FACULTY ATTITUDES TOWARD OPEN ACCESS PUBLICATIONS FOR SCHOLARLY COMMUNICATION IN CENTRAL UNIVERSITIES OF NORTH EAST INDIA: AN EVALUATION

A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF DOCTOR OF PHILOSOPHY

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MZU REGISTRATION NO.: 1900183
Ph.D. REGN NO: MZU/Ph.D./1432 of 23.07.2019

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SEPTEMBER 2023

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SUBMITTED
IN PARTIAL FULFILMENT OF THE REQUIREMENT OF THE DEGREE OF DOCTOR OF PHILOSOPHY IN LIBRARY AND INFORMATION SCIENCE OF MIZORAM UNIVERSITY, AIZAWL

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CERTIFICATE

This is to certify that **Maya Deori**, Ph.D. Scholar of the Department of Library and Information Science, Mizoram University has written her thesis titled "**Faculty Attitudes toward Open Access Publications for Scholarly Communication in Central Universities of North East India: An Evaluation**" under my supervision. To the best of my knowledge and belief, the work embodies her original investigation and findings and has not been published anywhere. I consider it worthy of the Degree of Doctor of Philosophy (Ph.D.) in Library and Information Science at Mizoram University.

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DECLARATION

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September 2023

I, **Maya Deori**, hereby declare that the subject matter of this thesis is the record of work done by me, that the contents of this thesis did not form basis of the award of any previous degree to me or to do the best of my knowledge to anybody else, and that the thesis has not been submitted by me for any research degree in any other University/Institute.

This is being submitted to the Mizoram University for the degree of **Doctor of Philosophy in Library and Information Science.**

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ACKNOWLEDGEMENT

At the very outset, I would like to offer my heartiest and deepest gratitude to my supervisor **Prof. Manoj Kumar Verma,** department of Library and Information Science, Mizoram University, Aizawl for his valuable guidance, support and inspiration throughout the research work. It has been a privilege working under the supervision of a hardworking, knowledgeable, and experienced person like him, who has always been a source of support and confidence. I sincerely thank him for giving me the freedom to express my thoughts and making the research work an enjoyable one.

I gratefully acknowledge **Prof. Pravakar Rath, Head of the Department, Prof. R.K. Ngurtinkhuma, Professor; Prof. S.N. Singh (Retd. Professor)**, **Dr. Langaizuali, Assistant Professor; Dr. F. Chanchinmawia, Assistant Professor;** and **Dr. Manendra Kumar Singh, Assistant Professor** of the Department of Library and Information Science, Mizoram University, Aizawl for their moral support and helpful advice during my research work.

I would like to express my gratitude to **Dr. Akhandanand Shukla**, Professor, Department of Library & Information Science, North Eastern Hill University (NEHU) and **Prof. Mohammad Nazim,** Professor of Aligarh Muslim University for their endless support, blessings, and encouragement during my research work.

It is my privileged and proud moment to thank all my teachers I was taught by for shaping my life.

I would like to extend my sincere thanks to all my fellow research scholars Tribeni Pathak, Bwsrang Basumatary, Swagota Saikia and Bhagyashree Chetia for their insightful suggestions and help. Thanks should go to all my cooperative and supportive friends and well-wishers.

Lastly, I would like to extend my heartfelt thanks to my family and friends for always being there for me as my strength.

Bibliography given in the thesis to be considered as acknowledgement to respective proprietor of the document. It is my core duty to thank all the research scholars whose thesis were the major area of my study.

Aizawl, Mizoram **(MAYA DEORI)**

Dated:

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LIST OF ABBREVIATIONS

TERM	DESCRIPTION
ACS	American Chemical Society
AGR	Annual Growth Rate
ALA	American Library Association
APA	American Psychological Association
APC	Article Processing Charges
API	Application Programming Interface
AU	Assam University
B.Ed.	Bachelor of Education
BBB	Budapest-Bethesda-Berlin
BOAI	Budapest Open Access Initiative
BRICS	Brazil Russia India China & South Africa
CBCS	Choice Based Credit System
CBSE	Central Board of Secondary Education
CC	Creative Commons
CERA	Consortium for e-Resources in Agriculture
CIET	Central Institute of Educational Technology
CSIR	Council of Scientific and Industrial Research
CURL	Consortium of University Research Libraries
CWTS	Centre for Science and Technology Studies
D. Litt	Doctor of Literature
DHE	Directorate of Higher Education
DOAB	Directory of Open Access Books
DOAJ	Directory of Open Access Journals
DOAR	Directory of Open Access Repository
DOI	Digital Object Identifier
DORA	Declaration on Research Assessment
DST	Department of Science and Technology
DT	Doubling Time
ECHO	European Cultural Heritage Online
ECRs	Early Career Researchers
ERIC	Education Resources Information Centre
ETDs	Electronic Thesis or Dissertation
FTP	File Transfer Protocol
GoI	Government of India
HASS	Humanities, Arts and Social Sciences
HOAP	Harvard Open Access Project
ICAR	Indian Council of Agricultural Research
ICMR	Indian Council of Medical Research
ICT	Information and Communication Technology

IIT	Indian Institute of Technology
INDEST	Indian National Digital Library in Engineering Sciences and Technology
INFLIBNET	Information and Library Network
ISI	Institute for Scientific Information
JIF	Journal Impact Factor
JISC	Joint Information Systems Committee
JNV	Jawahar Navodaya Vidyalaya
KVS	Kendriya Vidyalaya Sangathan
LIS	Library and Information Science
M.Phil.	Master of Philosophy
MHRD	Ministry of Human Resource Development
MoE	Ministry of Education
MOOC	Massive Open Online Course
MU	Manipur University
MZU	Mizoram University
NAAC	National Assessment and Accreditation Council
NCERT	National Council of Educational Research and Training
NCTE	National Council for Teacher Education
NDLI	National Digital Library of India
NDLTD	Networked Digital Library of Theses and Dissertations
NE	North East
NEHU	North Eastern Hill University
NIH	National Institutes of Health
NIOS	National Institute of Open Schooling
NIRF	National Institute Ranking Framework
NKC	National Knowledge Commission
NME-ICT	National Mission on Education through ICT
NPTEL	National Programme on Technology Enhanced Learning
NROER	National Repository of Open Educational Resources
NU	Nagaland University
OA	Open Access
OAD	Open Access Directory
OAI-PMH	Open Archive Initiative - Protocol for Metadata Harvesting
OAJ	Open Access Journals
OAR	Open Access Repositories
OASPA	Open Access Scholarly Publishers Association
OCLC	Online Computer Library Center
OCW	Open Course Ware initiatives
OECD	Organisation for Economic Co-operation and Development's
OER	Open Educational Resources
OLH	Open Library of Humanities

OSI	Open Systems Interconnection
OSS	Open-Source Software
PDF	Portable Document Format
PG	Project Gutenberg
Ph.D.	Doctor of Philosophy
PLOS	Public Library of Science
PMC	PubMed Central
POA	Programme of Action
RGR	Relative Growth Rate
RGU	Rajiv Gandhi University
ROAR	Registry of Open Access Repository
ROARMAP	Registry of Open Access Repository Mandates and Policies
SA	Subscription Access
SciELO	Scientific Electronic Library Online
SJR	SCImago Journal Rank
SKU	Sikkim University
SPARC	Scheme for Promotion of Academic and Research Collaboration
SPSS	Statistical Package for Social Sciences
SSRN	Social Science Research Network
STEM	Science, technology, engineering, and medicine) sectors
SWAYAM	Study Webs of Active-Learning for Young Aspiring Minds
TIMTAY	Tilak Raj Chadha Institute of Management and Technology
TU	Tripura University
TZU	Tezpur University
UGC	University Grants Commission
UNESCO	United Nations Educational, Scientific and Cultural Organization
WHO	World Health Organization
WoS	Web of Science
WWW	World Wide Web

CHAPTER 1

Introduction

1.1. Introduction

Library and Information Science is a very broad discipline that has adopted highly specialized techniques and research strategies. The research in LIS has evolved as a professional practice by various academicians and professionals in the field. From the past to the present, various pieces of research have been carried out by professionals emerging from the category of traditional areas like classification, bibliography, user study, information literacy, etc. to communicative and computer science-related areas. Since Library and Information Science have always been confined with a clear objective to satisfy their users in case of services or information retrieval processes. Therefore, with the introduction of Information and Communication Technology (ICT), it has been combined with computer-related facilities for the users. Nowadays, in research, it has always been observed that the researchers have focused on selecting the users' affiliated research areas. With the rapid growth in ICT, electronic publishing and digital libraries have contributed to the restructuring of scholarly publishing patterns in academic institutions and it has had a lot of impact on the scholarly communication process of academics, scholars and researchers from traditional print publication to electronic publications. Open access scholarly communication is a new trend in communicating the research findings and in the last decade it has gained more and more popularity among the academic community because open access is beneficial for both- users as well as researchers. Akterian (2017) has found in his research that there has been tremendous growth in open access publications since 2000 and assumed that if growth continues at the same speed, in 2040, all scientific communication will be published in open access mode only.

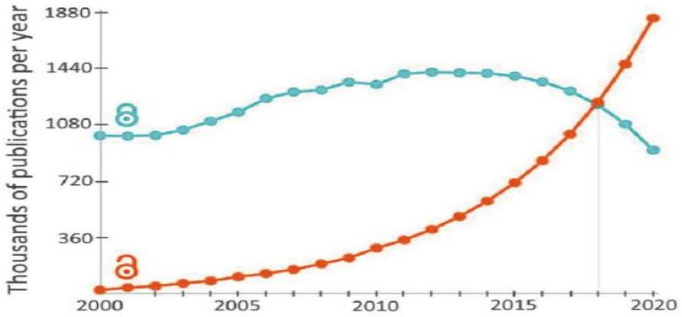

Figure 1.1: Comparison of the Development of Open Access Publications
(Source: "Towards Open Access Scientific Publishing" by Stepan G. Akterian)

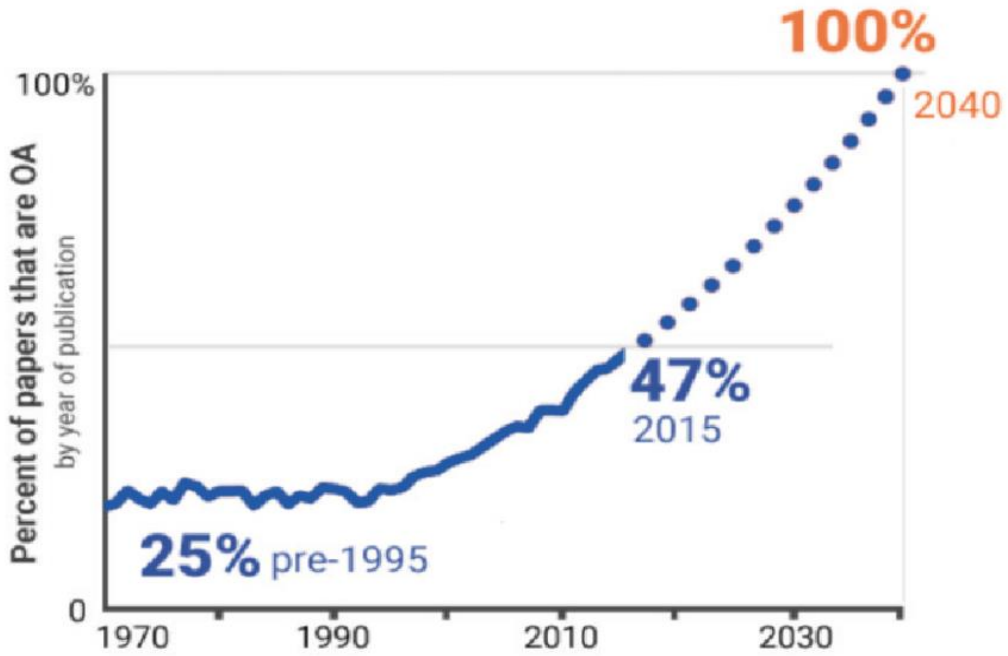

Figure 1.2: Forecast of the Share of Open Access Publications
(Source: "Towards Open Access Scientific Publishing" by Stepan G. Akterian)

Scholarly communication is a means through which scholars communicate with each other in a broader public population. It is the process of authoring, publishing and use of the scholarly publication. It can be defined as "*the system through which research and other scholarly writings are created, evaluated for quality, disseminated to the scholarly community, and preserve for future use*" (Association of College & Research Libraries, 2003). Scholarly Communication can be described as a process through which researchers and scholars publish and share their research articles basically in peer-reviewed journals so that it is visible to information seekers worldwide. By adopting the term scholarly communication mainly, the LIS professionals are accepting it as a new mode of delivery of information. The professionals can go beyond supporting researchers in discovering and accessing scholarly information, by getting involved in knowledge creation and changing the way through which new research is produced and shared. It can also help in serving the economic crisis in journal publishing, by encouraging and supporting the researchers to publish in open access journals.

1.1.1. Open Access

Open access is free, immediate, online and availability of research articles with reusable rights. Open access has certain features of the availability of free online resources with no or fewer copyright/licensing restrictions which diminishes barriers to information dissemination. This is all about making the scientific research content available for anyone and anywhere in the world to read access and build upon so that people can do interesting things in new ways with the available materials. The idea of open access is to make the literature search more valuable and relevant. Open access publishing has many benefits for the researchers mainly greater visibility than subscription-based articles and due to higher visibility, the article receives more citations which eventually decides the impact of the study.

There are two degrees of open access that can be distributed as *gratis* open access and *libre* open access which means free of charge online access and free of charge online access with various additional usable rights respectively. The various additional rights can be granted by the use of Creative Commons Licenses. And there are two main different routes to open access publishing i.e., Green and Gold. The '*green*' is generally self-archiving, where the authors make their final accepted version of articles freely available to all by depositing and displaying them in central or institutional repositories. The '*gold*' means journal publishing or the publishers of the journal provide full access to the research articles either by providing full authority to the author or institution; or by charging a processing fee. Later the '*hybrid*' was added to the list which means that the traditional subscription-based journals allow to publish certain publications in open access section of the journal by receiving a modest amount or fee from the author.

1.1.2. Budapest Open Access Initiative (BOAI)

Budapest Open Access Initiative was the first meeting held on the open access area by the Open Society Institute at Budapest, Hungry back on December 1-2, 2001. It is considered to be the first worldwide initiative on open access except for the European countries. This initiative was aimed at diminishing access barriers to the peer-reviewed literature to encourage research, improve education and make

literature more valuable and relevant. This initiative was also taken to share the knowledge between the poor and the rich uniting humanity which basically can be regarded as a step to remove the digital divide and satisfy the quest for knowledge among the information seekers.

Budapest Open Access Initiative (BOAI) defines open access as *"free availability on the public internet, permitting any users to read, download, copy, distribute, print, search, or link to the full texts of these articles, crawl them for indexing, pass them as data to software, or use them for any other lawful purpose, without financial, legal, or technical barriers other than those inseparable from gaining access to the internet itself. The only constraint on reproduction and distribution, and the only role for copyright in this domain, should be to give authors control over the integrity of their work and the right to be properly acknowledged and cited"*.

Following are some of the definitions provided by the prominent authors:

> Suber (2002) defines open access as "*Open access to scientific journal articles means online access without charge to readers or libraries. Committing to open access means dispensing with the financial, technical, and legal barriers that are designed to limit access to scientific research articles to paying customers. It means that, for the sake of accelerating research and sharing knowledge, publishers will recoup their costs from other sources.*"
>
> Morison (2006) defines Open Access as *"Open Access literature is free online for anyone, anywhere to read, download, and use, providing that the author is properly cited, to be freely available as soon as it is published, If not before (as a preprint). Open Access is an obvious choice for works that authors have traditionally given away, such as scholarly, peer reviewed journal articles, the focus of the open access movement. Open Access makes sense for other materials too, such as government documents, theses and conference proceedings".*

Prosser (2003) defines Open Access as "*free and unrestricted access on the public Internet to literature that scholars provide without expectation of direct payment. There are many reasons for doing this; it accelerates research, enriches education and shares learning across rich and poor nations".*

1.1.3. Central Universities of North East India

The central universities are established by an Act of Parliament under the Union Human Resource Development Ministry. Generally, universities in India are recognized by the University Grants Commission (UGC), which was enacted under the University Grants Commission Act, 1956. Under UGC, there are mainly 56 central universities listed all over India. Among the 56 Central Universities, there are 9 central universities in the Northeastern regions excluding Central Agricultural University, Imphal and National Sports University, Imphal, Manipur. The nine central universities are- Assam University, Silchar; Manipur University, Imphal; Mizoram University, Aizawl; Nagaland University, Nagaland; North Eastern Hill University, Shillong; Sikkim University, Gangtok; Rajiv Gandhi University, Itanagar; Tezpur University, Tezpur and Tripura University, Tripura. Among the 9 central universities in the Northeast, North Eastern Hill University (NEHU) is the oldest university according to the year of establishment i.e., in 1973 and the Sikkim University is the newest of all in 2006. All the central universities offer Masters, M.Phil, Ph.D, and D. Litt. programmes. And each university has more than 30 specialized departments. Besides the regular courses or departments in the universities, there are some special departments like Yoga, National security, several tribal language studies, etc. As per the NIRF (National Institute Ranking Framework) of India, Tezpur University is regarded as the topmost university among all the central universities in Northeast India followed by NEHU and Mizoram University.

1.2. Significance of the Study

The term open access often means the availability of free peer-reviewed literature on the web with an opportunity to be retrieved by the public community allowing them to print, copy, download, and share the full-text articles. Open Access (OA) publishing has various advantages for all academic communities, including (a) Authors: Through OA, they may reach a global audience and make their accomplishments more widely known; (b) Universities: OA improves their goal of information sharing by enhancing the profile of their scholars and their publications. It also lowers publication expenses associated with journal and database subscriptions. Nowadays, open access is believed to be an emerging research area in the field of Library and Information Science where researchers determined the attitude and behaviour of different academic communities towards open access and measured their contribution. As stated by the report of the National Science Foundation in 2020, India has surpassed to third position in terms of scientific publications with 1,49,213 papers. Since Indian academicians are already very aware of the importance of scientific publications, therefore, it is very interesting and challenging to know the Indian academicians' attitudes towards OA publications. To know the trend of the academicians regarding open access publishing, the present study helps to provide a clear view of OA awareness, attitudes towards OA publications and insight story in the adoption of OA.

In addition, the study also anticipates a clear vision regarding the adoption of open access routes or open access publication patterns such as the Gold, Green, Bronze, and Hybrid. Besides that, the study strives to rank the most productive central Universities of North-east India and the most prolific contributors among the faculties in OA publications. Moreover, the findings of the study offer acuity to the researchers at the participating academic institutions with clarity to help them decide how to optimize scholarly communication for future high-impact publications.

1.3. Scope of the Study

Since the region of North-east India is present in the easternmost province of India linked with central India through a thin passageway pinch between Nepal and Bangladesh. In terms of the Academic community, even after being a prominent part of India, due to its geographical locations, the academicians of the regions sometimes lapse out certain academic progress and advancements compared to other regions of India. Since the central universities play a vital role in these regions in projecting academic and research achievements, it is also necessary to review the status of the academicians regarding the latest areas of research. Since the concept of open access publishing has been building a virtuous position in sharing and dissemination information in the digital world which led to evaluating the status of the adoption of open access publishing.

Therefore, the scope of the present study is limited to analyze the faculty's attitude towards Open Access publications for their scholarly communication in central universities of North East India. Presently, there are a total of 11 central universities (as on 05.03.2020), situated in different states of North East India. Out of these central universities, two central universities i.e., Central Agricultural University, Manipur and National Sports University, Manipur are different from other central universities in terms of nature and administrative control under ICAR and Ministry of Youths and Sports respectively however all other central universities are under UGC. Thus, the scope of the present study is limited to nine central universities of North East India as listed in Table 1.1 which are recognized under the University Grants Commission (UGC). The publications of faculty were tallied from the Scopus database and only those publications were considered which appeared in the Scopus database.

Table 1.1: List of Selected Central Universities in North-East India
(Source: Respective university websites collected on 25th February 2020)

Sl. No.	Name of Central University	Year of Estd.	State	Website
1.	Assam University	1994	Assam	http://www.aus.ac.in/
2.	Manipur University	1980	Manipur	https://www.manipuruniv.ac.in/
3.	Mizoram University	2001	Mizoram	https://mzu.edu.in/
4.	Nagaland University	1989	Nagaland	https://nagalanduniversity. ac.in/English/
5.	North Eastern Hill University	1973	Meghalaya	https://www.nehu.ac.in/
6.	Rajiv Gandhi University,	1984	Arunachal Pradesh	https://rgu.ac.in/
7.	Sikkim University	2007	Sikkim	https://cus.ac.in/index.php/en/
8.	Tezpur University	1994	Assam	http://www.tezu.ernet.in/
9.	Tripura University	2007	Tripura	https://tripurauniv.ac.in/

Table 1.2: Overview of Selected Central Universities in North-East India
(Source: Respective university websites collected on December 7th 2020)

Sl. No.	Name of Central University	No. of Dept.	No. of Faculty
1.	Assam University, Silchar	41	357
2.	Manipur University, Imphal	37	224
3.	Mizoram University, Aizawl	35	230
4.	Nagaland University	42	218
5.	North Eastern Hill University, Shillong	47	332
6.	Rajiv Gandhi University, Itanagar	26	171
7.	Sikkim University, Gangtok	33	208
8.	Tezpur University, Tezpur	27	279
9.	Tripura University	46	172
	Total	**334**	**2321**

1.4. Research Design

A research design is a methodical approach utilized by the researcher to offer genuine, unbiased, reliable, and economically viable solutions to problems. It is an arrangement of parameters for gathering and evaluating data that attempts to strike operational effectiveness with relevance to the study objective. It emphasizes on crafting a tactical strategy to carry out numerous procedures and responsibilities essential to successfully conclude the study. And also, validates that these methods are sufficient to generate authentic, truthful, and comprehensive responses to the research questions (Kumar, 2011).

1.4.1. Statement of the Problem

Open access is generally the scholarly publication which is free of restrictions with immediate online access to peer-reviewed full-text research articles along with the right to read, copy, download, share and print. For any researcher, it is equally important how the research findings will be shared with the rest of the academic communities. And sharing of research work has undergone a tremendous change in the way of scientific communication in the last two decades and from the LIS perspective, it is a very interesting and challenging attempt to measure the changes in the attitude of the faculties in their scientific communication of central universities of North East India. The main aim of this study is to examine the attitude and perception towards publishing in open access platforms. The study also gives insights into the most prolific contributors, research contributions of central universities of NE India, leading universities and top faculty in OA publications in these universities, preferred route to publish OA publications, popular OA journals and platforms and purpose for publishing in open access platform.

1.4.2. Objectives of the study

A research objective is a simple, explicit phrase that gives out a clear direction to carry out the investigation of the study. The objective of the research provides a vibrant indication of what to achieve in the whole investigation.

The objectives of the present study are to:

1. Find out the research contributions of the faculties of central universities of North East India
2. Assess the level of awareness about open access (OA) among the faculties
3. Investigate the faculty's publications in OA in selected universities
4. Reveal the attitude and behaviour of faculty towards their OA publications
5. Find out the preferred routes of OA publications by faculty
6. Identify the degree of satisfaction among the faculty's OA publications
7. Rank the most productive central universities and the most prolific contributions in OA

1.5. Research Methodology

A research methodology gives the research investigation authenticity and delivers valid scientific findings. Furthermore, it provides a comprehensive technique that assists in maintaining researchers' focus and enables a basic, viable, and reasonable technique. It summarizes the steps followed and the procedures that culminated in the study findings.

1.5.1. Type of Research: The present study eventually examined the purpose and productivity of publication in open access platform by the faculty which described that the nature of the study was both quantitative and qualitative. The study adopted both bibliometrics and survey methods for the identification of samples and collection of data.

1.5.2. Sample of the Study: The faculty of the central universities of North-East India was reserved as a sample for the study by using the census sampling method. The publications or research contributions of the faculty of the central universities of North-East India on the open access platform that was indexed in the Scopus database until 2022 were considered as the sample of this study.

A survey was conducted to examine the attitude and behaviour of the faculty members towards open access which was based on 90 faculty members (top ten faculties from each university based on the OA publications). However, only 65 faculty members from 9 central universities responded to the questionnaire.

1.5.3. Data Collection Tools: For collection of data, the following tools were used in this study**:**

- ***Scopus Database:*** The Scopus is the greatest database of literature that has undergone peer review, including scientific journals, books, and conference proceedings. It offers a comprehensive examination of the research conducted globally in various areas of science, technology, health, social and behavioural sciences, and humanities and arts fields. The Scopus database was utilized to compile the publication statistics from the undertaken central universities.
- ***Google Form for questionnaire:*** Google Form is a product or tool from Google which is online and free permitting for creation of forms for surveys and quizzes. It also elaborately provides the feature to share and edit as well as analyse the data retrieved from the responses of the respondents. This study has circulated a questionnaire to each of the sample populations using Google Forms from Google to accomplish the collection of data for the qualitative measure using the survey method.

1.5.4. Data Collection Procedure: By using the Scopus database, the data required for evaluation was retrieved between November 19th to December 14th 2022 using the Scopus Database up until the year 2022. The retrieved data was scrutinized and arranged according to standard interpretation using Microsoft Excel. The total contribution of the faculties and their variations was identified manually using Biblioshiny (Bibliometrix R Package). Biblioshiny is an open-source tool to perform a comprehensive scientific mapping assessing scientific publications. It was created using the R programming language to ease the interface with other statistical and graphical applications and to be adaptable (Aria and Cuccurullo, 2017). The availability of open access scholarly publications was analysed manually using MS Excel. While, to examine the attitude and behaviour of the faculty members towards

open access, a survey was conducted and the top ten faculties from each university were identified as the sample size. A questionnaire was circulated from March 26th 2023 to each faculty included in the sample via email at first, later WhatsApp, which was then followed by a telephonic approach to each of the sample population.

1.5.5. Data Analysis and Interpretation: The collected data from the Scopus database and questionnaire was scrutinized, tabulated, and analyzed using suitable software packages such as MS Excel and Biblioshiny (Bibliometrix R Package). Later the analyzed data was displayed by using different tables and graphs for better interpretation of the result.

1.6. Chapterization

Chapterization is the basic summary of the whole investigation report with logical structuring into sections and sub-sections. Chapterization helps to engage the reader's receptivity to fresh concepts and inferences with systemic enlightenments. This study is classified into six chapters handing out all the logical details of the report along with bibliography and appendices. Moreover, APA 7th reference style is used for both in-text citations and bibliographic references. The classified six chapters are arranged in the following particulars:

Chapter 1: Introduction

This chapter provides a precise introduction to open access and its historical relevance. This chapter also specifies the objectives identified for the study along with the scope of the study. It also states the problem for undertaking the study and explains the research methods and tools used for the study. Furthermore, it also bestows the entire framework of the investigation labelling as chapterization.

Chapter 2: Review of Literature

This chapter identified all the relevant research projects undertaken in the area of open access to validate this study. It also defines the current information related to the scope of the study. This chapter is divided into sub-sections pertinent to the topic such as open science, open access evaluation, and others. The review of the literatures are arranged in descending chronological order for each sub-section.

Chapter 3: Conceptual Approach of Open Access

This chapter aims to explore the concept of open access and provide a comprehensive understanding of its history, significance, and broader implications in academic and scientific research. By delving into the historical development of open access, ranging from the Budapest Open Access Initiative to the present day, it gives insights to readers about the evolution and milestones of this movement. Furthermore, the chapter highlights the critical importance of open access in facilitating the unrestricted dissemination of knowledge, promoting collaboration, and fostering innovation across diverse disciplines. It also explores the numerous benefits of open access, including increased visibility and impact of research, enhanced public engagement, and accelerated scientific progress. Finally, it states the implications of open access, including potential challenges and opportunities for researchers, publishers, and the scholarly community.

Chapter 4: Central Universities of North-East India: An Overview

This chapter provides a detailed view of the undertaken central universities of North-East India. It explains the mission and vision of each university and points out the details of the academic departments along with an illustration of their official website.

Chapter 5: Data Analysis and Interpretation

This chapter is referred to as the body of the entire study since it comprises the final evaluation results after the analysis of the objectives. This chapter pertains to the answers to the research questions with a systemic outlook by adopting tables and figures or graphs. The comprehensively analyzed data are interpreted for a better understanding of the findings.

Chapter 6: Findings, Conclusion and Suggestions

This chapter calls out the outline of the findings of the study such as the awareness and adoption of open access publishing among the selected faculties of central universities of North-East India and the relevant challenges confronted while dealing with this study. This chapter also reveals suggestions and recommendations to the academicians of the country about the concept of open access.

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CHAPTER 2

Review of Literature

2.1. Introduction

A review of literature is an in-depth assessment of research or publications on a relevant subject or research issue. A review of literature is a survey of academic books, journals, and other materials pertinent to a certain problem, field of study, or theory, and it offers a quick overview, outline, and critical assessment of these resources (Ramdhani, 2014). In general, a review of literature may be interpreted as a more or less logical method of assembling and examining past studies (Snyder, 2019). The main purpose of reviewing the literature is to find out what has been previously achieved which is related to the topic. Another additional purpose of reviewing the literature is to find different research methods and strategies for the collection of data that have or have not been successful earlier in a productive way associated with the topic (Gay et al., 2006).

For the present study, a total of sixty-eight relevant works of literature were collected from various databases using certain search queries such as scholarly communication, open access, open access resources, open access funding, open access routes, open access publishing, open access, and non-open access comparison. Scopus database, Web of Science, Google Scholar, ResearchGate, ShodhGanga, Publish and Perish and many more databases were approached to collect the relevant literature for the study. The review literature for the study was selected from 2003 to 2023. The following sub-themes comprise the review of the related literature for the present investigation:

a) Overview of Scholarly Communication
b) Concept of Open Access
c) Open Access Evaluation
d) Open Access Initiatives
e) Funding Scenario of Open Access Publications
f) Evaluation of various Open Access Routes

2.2. Overview of Scholarly Communication

The beginning of the concept of scholarly communication was subsequently at that moment when the launching of two protuberant journals named Journal de Sçavans and Philosophical Transactions of the Royal Society (of London) happened in the year 1665 even after a few weeks apart between the two. The introduction of scholarly

journals in the 17th century made a drastic turning point for researchers and scholars (Swan, 2006). From regular print publications to the digital era, scholarly communication has accomplished various stages of progress.

Das (2015) stated that scholarly communication is the mode of communicating and publishing research and investigating results related to academic knowledge. Even so, scholarly communication makes up a tiny portion of the vast research loop, however, these scholarly publications document cutting the edge of improvement across various range of areas. These features additional opportunities for communication, scholarly discussion, and knowledge augmentation. Scholarly communication is the preliminary step for enhancement of the learned societies through approaches like peer-reviewed journals, conference proceedings, research reports, patents, and numerous others.

Mabe (2010) discusses various behavioural and information science approaches to scholarly communication and how it is communicated through various mediums formal and informal, public and private. In a formal context, the research ideas are communicated through books or peer-reviewed journals, symposia, and conferences. However, during early ages, the research ideas are disseminated in private to the research team or through informal discussion through email, letter, and telephone. The main aim is always to make the research outcome public, the emergence of technology has transformed its communication ways by making it private to public through the adoption of open access models.

Bergman (2006) highlights that the Open Access (OA) movement has brought great momentum to scholarly communication for publishing research work in OA journals, electronic archives, and repositories for presenting federally funded research to the public. It is a boon for the faculty members, researchers, or librarians who are working cooperatively to develop new ideas for scholarly output. During the rapid growth of the internet and technology which led to the high-cost journals serial crisis, the emergence of the OA has led to justify the taxpayers, largest journal publishers also for librarians to revisit price structures.

Thorin (2003) defined scholarly communication as something broader than publication but a way for scholars to communicate to create new knowledge or discoveries. The process of scholarly communication is considered in three

approaches, i.e., discovering new ideas through research and communicating informally with other researchers, method of shaping and communicating the research results formally with colleagues and finally distributing the final research output to the libraries and other repositories in print or electronic for the benefit of the public.

2.3. Concept of Open Access

Crossley *et al.* (2022) outlined the scholarly significance and author behaviours of open-access journals in the area of otolaryngology by comparing the articles of three open-access and subscription-based journals based on Google Scholar and Web of Science citation counts. The average number of citations for publications in otolaryngology-specific open-access journals was substantially lower (6.8) than for those in subscription-based journals (12.4, p 0.0001). The h-index of the first contributors was comparable between open-access and subscription-based journals, while the h-index of the final researchers was relatively low in open-access journals. Citations indicate that open-access papers have not yet reached the same degree of impact as subscription-based journals.

Deori & Verma (2022) explained the conceptual overview of Open Access with concern to its publishing models. The study discussed its initiatives including different popular publishing models like Gold, Green, and Bronze OA models.

Lynch et al. (2022) examined the effectiveness of open access (OA) publications on citation counts and concentrated rates of publications linked to lumbar spine surgery from the Altmetric database. A total number of 5245 papers were selected, among which 2063 had open access and 3182 did not. Altmetrics Attention Score (AAS) and Mendeley Readers (both P0.001) and Dimensions Citations (P=0.422) were remarkably and substantially associated with OA status. Among the top 10 reviewing journals, OA status strongly influenced Dimensions Citations for European Spine Journal, Journal of Neurosurgery: Spine, and Neurosurgery (P0.005) and anticipated AAS for Spine, European Spine Journal, The Spine Journal, Journal of Neurosurgery: Spine, and Neurosurgery (P0.017, all). Public attention ratings eventually proved to be strongly impacted by OA status, but not citation rates, although impacts varied depending on the journal where the articles were published.

Ming & Zhao (2022) evaluated 60 targeted journals that "reverse flipped" from OA to subscription in order to discover the flipping impact. The impact of an academic journal's transition from a subscription-based model to an open-access (OA) model has altered the open-access citation advantage. Numerous journals have made the transition from the subscription model to open access (OA), but they also converted their preswitching articles (i.e., those published under the subscription model) to OA. As a result, there are currently no subscription articles left to be matched with their postswitching OA equivalents. Using the difference-in-difference (DiD) analytical approach, the researchers instigated two OACA-related assertions mainly depending upon the bibliographic and citation data of pre- and post-switching articles within those journals. The accessibility of the journals' papers will not likely change as a result of reverse flipping, which might have an influence on the impact. Instead, it may result in a systematically different set of submissions to the journals, which would greatly diminish their effect.

Özay *et al.* (2022) compared the yearly SJR, according to the SCImago database and measured other variables that demonstrate the impact of journals on science in the field of obstetrics and gynaecology using open access (OA) or subscription access (SA). The researchers assessed and compared the transitions in OA and SA journals' one-year SJR (SCImago Journal Rank) and journal impact factor (JIF). The researchers also revealed that between 1999 and 2018, there was an increasing number of OA and SA journals in the area of obstetrics and gynaecology that were listed in the SCImago database. The researchers demonstrate that the scientific credibility of journals has been significantly rising for OAP journals in recent years, despite the fact that OA journals have always had the drawback of APC.

Shivaram *et al.* (2022) assessed the research productivity of the top six engineering universities in Karnataka according to the NIRF rankings with the use of scientometrics parameters including publication and citation growth, annual growth rate, and document types in addition to citation output of open access papers. All of the institutions have seen a substantial increase number of citations, MS Ramaiah Institute of Technology (MSRIT) with 1.7 is first and Visvesvaraya Technological University (VTU) is recorded to be the second-highest number of citations per article at 1.69. The average number of citations for open-access papers is greater than for non-

OA articles. The publications from the Rashtreeya Vidyalaya College of Engineering (RVCE) with the greatest average number of citations (11.8) were nearly four times as cited as those with the lowest average number of citations (2.58).

Simard *et al.* (2022) studied the differences in the dissemination and adoption of open-access publications by countries. Based on the two indicators that is, the number of literatures in OA and references made to articles in OA. The data for the study was collected from the Web of Science between 2015 to 2019, for analyzing the national difference in the use of OA, the countries have been grouped into four income levels. The results reveal that most of the OA publications are in green OA rather than gold, Sub-Saharan African countries are more active in the use and publishing of OA publications than the other countries followed by North America, however, Canada tends to cite OA but publish less in OA. It can be understood that countries with low income are highly publishing and citing OA and countries with low income and high income publish and cite OA at an average rate. The study suggests more initiatives at institutional, national, and global 8, levels for adopting OA.

Verma & Sonkar (2021) studied the growth of open-access scholarly communication in the BRICS countries from 2011 to 2020 through the lens of the Scopus database. The study found a total of 13,943,979 publications contributed by BRICS countries out of which 158902 publications were in open access form. Among the BRICS countries, China (65%) appears to be the highest publisher of open-access publications followed by Brazil (17%), Russia (7%), India (6%), and then South Africa (5%). The journal PLOS One journal is one of the prolific sources for publishing maximum open access publications. The Open Access publications are mostly published in the field of Medicine by the BRICS countries.

Bjork & Solomon (2012) conducted a comparative analysis between OA journals and subscription-based journals to determine if OA publishing affects the quality of the peer review system. The study is based on factors like citation rate, journal age, publisher's country, and discipline. DOAJ has been used for identifying the OA journals, and Ulrich's periodical directory is used for journal age and discipline. The comparison between OA and subscription-based journals was performed from the Web of Science and Scopus databases. The results revealed that the citation rate of subscription journals is 30% higher than the others. The overall analysis concludes that

both OA and non-OA journals indexed in Web of Science and Scopus have similar scientific value and quality.

Suber (2012) defined Open Access (OA) literature as something that is free access, available online with minimal copyright and licensing restrictions along with the facility to copy, distribute, and re-use. The emergence of OA has reduced the cost of the journal subscription amount, pay-per-view cost, licensing cost, and permission barriers.

Cullen & Chawner (2011) state that the concept of Open Access was introduced in the year 1999 during the launch of the Open Archives Initiative at the Santa Fe Convention. After that, several other initiatives like the Budapest Open Access Initiative in the year 2001 with the motto to make scientific literature accessible online free of charge, followed by Bethesda in June 2003 and the Berlin Declaration in October 2003 asking for the elimination of both permission and price barriers. These three declarations Budapest-Bethesda-Berlin are also known as BBB for making literature freely accessible online.

2.4. Open Access Evaluation

Alshammari (2022) determined the growth of urban studies from 2011 to 2019 by concentrating on the number of journals and publications concerning their open accessibility by cumulating with bibliometric variables. The term "Urban Studies" was used to filter publications from 2011 to 2019 from both Scopus and Web of Science (WoS) databases revealing that Urban Studies journals increased from 83 in 2011 to 193 in 2019. Open-access papers made up about 45% of all publications in 2019, up from 25.6% in 2011. From 18 (22%) in 2011 to 69 (35.9%) in 2019 there was a substantial rise in the sum of open-access journals ($p = 0.005$). Open-access journals are progressively being published by educational institutions and small and independent publishers; their output is relatively more prominent than that of major, established publishers.

Wilson *et al.* (2022) analyze the scenarios of open-access research articles that emphasize the benefits for women while assessing the gender imbalance in academic publications. The study used alternate analytical techniques to examine OA from a gender viewpoint like examining the gender demographics of the academic

workforce and the relationships between research output at institutions in the UK and Australia. The study of the correlations and connections between the proportions of women academics and open access publishing at Australian and United Kingdom universities reveals those Australian institutions with larger proportions of academic women publications visibly more in Gold OA. The researchers propose that women may expand the visibility of their research by questioning gender-blind assertions in publication, advertising, and funding procedures, expanding beyond conventional, current academic communication strategies, and engaging in other forms of communication.

Hobert *et al.* (2021) provide insight into how open access (OA) to journal publications from contributors affiliated with German universities and non-university research institutes developed between 2010 and 2018. The study discovered that 45% of the publications under consideration throughout the observed period were freely accessible. The research reveals that subject-specific repositories are the most widely accepted kind of OA. Furthermore, the proportions for publishing in complete open-access journals and open access through institutional repositories also metaphor compare substantial rises. The findings of this study also provide a baseline for evaluating the potential effects of recent transformational agreements with publishing companies on academic communication, enabling data-driven decision-making about the institutional adoption of OA in Germany.

Nazim (2021) determined the free availability of the research publications of the Indian institutions included in the Web of Science (WoS) for the years 2015–2018. From the CWTS Leiden Ranking 2020 database, articles published metadata for 36 universities have been extracted. According to the study's results, roughly 23% of all articles from these institutions are freely available, and their average percentage of OA articles is substantially lower (almost half) than the global average for universities (43%). Green OA held the top spot with 17% of cases where the greatest percentile (34.37%) was attained in the field of biomedical and health sciences. After describing the accomplishments of India, the research ends with an aspiration for enhancing academic institutions' global cooperation on open access.

Vílchez-Román & Vara-Horna (2021) attempts to verify an empirical model that describes the interplay between substance, consumption, and citation in open-access

articles at the data level. This research's data was gathered from the PLoS website on August 24, 2018, where 776,465 data from PLoS ONE were obtained using an R API (Application Programming Interface). Utilizing mediation analysis, the empirical framework was confirmed. For the conceptual model and each thematic region, scaling with 500 replications was performed to determine the importance of the variables.

Nicholas *et al.* (2020) investigated whether open access (OA) publication is appreciated and utilized by early career researchers (ECRs). The data presented here is compiled from a questionnaire-based global survey of 1600 participants, which represents the second and concluding year of a four-year, mixed-methods longitudinal investigation that is intended to determine if ECRs will function as transformational leaders for scholarly communications. The results demonstrate that the majority of ECRs are accepted for publication in open-access journals, with differences by profession and region. Most interestingly, there were more benefits and fewer drawbacks to open access publication, which could be a sign of issues related to cost and accessibility instead of reputational considerations. The most significant justification for publishing OA is social, despite the fact that OA is thought to particularly help ECRs advance their careers.

Pölönen *et al.* (2020) demonstrated the country-wide estimation of the frequency and proportion of OA is obtained using institutional publications datasets that cover all peer-reviewed publications across all disciplines, publication formats, and languages. The researchers examined the overall prevalence of WoS, Scopus, and DOI in addition to the distribution of open-access productions across various areas, publication categories, languages, OA approaches (gold, hybrid, and green), and OA data sources (DOAJ, Bielefeld list, and Sherpa/Romeo). The conclusion states that institutional data, embedded at the regional and global levels, serves as a crucial fundamental component of the massive data infrastructure required for a thorough assessment and evaluation of OA across nations, for instance at the European level.

Rej *et al.* (2020) investigated the citation performance indicators in the discipline of gastroenterology were significantly affected by open-access publications. Gut, Gastroenterology, and the American Journal of Gastroenterology (AJG) were evaluated for relevant research publications that were cross-referenced with the Web of Science (WoS) database between January 2009 and December 2013. The three

journals' open-access papers received considerably more citations than their closed-access counterparts (median citation rate: 38.5 vs. 33, p=0.044), demonstrating the advantages of open-access publication in the domain of gastroenterology. The statistics demonstrate the potential advantage of citation metrics for open-access publication is substantial in gastroenterology journals.

Srichandan *et al.* (2020) analyzed the level of research products indexed in the Web of Science generated by India's 100 most prolific institutions that have been published in open access platform for 2016. The paper also investigates the research articles from these institutions that can be found on the well-known pirate website Sci-Hub. It is intriguing to note that legal OA proportions are much lower than Sci-Hub distribution for these academic organizations, which leaves a clue that India's current open access promotion procedures are ineffective. The findings suggest that either there exist certain barriers preventing researchers from using legal OA models or that there may be some reluctance toward doing so.

Torres-Salinas (2020) examined the worldwide perspective on the continuous expansion of research publications on COVID-19 in multiple databases such as Dimensions, Web of Science Core Collection, Scopus, PubMed, and eight other repositories. Regarding the outcomes, Dimensions indexes a total of 9,435 articles, 69% of which have undergone peer review, and 2,677 preprints, which is much more than Scopus's (1,568) and WoS's (253) combined totals (718). PubMed Central, medRxiv, and SSRN are the top three of the eight repositories assessed, although, amidst their significance, journals remain the primary means of scholarly publishing.

Zhu (2020) surveyed to learn more about the concerns regarding the practice of data sharing, its features, and levels of support to over 1800 UK-based academics. It was found that although the majority of academics agreed on the value of sharing research data, however, most of the respondents had never done so. Additionally, it was discovered that the practice of sharing data was correlated with knowledge of the Research Council UK's (RCUK) Open-Access (OA) strategy, with the involvement of Gold and Green OA publications mostly. A modest number of academicians promoted their study data by posting online using social media platforms like Twitter, blogs, and Facebook.

Gasparyan *et al.* (2019) provided an outline of the current and developing online methods for adopting a standard approach to open access. The emphasis on journal indexing with free and open databases and search engines is growing as the number of high-quality open-access journals rises. Services like Directory of Open Access Journals and PubMed Central are unable to fully fulfill the users' rising expectations, hence efforts are being made in China, Japan, Korea, Russia, and other countries to improve the indexing and archiving of open-access resources. The lack of understanding of the significance of all of its components, from liberal copyrights to open post-publication discussion, maybe the cause of the tardy adoption of comprehensive and instantaneous open access in various regions of the world.

Holley (2019) analyzed the existing scenario of open access, with a focus on the United States, and its outlook for the future through the literature study of articles from 2015. The author explores the discipline of social sciences, humanities, and fine arts as well as the STEM (science, technology, engineering, and medicine) sectors in order to explore the impact of open-access publishing. Open access has made scholarly materials more accessible and encouraged the dissemination of their findings, frequently just after the submission of fees. Author processing charge (APC) and the purchase of smaller presses are two strategies adopted by major commercial publishing organizations to make a profit from open access.

Rovira, Urbano & Abadal (2019) found out the frequency with which the authors of Catalonia's CERCA research centers utilize open-access journals, repositories, social media, and other platforms to share their research findings. Out of a total publication of 44,423, a sample of 3,730 research papers published by authors from CERCA research centers between 2011 and 2015 that were accessible on the Web of Science was examined to determine the adoption of open access and in full-text format. The analysis indicates that 52% had at least made one version of the article available in either journals or repositories. This research emphasized the significant role that academic social media sites have played in the massive rise in open access availability.

Bala & Pratap (2018) analyzed the awareness, availability, and perception towards open access resources among the students of management and the faculty of Tilak Raj Chadha Institute of Management and Technology (TIMT), Yamuna Nagar, Haryana. The study was conducted by adopting a survey method and data were collected from

postgraduate students and faculty members of Management Science of this institution. This study reveals that the majority (82.95%) of the users in TIMT, Yamuna Nagar, Haryana, have awareness and use open-access resources to fulfil their information needs.

Muthuvennila & Thanuskodi (2018) examined the accessibility, use, and awareness of the open access resources amongst the PG students of Library and Information Science in Alagappa University DDE by adopting survey method through questionnaires, interviews, and observation techniques for the collection of data. It was found that most of the students are merely aware of the open-access resources and hence lesser number of effective users.

Laakso & Polonioli (2018) analyzed open access to journal publications among ethicists of open access publishing in journals through mapping of the bibliometric from 2010-2015. A total number of 297 ethicists affiliated with top-ranking philosophy departments were identified and their journal publication information was recorded (1682 unique articles) of the concern period. The journal articles were then queried through Google Scholar in order to establish the open access status (web locations, document versions) of each publication record. Open access to 27% of total articles, i.e. close to half of the 56% total open access observed, was provided through a single copy available on the web. Academia.edu, ResearchGate, and PhilPapers were all observed to have a strong presence among the dissemination channels used by ethicists.

Jeyapragash *et al.* (2016) analyze the open-access journals listed in the Directory of Open Access Journals (DOAJ) within the selected five-year period in all the disciplines. The main objectives of the study are to analyze the subject, language, and year-wise publication of the journals and also to know the multidisciplinary approach to publications. The data were collected from the DOAJ.org website and analyzed by using MS Excel. The study revealed that most of the journals were published in the English language and the maximum number of articles has been published in Medicine whereas Navel Science has the minimum number of publications. Some of the recommendations were to create awareness among developing countries like India to publish in an open-access platform more often and the social science discipline should increase its publication rate.

Prince & Saravanan (2015) analyzed the users' awareness and perception of open access resources in the higher educational institutions in the Kanyakumari district. The main objectives of the study are to examine the awareness about open-access resources, the purpose, and reason for using open-access resources, level of satisfaction, and perception towards open-access resources. By using the survey method, data were collected from PG students, research scholars, and faculty members of Arts & Science, Engineering, Education Colleges, and the University of Kanyakumari district. From the study, it was revealed that most of the respondents were fully aware of open-access resources and they used the resources mainly for their course-related work and were satisfied by their use in their academic field.

Nazim & Devi (2008) examined the trends and availability of open access publishing in India through the case study method on certain parameters like the total number of institutional repositories and open access journals in India, number of documents, software used, types of documents, etc. For an overall number of journals, India stands in 12^{th} position, among the top 25 open-access publishing countries and 5^{th} in the list of open-access journals. Through this study, it is very clear that the professionals of Library and Information Science are realizing the importance of open-access publishing and institutional repositories in India.

2.5. Open Access Initiatives

Bautista-Puig (2021) explores how Spanish managers perceive OA as well as the preference to flip utilizing quasi-structured interviews and bibliometric attributes. By evaluating twelve semi-structured interviews with editors of Spanish journals, the research indicates that even though most managers are aware of the obvious signs, just two of them believed that they could alter their reality. The findings suggest that being forced to switch to OA by the host institution, financial concerns, better exposure, and globalization are the driving factors. The switching led to a spike in article applications, exposure, or globalization however the biggest drawback is seen to be the lack of connections with other institutions and organizations.

Faulkner (2021) examines faculty practices at the college-department level by faculty publishing habits and utilization of citations. The library community believes that open-access (OA) publication is the future, and it will help academics and students

worldwide by balancing the competitive landscape, reducing costs, and widening the creation of information and knowledge. The findings demonstrate that faculty members in the psychology department at California State University, Los Angeles consistently publish at all OA levels, however, they don't always use formal self-archiving as often as they do with citations.

Kirtania (2021) conducts a bibliometrics analysis of the Indian Open Access scholarly publications during the time period of 1970 to 2020 from the Lens database. The results show that there are 4,17,887 number of open access publications contributed by India holding the 13th rank United States being the 1st, and the affiliation Indian Institute of Science has published the maximum papers, most of the papers are published in the field of science like medicine, biology, chemistry physics, etc and the RSC Advances journal appears to be the prolific journal. Regarding prolific publishers, Elsevier tops the list followed by Medknow, Springer, Wiley, etc.

Momeni *et al.* (2021) sought to comprehend how shifting a journal to an open-access model affects its future publishing numbers and citation impact. The researchers examined two separate segments of journals from the Directory of Open Access Journals (DOAJ) and the Open Access Directory (OAD) that had switched to an OA model and compared their progress to two corresponding control groups of comparable journals. According to the findings, journals that switched to an open-access approach generally produced more publications than journals that maintained their gates closed. These findings suggest that shifting to an open-access publishing approach can improve a journal.

Greussing *et al.* (2020) conducted a qualitative study of the challenges of open-access publishing investigating the individual and institutional aspects. The study is based on group discussion and interviews to understand the researcher's perspectives and attitude towards open-access publishing. The researchers are mainly from the field of biomedical and health informatics across different countries of different seniority levels. It is found that most of the researchers are in favour of freely accessible scientific literature but there is a lack of awareness related to choosing OA journals for research publishing. The main challenge found is the Article processing charge and quality matter according to the viewpoint of the researchers.

Singh & Chander (2018) studied the growing trends and growth of LIS open-access journals indexed in DOAJ. A total number of about 119 LIS Journals were found in the month of September 2017 are analyzed on the different parameters such as production and hosting platform, reviewing system productivity of publisher, article processing charges, and many more in the form of Open Access Journals (OAJ), Open Access Repositories (OAR), Open-Source Software (OSS), Open Educational Resources (OER) and MOOC's. OA journals in LIS provide up-to-date information to readers and scholars without any geographic and economic barriers.

Rath (2015) examined the Directory of Open Access Journals (DOAJ) of Social Science subjects published in India and identified 60 open access Social Sciences journals in India. This study was analyzed on the basis of certain parameters such as trends of open access journals in Social Sciences, their policy on acceptance of papers for publication, the factors to increase OA journals, and the major publishers of open access journals in social sciences in India. It was found that the highest number of open-access journals appeared between 2009 to 2014. The paper also discussed about implications of open-access publishing on Social Science research libraries and made a few suggestions for encouraging open-access publishing in Social Science subjects in India.

Joshi *et al.* (2012) discussed the emergence and development of open-access initiatives across the world as a boon to academic libraries. The initiatives for open access started in the year 2001 with the Budapest Open Access Initiative (BOAI), then in 2003 Bethesda Statement and Berlin Declaration, in the year 2004 Organisation for Economic Co-operation and Development's (OECD) Declaration and lastly the initiative of Brazil Salvador Declaration in 2005. The study also highlights the different routes of OA like 'gold' which requires a subscription to publish in the open access route, 'green' which requires a subscription with self-archiving in the repository and the 'hybrid' route which offers both free and subscription-based articles. The research identifies the growth of OA journals from the year 2008-2012 in DOAJ, results reveal a steady increase of journals in the world. The country United States has contributed the highest in DOAJ followed by Brazil and UK.

2.6. Funding Scenario of Open Access Publications

Deori *et al.* (2023) investigated that the recipients of grants for scholarly research comply with the requirement that the results of their studies be made available to academic audiences. This research assessed four well-known Indian government funding agencies that have embraced open access by registering at ROARMAP using data from published papers published between 2017 and 2021 that were taken from the Scopus database. However, the investigation also shows that authors are hesitant to accept open access publications for research papers or projects started by funding authorities, even when publishing in open access journals has a positive impact and considerable publicity.

Deori *et al.* (2022) have identified the availability of open-access literature on Scientometrics across the globe from 2012 to 2021 from the Scopus database. The study focused on evaluating the performance measurement and network visualization of the literature. The findings reveal that the availability of open access literature in the area of scientometrics is relatively low but the citation rate is comparatively higher than the non-open access literature. China appears to be a highly productive country but has a weaker collaborative structure than the United States and the United Kingdom. The authors suggested that other researchers adopt more open-access publishing for greater visibility of the research at the global level.

Deori *et al.* (2022) have evaluated the scenario of open-access publications among the scholarly community of Mizoram University. The main aim of the study is to assess the acceptance and adoption of open-access publications by the scholarly community. The data was collected from the Scopus database published during 2011-2020. The study has found 1233 papers out of which 302 papers were open access. The findings reveal that the Department of Biotechnology under the School of Life Science has the maximum open access publications in the university. The number of open-access publications increased especially from the year 2020.

Deori *et al.* (2022) studied the attitude of Life Sciences faculties toward open-access publications among three central universities in North East India. The approach of the study is basically comparative between Assam University, Mizoram University, and North-Eastern Hill University (NEHU) of three departments Zoology, Botany and Biotechnology. The findings reveal that the faculties of Assam University are more

concerned about adopting open-access publishing despite having the least faculty. The highest share of OA articles is occupied by Mizoram University. The Department of Biotechnology has maximum OA papers. Green open-access publishing is the highly preferred route. Even, though the selected universities have accepted Open Access still they need to improve the publication pattern.

Deori & Verma (2022) evaluated the adoptability of open access publications between North-Eastern Hill University and Tezpur University (TZU). The dataset was retrieved from the Scopus database. The findings reveal that research scholars of NEHU were more willing to adopt open-access publishing than TZU.

Deori, Verma & Nazim (2022) studied the scenario of India's Open access research with context to national and international funded agencies from the Scopus database. The study found a total of 150638 funded research publications out of which 44166 publications were open access. Most of the funded publications were available under the green route followed by gold and bronze. Bangladesh Council of Scientific and Industrial Research ranks 1st among international funding agencies, department of Science and Technology, India tops the list of government funding bodies, Indian Institute of Technology Bombay has the highest funded publications, from the Department of Chemistry maximum funded publications are published, the journal *Scientific Reports* produces the most funded publications.

Dorta-González & Dorta-González (2022) evaluated the implications of hybrid journals' impact on the Open Access (OA) paradigm. The research papers from 200 hybrid journals on 4 different topics published in 2017 were examined, in addition to the citations of those articles acquired from 2017 to 2020 in the Scopus database. The frequency of OA and the number of citations per publication are contradictory. In 80% of hybrid journals, there is indeed a benefit of OA citations. Humanities have a higher OA citation leverage than science and social science.

Martínez-Galindo *et al.* (2022) remarks that open Access is gaining rapid recognition in the scholarly communication sector with the assistance of government agencies, and corporations that sponsor research funds, for higher educational institutions. The Spanish Law on Science, Technology, and Innovation, Plan S, and a number of university mandates are a few manifestations of this transition throughout the panorama. In light of the circumstances, it is vital to verify that these mandates are

being followed from at minimum two angles: first, to guarantee that publications are Open Access; and second, to guarantee that they adhere to the stated timeframes. The researchers suggested using the data already portrayed in the repositories to optimize the whole surveillance, including knowledge of the funding agencies, the timeline of the work submitted to the repository, and the date it was published in an academic journal, as well as presenting this data using the OAI-PMH (Open Archive Initiative - Protocol for Metadata Harvesting) protocol. Harvesters may also gather this data in order to use it as a technique to locate the adoption of national Open Access publishing regulations.

De Filippo & Mañana-Rodriguez (2021) examine the open access (OA) productivity from public Spanish institutions between 2011 and 2020. In order to offer empirical support to the responses to the investigative questions, a bibliometric study was conducted using Clarivate Analytics' Web of Science Core Collection. Four aspects were examined by the bibliometric evaluations: activity factors, OA categories, impact attributes, and funding. The research reveals that the bibliometric data are consistent with the educational OA initiatives and activities mentioned in university policies and mandates. There is a significant correlation between visibility, funding, and open access, and OA articles routinely receive more citations than non-OA journals (Green OA leading the charge in this regard).

López-Borrull *et al.* (2020) examined the Spanish journals with the highest SCImago Journal Rank in the social sciences to determine whether they adhere to the standards set out by Coalition S for Open Access journals of excellent calibre. Plan S may not now have the support of any Spanish government or private research funding agencies, but it is intriguing to consider how it might impact the environment of Spanish scientific publications. Even though most journals comply with the standards for open-access publishing, there are still technological issues that prevent them from achieving maximal interchange and reutilization. In the end, it is advised that journals should embrace Plan S as a chance and seize it to implement a comprehensive digital revolution.

Misra & Agarwal (2019) studied the status of open-access publications in India. It focuses on the development of open-access publishing in India, efforts to promote open-access publishing in India (not just OA journals), and the significance of

publishing, especially OA publications, in academic betterment in India. The paper also discusses the obstacles of OA and open science in India particularly its applicability to Plan S and its future aspect. The paper suggested that all Indian authors should have assistance with limitless funding to cover the cost of open-access publication. Unfortunately, the situation in India is considerably different therefore efforts should be directed at raising scientists' knowledge of high-quality OA.

Roy, Biswas & Mukhopadhyay (2012) studied the trends and development of open-access scholarly information in India. The study analyses various OA channels, journals, OA Archives, Open Course Ware initiatives (OCW), Digital Library Projects, Metadata Harvesting Services, and the role of government in supporting OA. The findings revealed that OA initiatives and OA channels are increasing in India and governing bodies like UGC, NKC, CSIR and ICMR have taken certain initiatives for open-access content. In India, 65 institutions are registered in OA archives like the Registry of Open Access Repository (ROAR) and Directory of Open Access Repository (DOAR), Digital Library projects like the Indian National Digital Library in Engineering Sciences and Technology (INDEST), Vidyanidhi, Electronic Theses and Dissertation Project (INFLIBNET), Indian Parliament Library have been developed.

Sawant (2009) investigated the scenario of open-access initiatives in India by considering the availability of open-access journals. The study found 178 open-access journals in India, the journals are mostly published or funded by agencies like ICAR, ICMR, IASc, and INSA that are indexed in indexing and abstracting services like Index Medicus, SCIRUS, SCOPUS, Chemical Abstracts Service, etc also connected with DOAJ and PubMed and OJ Gate. The oldest archive found online is the Journal of Genetics published by the Indian Academy of Sciences.

Hirwade & Rajyalakshmi (2006) discussed the open access scenario in India. Mentions about various initiatives starting from DOAJ, Indian Academy of Sciences, Indian National Science Academy, Indian Journals .com, Indian Medlars Centre, ePrints@IISc, Open J-Gate Informatics (India) Limited, Open DOAR and The National Academy of Sciences, India. The study investigates the subject-wise availability of OA journals in DOAJ and found that in the subject of Social sciences, a maximum number of journals are available in DOAJ and 54 journals in Library and

Information Science. It is also found that India occupies the 3rd position in OA contribution among the developing countries as reflected in the Science Citation Index followed by China and South Korea.

2.7. Evaluation of various Open Access Routes

Frantsvåg (2022) presents the systematic evaluation of scholarly articles visualizing the recent trends of Norway as a whole especially in terms of Diamond Open access during 2017-2020. Diamond OA is an open access approach where neither the author nor the readers pay any amount as article processing charge (APC) or accession of the scholarly contents however the whole cost is borne by either public funders or institutions or professional organizations. The Diamond OA is low in Norway when compared to global scholarly articles. The Diamond OA approach in Norway is mainly induced in the scholarly field of Humanities (68%) and Science (15%) whereas the Medicine field (8%) is the lowest.

Kurata *et al.* (2022) investigated the trend from the viewpoint of how OA is employed. The dataset included 2,368 randomly chosen publications from 2013 and 2,999 from 2018 that were listed in the Web of Science. In total, 61.7% of all sampled articles in 2018 were freely accessible on at least one website in 2020, compared to 56.5% of all selected articles in 2013 that were free and accessible on at least one website in 2015. Regarding the method of execution, ASNs were used the most frequently (44.4% in 2015 and 56.0% in 2020), trailed by Subject Repositories (35.0% in 2015 and 39.6% in 2020) and Gold (24.1% in 2015 and 37.4% in 2020). The very first primary element was the pivot displaying the number of simultaneous OA executions for each publication in 2015 and 2020, and the second major element was the challenging axis perpendicular to the initial axis.

Quigley (2021) examined whether Humanities, Arts, and Social Sciences (HASS) researchers perceive and use open access, as well as the challenges they encountered in providing too many of their scientific publications open access. The study found that although some participants share more towards their work as open access through APC-based gold open access (in DOAJ-listed journals), other participants face severe hurdles. Additionally, this study discovered that some participants had extraordinarily complicated views on open access that, depending on the viewpoints they were

contemplating, significantly affected participants' interactions. These viewpoints include those of a funding evaluator, a research supervisor, a journal editor, and a world democracy.

Ezema (2020) evaluates the influence of gold open access (OA) journals in engineering and technology research. The Directory of Open Access Journals was utilized for the study with a maximum of 37 gold route journals that demand article processing charges (APC) and 66 additional OA journals in the domain without APC (i.e., platinum OA). Citations, paper productivity, cite/article, cite/journal, and h-index of journals were extracted using an informetric technique to measure the effect of research. The results showed that commercial publishing corporations generated more than 60% of the journals published by the APC. The average article processing fee was $727.00, with fees ranging from $7.60 to $3,471.50. The gold route journals' APC amounts and the strength of their influence on research were positively correlated, although weakly.

Nazim & Zia (2020) examined the availability of Open Access research literature in the field of digital libraries by collecting Web of Science's Core database on June 11, 2018. Later, the results were specified in journal articles published in the English language from 2009 to 2018. The study findings revealed that more than 26 % of total articles in the field of the digital library were available through the gold route of OA, whereas, 64.76 % articles of the total were available through the green route of OA and 78 % of self-archiving articles were found in final publisher's PDF versions.

Robinson-Garcia, Costas & Leeuwen (2020) analyzed measuring the OA publications of Worldwide universities on the basis of some predefined indicators concerning its policy and practices. The policy includes the Green and Gold open access publications in the five fields of science i.e., Life and Earth Science, Biomedical and Health Science, physical science and Engineering, Social Science and Humanities, Mathematics and Computer science. The study has selected a total of 963 institutions based on the Leiden Ranking and the data has been extracted from the Web of Science database, for tracking the OA status Unpaywall is used. It is found that out of 41% of total publications are openly accessible 'Green' is the most common type of OA with 77% followed by Gold with 33%. The results show that Brazilian universities consist maximum of Gold OA publications.

Piryani, Dua & Singh (2019) investigated the trends and levels of OA by computationally analyzing research publishing data for India from the Web of Science over the previous five years (2014-2018). According to the findings, just approximately 24% of the research output from India over the past five years has been made open access, compared to the global average of 30%. In comparison to green and bronze OA, gold OA offers higher numbers of publications. Additionally, the number of publications available as OA varies between disciplines, with a larger percentage of articles in the fields of medicine, physics, and biology available as OA than in the fields of arts and humanities, social science, and information science.

Nazim & Ahmadi (2018) examined the growth and development of Open Access (OA) initiatives in India based on a survey of literature and data collected from the Web of Science-Core Collection, Directory of Open Access Journals (DOAJ), Directory of Open Access Repositories (Open DOAR). The study was also concerned with the position of India, in terms of total OA Journals, total research output, and OA gold papers. The study revealed India's position in terms of share of gold OA publications is relatively mainly because of some Government departments like the University Grants Commission (UGC) and governing bodies of the major research councils, such as the Council of Scientific and Industrial Research (CSIR), Indian Council of Agriculture Research (ICAR), who have mandated OA and self-archiving for their journals.

Zhang & Watson (2017) analyzed the scenario of physical science researchers funded by the Canadian Institutes of Health Research's compatibilities towards open access policies as well as compared the rate of citation through green and gold routes. The study is based on Web of Science data which found that the citation count for gold open access was the highest followed by the articles of hybrid journals. The study suggests that to comply with open access policies green open access is the most economically suitable which will have more research impact than gold open access.

Mukherjee (2014) studied the characteristics of 462 OA journals under green, gold, and hybrid routes in India. The journals have been selected from DOAJ, IndianJournal.com, and Open J-Gate. The characteristics were calculated based on the growth, publishers, subjects, and citation count received in each route using the journal's website, Indian Citation Index, and Google Scholar. The gold route is found

to be the most famous for article publishing, the size of the OA journals varies among the publishers, where a single publisher has over 77 journals but 264 publishers have only one journal. Around 43% of journals charge publication fees, and the impact factor of the gold open-access journal was found to be 0.58. Based on the data the study suggests the publication charges do not hinder the authorship in the fields of computer science, pharmacy, and medicine.

Harnad *et al.* (2004) studied the impact of green and gold routes on open-access articles. The research states that OA articles have a higher provision citation rate than non-OA articles. The study has covered articles from all the disciplines in 12 years of 14 million research articles through the lens of the Institute for Scientific Information (ISI) database. It is found that the rate of citation has increased with the passing of time mostly in the discipline of Physics followed by Sociology, Psychology and so on.

Research Gap

Based on the review of the literatures, it has been observed that many studies have been conducted on open-access publishing with various scopes and objectives. All literature has been divided into certain sub-themes such as Open Access Evaluation, Comparison of Open Access & non-open Access publications, Open Access Initiatives, and many more. However, as it is seen from the reviewed literature the very least number of studies have been conducted on the routes or approach of publishing in open access. Also, a few studies were conducted to know the attitude and awareness amongst the users towards open-access publishing. Therefore, this study has been conducted on the faculty's attitude towards open-access publishing mainly among the central university of North-East India. With this study, it is an attempt to cover up the research gap among the selected research area i.e., faculty of Central Universities of North-Eastern India.

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CHAPTER 3

Conceptual Approach of Open Access

3.1. Scholarly Communication

Researchers', scholars', and scientists' main business is scholarly communication (Das, 2015). They communicate about their work to others through certain channels, such as journals, conference proceedings, books, working papers, thesis & dissertations, research reports, etc. Scholarly communication refers to the process of creating, disseminating, and evaluating academic knowledge within the scholarly community. It is a complex process that encompasses the methods, practices, and systems through which scholars share their research findings, collaborate with peers, and contribute to the advancement of knowledge in their respective fields. Scholarly communication plays a crucial role in the growth and development of disciplines, as well as the overall progress of science and academia. A research paper is a standard way of presenting one's research findings against certain research questions based on the scientific methods of experiments, observations, and data analysis (Das, 2015). Authors or researchers prepare manuscripts for submission to scholarly journals where they narrate scientific experiments, research methodologies, findings, and conclusions on particular topics. Writing for scholarly communication to high-standard peer-reviewed journals typically follows a standardized structure, such as the Introduction, Methods, Results, and Discussion providing a logical and consistent flow of information. This requires proper citation and referencing of sources to acknowledge the contributions of previous research and provide a foundation for the study. Most importantly, it must undergo a rigorous peer review process to ensure scientific excellence and integrity, where experts in the field evaluate the quality, validity, and significance of the research before it is accepted and published (Kington et al., 2021). Peer review is a standard practice by most credible scientific journals and is an essential part of determining the credibility and quality of work submitted (Kelly et al., 2014). It adheres to ethical guidelines, ensuring the protection of human subjects, maintaining confidentiality, and maintaining research integrity contributing to the broader scientific knowledge base, informing future research, shaping policy decisions, and advancing the field of study.

Scientific communications through journals are considered the highest quality because they undergo a rigorous peer-review process (ALA, 2023). This means that experts in the field review the paper to ensure that it meets certain standards of quality and accuracy. Journals also have a reputation to uphold, so they are more likely to publish high-quality research. Additionally, the quality journals are often indexed in databases, such as the Scopus and Web of Science making it easier for researchers to find and access them. Furthermore, publishing in a reputable journal can enhance a researcher's reputation and career prospects (Demeter et al., 2022). Figure 3.1 clearly shows the workflow process of scholarly communication through quality peer-reviewed scientific journals. Communicating or publishing scholarly research through quality peer-reviewed journals is not an easy task. Researchers have followed certain standards and processes and journals go through certain steps.

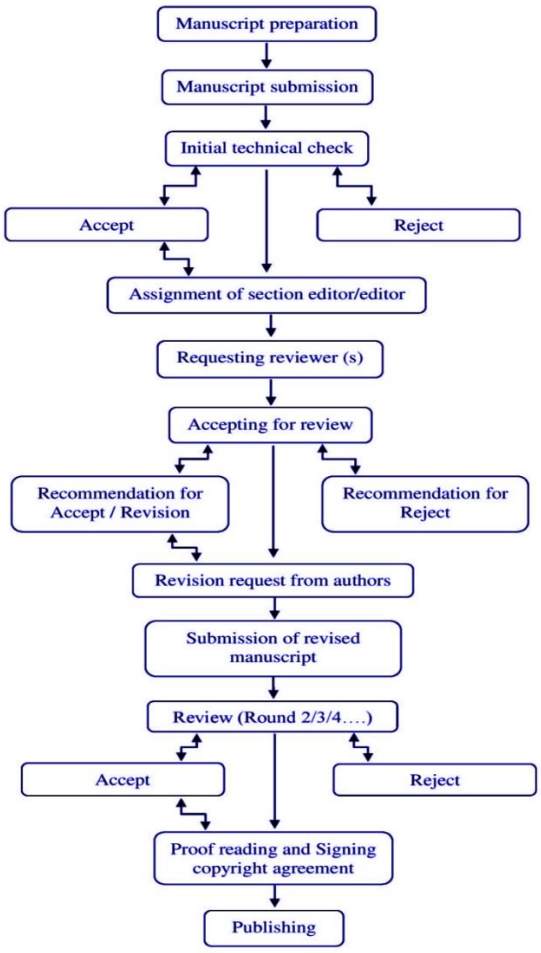

Figure 3.1: Workflow Process of Scholarly Communication through Peer-Reviewed Scientific Journals
(Source: Designed by Researcher)

3.2. Emergence of the World Wide Web (WWW)

The emergence of the World Wide Web has fundamentally transformed how we connect, communicate, and access information. With its advent in the late 20th century, the internet rapidly became a global network that revolutionized how knowledge was accessed, disseminated, and exchanged. It enabled individuals worldwide to navigate websites, share content, and engage in interactive experiences. The World Wide Web opened up unprecedented opportunities for collaboration, knowledge sharing, and global connectivity, shaping the modern digital landscape and paving the way for the interconnected world we live in today. Various tools and technologies have been developed for various purposes, i.e., communication, collaborative workstations, entertainment, business, and many more. Innovative tools and technologies made our lives more comfortable and updated. The research and development and scholarly communication process has also not been exempted from the influence of the WWW. Today, researchers share their research highlights through various academic and professional social networking sites, Research Gate, Google Scholar, LinkedIn, etc., and communicate with other researchers. That makes it easier to find potential collaborators and experts' suggestions from academia. It is a medium for collaboration and interaction between individuals and their computers without any regard for geographic location. Apart from that, various social media platforms can help researchers share their research findings and promote the research works after it is published. That makes research visibility wider and attracts attention from the masses.

Especially in the realm of academia, the World Wide Web (WWW) has emerged as an indispensable tool in the present time. Its significance lies in the unparalleled access it provides to vast amounts of information and knowledge from all corners of the globe. Through the WWW, researchers, students, and educators can effortlessly navigate through an extensive collection of academic resources, scholarly articles, research papers, and educational materials.

3.3. Open Access

In general, the term “open” means available for people to enter, visit, use, etc. which is not closed to anyone. Likewise, a publication is defined as ‘open access’ when there are no financial, legal, or technical barriers to access it. Open Access is when publications are freely available online to all at no cost and with limited restrictions with regard to reuse (springer.com, 2023). It is defined as “open access”, when there are no financial, legal, or technical barriers to accessing it, meaning anyone can read, download, copy, distribute, print, search for and search within the information, or use it in education or in any other way within the legal agreements (openaccess.nl, 2023). It refers to making scholarly research literature freely available to the public online without restrictions (Laakso et al., 2011; Abdelrahman, 2021). OA is the practice of providing unrestricted access to electronically published peer-reviewed scholarly journal articles. The rationale behind OA is that the research process is facilitated by ensuring rapid and widespread access to research findings such that all communities have the opportunity to build upon them and participate in scholarly conversations (Tennant et al., 2016). Open access publications are a type of scholarly communication that enables free, immediate, and unrestricted access to research outputs, including articles, books, and data (Greussing et al., 2020; Chakravorty et al., 2022).

However, it involves certain rules, such as licensing and copyright agreements between authors and publishers. In addition, publishers often seek article processing charge (APC) from the authors for the publication of the scholarly research. Open access content has to be freely available online, and through licensing their work under Creative Commons, authors grant users the right to unrestricted dissemination and re-use of the work, with only the one provision that proper attribution is given to authors. Creative Commons (CC) licenses are public licenses. CC licenses let easily change copyright terms from the default of “all rights reserved” to “some rights reserved.” They are legal tools to permit in advance to share and use your work (WUR.NL, 2023).

There are six different CC licenses (FOTER, 2015; Creativecommons.org, nd):

i. CC BY
ii. CC BY-SA
iii. CC BY-NC
iv. CC BY-ND
v. CC BY-NC-SA
vi. CC BY-NC-ND

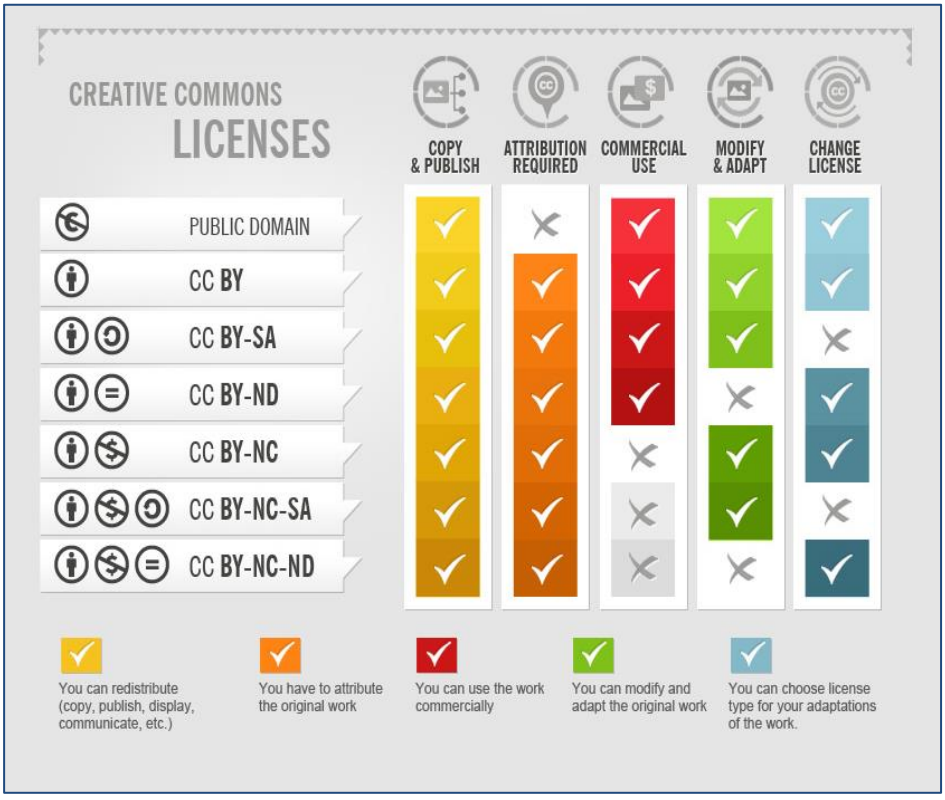

Figure 3.2.: Creative Commons (CC) licenses

(Source: https://foter.com/blog/how-to-attribute-creative-commons-photos/)

CC BY is the most open license. It allows the user to redistribute, create derivatives, such as a translation, and even use the publication for commercial activities, provided that appropriate credit is given to the author (BY). Similarly, CC BY-SA is also an open license and allows for commercial use. The letters SA (share alike) indicate that the adjusted work should be shared under the same reuse rights, so with the same CC license. NC (non-commercial use) and ND (no derivative works) are conditions that make the CC licenses more restrictive and thus less open (FOTER, 2015; Creativecommons.org, nd.).

Open access can be applied to all forms of published research output, including peer-reviewed and non-peer-reviewed academic journal articles, conference papers, book chapters, monographs, research reports, and images. This approach promotes collaboration, innovation, and the democratization of knowledge, enabling researchers, students, policymakers, and the general public to benefit from the latest discoveries and advancements in various fields. By embracing open access, the global research community fosters greater transparency, accelerates the pace of scientific progress, and contributes to the overall advancement of society.

Prior to the development of the open-access model, all the scholarly research-based peer-reviewed scientific publications were published in print journals with subscriptions and the costs might be exceptionally high. These journals were generally only available to the general public at well-funded university libraries, primarily in the developed world.

3.3.1. Definitions of the Open Access

Many scholars and research and development organizations have different definitions regarding open access and its concept. The most popular definition of open access was given by the Budapest Open Access Initiative (BOAI). It defines open access as,

> "By open access to this literature, we mean its free availability on the public Internet, permitting any users to read, download, copy, distribute, print, search, or link to the full texts of these articles, crawl them for indexing, pass them as data to software, or use them for any other lawful purpose, without financial, legal, or technical barriers other than those inseparable from gaining access to the Internet itself. The only constraint on reproduction and distribution and the only role for copyright in this domain should be to give authors control over the integrity of their work and the right to be properly acknowledged and cited" (BOAI, 2002).

Berlin Declaration (2003) and the Bethesda Statement (2003) clearly define that an Open Access publication is one that meets the following two conditions:

i. The author(s) and copyright holder(s) grant(s) to all users a free, irrevocable, worldwide, perpetual right of access to, and a license to copy, use, distribute, transmit and display the work publicly and to make and distribute derivative works, in any digital medium for any responsible purpose, subject to proper attribution of authorship, as well as the right to make small numbers of printed copies for their personal use (Berlin Declaration, 2003; Bethesda Statement, 2003).

ii. A complete version of the work and all supplemental materials, including a copy of the permission as stated above, in a suitable standard electronic format is deposited immediately upon initial publication in at least one online repository that is supported by an academic institution, scholarly society, government agency, or other well-established organization that seeks to enable open access, unrestricted distribution, interoperability, and long-term archiving (Berlin Declaration, 2003; Bethesda Statement, 2003).

Moreover, the Bethesda and Berlin statements also define- "For a work to be OA, the copyright holder must consent in advance to let users "copy, use, distribute, transmit and display the work publicly and to make and distribute derivative works, in any digital medium for any responsible purpose, subject to proper attribution of authorship…." (Bethesda, 2003; Berlin, 2003).

Association of Research Libraries (2004) in the United States defined "open access as any distribution model created with no expectation of direct monetary return and which makes works available online at no cost to the readers."

Fitzgerald (2010) opines that open access "aims to disseminate knowledge broadly and freely across the internet in a timely fashion."

OA removes price barriers (subscriptions, licensing fees, pay-per-view fees) and permission barriers (most copyright and licensing restrictions). The Public Library of Science (PLOS) shorthand definition- "free availability and unrestricted use" - succinctly captures both elements (Suber, 2009).

Peter Suber also describes, "Open-access (OA) literature is digital, online, free of charge, and free of most copyright and licensing restrictions" (Suber, 2010).

According to Björk (2004), "'Open access (OA)' means that a reader of a scientific publication can read it over the Internet, print it out and even further distribute it for non-commercial purposes without any payments or restrictions."

Jain (2012) defined "open access materials as full text, can be accessed by anybody from anywhere and its contents can be in any format from texts and data to software, audio, video, and multi-media, scholarly articles and their preprints" (Jain, 2012).

The United Nations Educational, Scientific and Cultural Organization (UNESCO) defines - "Open access (OA) means free access to information and unrestricted use of electronic resources for everyone. Any kind of digital content can be OA, from texts and data to software, audio, video, and multimedia. While most of these are related to text only, a growing number are integrating text with images, data, and executable code. OA can also apply to non-scholarly content, like music, movies, and novels" (UNESCO, 2023)

While, Suber (2009) argued that "Removing price barriers without removing permission barriers is not enough for full OA under the Budapest (February 2002), Bethesda (June 2003), and Berlin (October 2003) definition, there's no doubt that price barriers constitute the bulk of the problem for which OA is the solution. Removing price barriers alone will give most OA proponents most of what they want and need.

3.4. Open Access Journals

Open access journals have revolutionized the academic publishing landscape by providing unrestricted access to scholarly articles online, free of charge. The development of the internet and the World Wide Web made it possible to publish scholarly articles and make them instantly accessible anywhere in the world where there are computers and internet connections. Due to the rapid growth of Information Communication Technology (ICT) applications in the publication industry, almost all journal publishing companies have shifted from traditional publishing to online publishing mode. As a result, there are three primary types of journal publications: *open access*, *closed access*, and *hybrid journals*. Among these three types of online journal publication, open access journal publication is a high priority and most

debated topic in the present time due to greater accessibility and visibility of research findings and ideas (Greussing et al., 2020). Open access publishing has seen rapid growth due to the widespread scientific support and availability of internet access in the contemporary era. In addition, research funding agencies are more frequently promoting or mandating publication in open-access venues (Laakso et al., 2011).

The scholarly open access (OA) journals make their content available online to anyone and in doing so help solve the access challenges posed by subscription journals (Solomon & Björk, (2012). Open access journals are scholarly peer-reviewed journals that are published online and are freely available to readers (Laakso et al., 2011). In recent years, various initiatives have emerged to promote open access. One notable example is the Directory of Open Access Journals (DOAJ), which indexes and provides a comprehensive list of high-quality open-access journals across different disciplines. This directory facilitates the discovery and dissemination of research while ensuring that published journals meet certain quality and transparency criteria. As of 6th June 2023, 19,546 journals were listed in the Directory of Open Access Journals (DOAJ) in 80 different languages from 133 countries across the globe (DOAJ, 2023). Among them, 13,243 listed journals are without Article Processing Charges (APCs).

Open access journals have brought about a paradigm shift in scholarly communication, fostering collaboration, innovation, and global knowledge sharing. They have opened doors for researchers from all backgrounds and geographical locations, making scientific information more accessible, discoverable, and impactful. With ongoing efforts and support, the open-access movement continues to reshape the academic publishing landscape, paving the way for a more equitable and sustainable future in research dissemination.

3.5. Rise of Open Access Publications

The rise of open access publication emerged as a response to the limitations and exclusivity of traditional scholarly publishing models. In the past, traditional modes of scholarly publishing, such as print journals, limited the accessibility and reach of research findings. However, with the rise of the internet and open access, the

scholarly community has witnessed a profound transformation in how information is exchanged.

Open access publication is a transformative movement in academic publishing that aims to make research articles freely available to the public, removing financial barriers that often hinder access to knowledge. The origins of open access can be traced back to the early days of the Internet when scholars and researchers recognized the potential of digital technology to revolutionize scholarly communication. The Budapest Open Access Initiative in 2002 earmarked a significant milestone, with the release of a statement that advocated for the open access publishing model (BOAI, 2002). This initiative laid the foundation for subsequent efforts to promote open access globally.

Since then, numerous initiatives and organizations have emerged to support and advance open access publication. One notable example is the Public Library of Science (PLOS), a nonprofit organization that pioneered the open access movement by launching its first open access journal in 2003. PLOS played a crucial role in demonstrating the feasibility and impact of open access publishing, inspiring other publishers and researchers to embrace the model. The idea for PLOS began in 2000 when an open letter was circulated by founders Harold Varmus, Patrick Brown, and Michael Eisen. Nearly 34,000 scientists from 180 countries signed. In 2003, they launched their first fully Open Access journal (PLOS Biology) in order to empower researchers to make science immediately and publicly available online, without restrictions (plos.org, 2023).

Another key initiative is the Open Access Scholarly Publishers Association (OASPA), which was established in 2008 to promote open access publishing standards and best practices. OASPA provides a platform for publishers, librarians, and researchers to collaborate and advocate for open access. It has developed guidelines and criteria for membership, ensuring that publishers adhere to high-quality publishing practices (oaspa.org, 2008).

In addition to these initiatives, funding agencies and institutions have also recognized the importance of open access and implemented policies to support it. For instance, the University Grants Commission made it mandatory through regulations issued in

June 2009 for all universities to submit soft copies of PhD theses and MPhil dissertations to the UGC for hosting in the INFLIBNET's digital repository "Shodhganga" (Gazette of India, 2016; INFLIBNET Centre, 2023). Similarly, the European Commission introduced the Horizon 2020 policy, which mandates that research funded by the commission should be made openly accessible (ucl.ac.uk, nd.). The United States' National Institutes of Health (NIH) requires all NIH-funded research to be deposited in the PubMed Central repository, making it freely available to the public within a year of publication (NIH, 2022).

Open access publication has transformed the way research is disseminated, enabling a broader and more inclusive access to knowledge. It facilitates collaborations, accelerates scientific progress, and ensures that research findings are accessible to both academia and the general public. As the open access movement continues to grow, it holds the potential to reshape the scholarly publishing landscape, promoting transparency, equity, and innovation in research dissemination.

Funding agencies and institutions worldwide have embraced open-access policies. For instance, Plan S, an initiative launched by a coalition of research funders, mandates that research outputs resulting from public funding should be made openly available immediately upon publication by 2021 (coalition-s.org, 2013; Petrak et al., 2021). Many universities and research institutions have also established institutional repositories to preserve and showcase the scholarly output of their communities. Figure 3.3 illustrates the year-wise growth of open access article publications based on the Scopus database as indexed between 2013 and 2022.

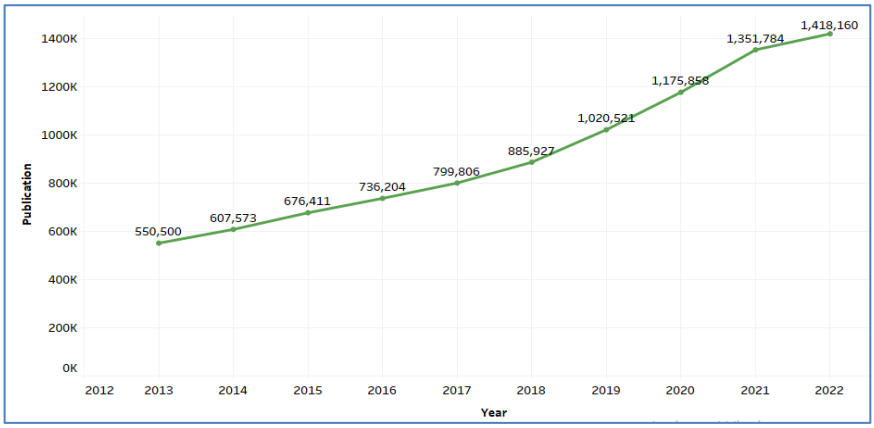

Figure 3.3: Growth of Open Access Articles Publications based on the Scopus Database (2013-22)

3.6. Features of Open Access Publications

Open access is an important part of scientific research, as it enables free and unrestricted access to research outputs, making scientific knowledge more accessible to a wider audience. Open access publications have distinct features and characteristics that set them apart from traditional subscription-based models.

The following are some important features of the open access publications as stated by Björk (2011).

i. **Free Access:** Open access publications provide free access to scholarly articles and research papers, eliminating paywalls and subscription fees that restrict access to knowledge.
ii. **Global Availability:** Open access publications are available to anyone with an internet connection, enabling researchers and readers worldwide to access the latest research findings.
iii. **Unrestricted Usage:** Open access publications allow users to freely use, distribute, and build upon the content without legal or copyright restrictions, fostering collaboration and innovation.
iv. **Novel Peer Review:** Open access publications employ a peer-review process to ensure the quality and validity of the research. Expert reviewers assess the methodology, findings, and significance of the work, maintaining high standards of scholarship.
v. **Open Licensing:** Open access publications often employ open licenses, such as Creative Commons licenses, which grant users the rights to reuse, remix, and redistribute the content with proper attribution.
vi. **Increased Visibility:** Open access publications have the potential to reach a wider audience compared to traditional subscription-based journals. This increased visibility can lead to higher citation rates and greater recognition for researchers and their work.
vii. **Faster article publication cycles:** Open access publications typically have shorter publication timelines compared to traditional journals, enabling researchers to disseminate their findings more quickly.

viii. **Data Sharing:** Open access publications promote transparency and reproducibility by encouraging the sharing of underlying data and research materials. This allows others to validate and build upon the published research.

ix. **Wide Range of Disciplines:** Open access publications cover a diverse range of academic disciplines, providing a platform for researchers in various fields to share their work and collaborate across disciplines.

x. **Funding Models:** Open access publications operate under different funding models. Some may rely on article processing charges (APCs) paid by authors or their institutions, while others receive support from grants, subsidies, or institutional memberships.

xi. **Preservation and Archiving:** Open access publications often prioritize long-term preservation and archiving of research content, ensuring its availability and accessibility for future generations.

xii. **Public Engagement:** Open access publications facilitate engagement with the broader public, enabling policymakers, educators, and interested individuals to access and understand the latest scientific research.

xiii. **Impact Measurement:** Open access publications often provide metrics and tools to measure the impact and reach of published research, allowing researchers to track the influence of their work and discover potential collaborations.

3.7. Historical Background of Open Access

The concept of providing free online access to journal articles began at least a decade before the term “open access” was formally coined (Wikipedia, 2023). Computer scientists have been self-archiving in anonymous FTP archives since the 1970s, and physicists have been self-archiving in arXiv since the 1990s (Fausto, 2013). The first online-only, free-access journals, which were eventually called “open-access journals,” began appearing in the late 1980s and early 1990s (Wikipedia, 2023).

However, Peter Suber (2009) mentioned in his blog article, that the timeline of the open access movement can be tracked when the online free access system began

during 1960s (Suber, 2009). One of the notable developments was the launching of Project Gutenberg (PG) in 1971, which is a volunteer effort to digitize and archive cultural works, as well as to "encourage the creation and distribution of eBooks" (Hart, 2004). However, the open access movement gained public attention in the 1990s as access to the internet became widely available and online publishing became the norm (CSHL, 2022). Paul Ginsparg created the arXiv archive for physics preprints at Los Alamos National Laboratory (LAN-L) to make preprints in physics freely available. The term "open access" gained momentum attention in the 2000s, specifically in 2002 and 2003, when the Budapest Open Access Initiative, the Bethesda Statement on Open Access Publishing, and the Berlin Declaration on Open Access to Knowledge in the Sciences and Humanities were formulated (Wikipedia, 2023; open-access network, 2023).

Figure 3.4 shows the timeline of the most important events of the open access movement. Apart from that, many events concerning open access are happening to date in order to promote the open access system. For example-

- **2018:** Launching of Plan S by cOAlition S (CSHL, 2022).
- **2021:** The transition period for Plan S implementation begins, which requires that scientific publications resulting from research funded by public grants must be published in compliant open-access journals or platforms from 2021 to 2024 (symplectic.co.uk, 2023).
- **2022:** Open Access is embedded in the European Commission's Horizon 2020 Research and Innovation programme (Wikipedia, 2023).

Figure 3.4: Timeline of the open access movement
(Source: https://www.mysciencework.com/omniscience/open-access-timeline)

3.8. Open Access Movement

The open access movement is a broad international movement that seeks to grant free and open online access to academic information, such as publications and data (Oakley & Vaughan, 2007). The concept of open access refers to unrestricted online access to scholarly research primarily intended for scholarly journal articles. Among all the events related to the open access movement as seen in Figure 3.4, the most remarkable milestones in the history of open access movements are BBB open access declarations. Towards the start of the 21st Century, they have shaped the OA publishing environment in successive decades. These declarations have also hinted at strong philosophical foundations for supporting the facts and principles of open access.

i. **Budapest Open Access Initiative (2002):** The Budapest Open Access Initiative (BOAI) is a landmark movement that emerged in 2002 intending to make scholarly research and literature freely accessible to all, fostering the widespread distribution of knowledge and accelerating scientific progress (BOAI, 2002)**.** It was the result of a meeting held in Budapest, Hungary, where a diverse group of individuals, including researchers, librarians, and advocates for open information, came together with the shared vision of transforming the traditional academic publishing system. The initiative champions the idea that scientific and scholarly literature should be freely accessible to anyone, anywhere, without financial or technical barriers. It encourages the dissemination of research findings, data, and knowledge on a global scale, fostering collaboration and innovation among researchers worldwide. The Budapest Open Access Initiative has been instrumental in driving the open access movement forward, inspiring similar declarations and policies across different academic disciplines and institutions, and paving the way for greater democratization of knowledge.

   To achieve open access to scholarly journal literature, the Budapest Open Access Initiative (BOAI) recommended two complementary strategies.

   a) **Self-archiving:** First, scholars need the tools and assistance to deposit their refereed journal articles in open electronic archives, a practice commonly called, self-archiving. When these archives conform to

standards created by the Open Archives Initiative, then search engines and other tools can treat the separate archives as one. Users then need not know which archives exist or where they are located, in order to find and make use of their contents (BOAI, 2022; Suber, 2015).

b) **Open Access Journals:** Second, scholars need the means to launch a new generation of journals committed to open access, and to help existing journals that elect to make the transition to open access. Because journal articles should be disseminated as widely as possible, these new journals will no longer invoke copyright to restrict access to and use of the material they publish. Instead, they will use copyright and other tools to ensure permanent open access to all the articles they publish. Because price is a barrier to access, these new journals will not charge subscription or access fees and will turn to other methods for covering their expenses. There are many alternative sources of funds for this purpose, including the foundations and governments that fund research, the universities and laboratories that employ researchers, endowments set up by discipline or institution, friends of the cause of open access, profits from the sale of add-ons to the basic texts, funds freed up by the demise or cancellation of journals charging traditional subscription or access fees, or even contributions from the researchers themselves. There is no need to favour one of these solutions over the others for all disciplines or nations, and no need to stop looking for other, creative alternatives (BOAI, 2022).

   The Budapest Open Access Initiative (BOAI) quickly gained traction and sparked a global movement in the academic community. Scholars, researchers, and institutions began to recognize the importance of open access in accelerating the progress of science and promoting knowledge sharing (Chan et al., 2016).

   As a result, numerous open access repositories and journals were established, each contributing to the growing body of freely accessible research. Furthermore, prominent funding agencies and institutions started mandating open access policies for the research they supported, further propelling the adoption of open access (Suber, 2012).

ii. **Bethesda Statement (2003):** The Bethesda Statement on Open Access Publishing was drafted by representatives of funding agencies, libraries, publishers, and scientists during a meeting on open access publishing held at the Howard Hughes Medical Institute in Chevy Chase, Maryland. Focusing on biomedical research, the statement stresses the need for rapid and efficient dissemination of research results in accordance with the principles of open access. It also emphasizes the opportunity (and the obligation) to share research results, ideas, and discoveries freely with the scientific community and the public. The statement primarily indicates three working groups (Bethesda Statement, 2003; Suber et al., 2003; JLIS.it, 2012).

1) ***Statement of the Institutions and Funding Agencies Working Group:*** The organizations sponsor and nurture scientific research to promote the creation and dissemination of new ideas and knowledge for the public benefit. To realize the benefits of this change requires a corresponding fundamental change in the policies regarding publication by the grantees and faculty. (a) Encourage faculty/grant recipients to publish their work according to the principles of the open access model, to maximize the access and benefit to scientists, scholars and the public throughout the world. (b) Realize that moving to open and free access, though probably decreasing total costs, may displace some costs to the individual researcher through page charges, or to publishers through decreased revenues, and the organization pledges to help defray these costs. To this end organization agrees to help fund the necessary expenses of publication under the open access model of individual papers in peer-reviewed journals (subject to reasonable limits based on market conditions and services provided). (c) Reaffirm the principle that only the intrinsic merit of the work, and not the title of the journal in which a candidate's work is published, will be considered in appointments, promotions, merit awards or grants. (d) Organizations will regard a record of open access publication as evidence of service to the community, in the evaluation of applications for faculty appointments, promotions and grants (Suber et al., 2003).

2) ***Statement of the Libraries & Publishers Working Group:*** Libraries and publishers should make every effort to hasten this transition in a fashion that

does not disrupt the orderly dissemination of scientific information (Suber et al., 2003).

Libraries propose to:

a) Develop and support mechanisms to make the transition to open access publishing and provide examples of these mechanisms to the community.
b) In education and outreach activities, give high priority to teaching the users about the benefits of open access publishing and open access journals.
c) List and highlight open access journals in the catalogs and other relevant databases.

Journal publishers propose to:

a) Commit to providing an open access option for any research article published in any of the journals they publish.
b) Declare a specific timetable for the transition of journals to open access models.
c) Work with other publishers of open access works and interested parties to develop tools for authors and publishers to facilitate the publication of manuscripts in standard electronic formats suitable for archival storage and efficient searching.
d) Ensure that open access models requiring author fees lower barriers to researchers at demonstrated financial disadvantage, particularly those from developing countries.

3) Statement of Scientists and Scientific Societies Working Group: Scientific research is an interdependent process whereby each experiment is informed by the results of others. The scientists who perform research and the professional societies that represent them have a great interest in ensuring that research results are disseminated as immediately, broadly and effectively as possible. Electronic publication of research results offers the opportunity and the obligation to share research results, ideas and discoveries freely with the scientific community and the public (Suber et al., 2003).

Therefore,

a) Bethesda Statement endorses the principles of the open access model.
b) Recognize that publishing is a fundamental part of the research process, and the costs of publishing are a fundamental cost of doing research.
c) Scientific societies agree to affirm their strong support for the open access model and their commitment to ultimately achieve open access for all the works they publish. They will share information on the steps they are taking to achieve open access with the community they serve and with others who might benefit from their experience.
d) Scientists agree to manifest their support for open access by selectively publishing in, reviewing for and editing for open access journals and journals that are effectively making the transition to open access.
e) Scientists agree to advocate changes in promotion and tenure evaluation in order to recognize the community contribution of open access publishing and to recognize the intrinsic merit of individual articles without regard to the titles of the journals in which they appear.
f) Scientists and societies agree that education is an indispensable part of achieving open access, and commit to educating their colleagues, members and the public about the importance of open access and why they support it.

iii. **Berlin Declaration (2003):** The Berlin Declaration on Open Access to Knowledge in the Sciences and Humanities was drafted within the framework of a conference on the development of new Web-based research environments (the first "Berlin Conference") that was organised by the Max Planck Society and the European Cultural Heritage Online (ECHO) project. By signing the declaration, leading European and American research organisations and universities committed to supporting further development of the notion of open access, for example, by encouraging researchers to publish their results in open access.

The Berlin Declaration (2003) supports the transition to the electronic open access paradigm to make progress by the following points (Berlin Declaration, 2003; openaccess.mpg.de, 2003).

a. Encouraging researchers/grant recipients to publish their work according to the principles of the open access paradigm.
b. Encouraging the holders of cultural heritage to support open access by providing their resources on the Internet.
c. Developing means and ways to evaluate open access contributions and online journals in order to maintain the standards of quality assurance and good scientific practice.
d. Advocating that open access publication be recognized in promotion and tenure evaluation.
e. Advocating the intrinsic merit of contributions to an open access infrastructure by software tool development, content provision, metadata creation, or the publication of individual articles. We realize that the process of moving to open access changes the dissemination of knowledge with respect to legal and financial aspects. Our organizations aim to find solutions that support further development of the existing legal and financial frameworks in order to facilitate optimal use and access.

iv. **Delhi Declaration on Open Access (2018):** India has also made several declarations in support of open access. The most notable one is the Delhi Declaration on Open Access, which was pronounced on February 14, 2018 (Das, 2018; Gautam, 2019). The declaration was signed by dozens of academics and supporters and aimed to make open access to scholarly literature a popular choice in the dissemination of scientific research.

This declaration was drafted by a group comprising researchers and professionals working to open up access to research outputs for the public good in India. The declaration is aimed at scientific communities, scholarly societies, publishers, funders, universities and research institutions to promote openness in science and research communications (cis-india.org, 2018).

The contributors and signatories of this declaration, members of Open Access India, Open Access communities of practice in India and the attendees of the

OpenCon 2018 New Delhi held on 3rd February 2018 at Acharya Narendra Dev College, Kalkaji, New Delhi (University of Delhi) agree to issue this declaration (Das, 2018; Open Access India, 2018; Cis-india.org, 2018).

a) Advocate for the practice of Open Science (sharing research methods and results openly which will avoid "reinventing the wheel") and adoption of open technologies for the development of models for sharing science and scholarship (Open Scholarship) to accelerate the progress of research and to address the real societal challenges.
b) To strive to publish our interim research outputs as preprints or postprints (e.g., Institutional Repositories) and encourage our peers and supervisors to do the same to make our research open and actionable promptly.
c) To practice and encourage researchers and scientists to implement openness in peer-reviewing and other editorial services, influence the scholarly societies to flip their journals into Open Access and contribute to the development of a whitelist of Open Access journals in India adhering to the "Principles of Transparency and Best Practice in Scholarly Publishing".
d) Harvest the support of the relevant stakeholders (scholars, journal editorial teams, university libraries, research funders, and authorities in charge of dissemination of scholarship in higher education) for spearheading the Open Access movement.
e) Take forward the concept of Open Access to further bring all the publicly funded research outputs (not limited to journal literature alone) to be freely available under open licenses to the public to use, reuse and share in any media in open formats.
f) Impress upon policymakers to adopt an open evaluation system for research and an institutional reward system for practising openness in science, scientific communications and academic research across disciplines including the Humanities and Social Sciences
g) Support and work for an alternate reward system in recognition and promotion not in terms of the 'Impact Factor' of the journals, but the 'Impact' of the articles/scholarship in science and the society and impress

upon all the scientists/scholars, research funders, research institutes, universities, academies and scholarly societies to sign the San Francisco Declaration on Research Assessment (DORA).

h) Strongly agree with the Joint COAR-UNESCO Statement on Open Access, Jussieu Call and Dakar Declaration. And will also follow the international initiative Open Access 2020, to develop roadmaps to support sustainable Open Access scholarly communication models which are free of charge for the authors and free of charge availability to the readers.

i) While learning from South cooperation on Open Access, it will work for developing a framework for Open Access in India and South Asia: National Policies for Open Access and country-specific action plans will be formulated aimed at making Open Access the default in India and South Asia, by 2025.

j) Creating more awareness of Open Access, infrastructure, capacity building, funding, and policy mechanisms, as well as incentivizing Open Access, we come forward to share success stories, studies, and discussions during Open Access Week.

3.9. Open Access Initiatives

Open access initiatives are of paramount importance as they promote the fundamental principles of knowledge sharing, equitable access, and scientific progress. By removing barriers such as paywalls and subscription fees, open access initiatives ensure that research findings are freely available to all, enabling researchers, students, policymakers, and the general public to benefit from the latest scientific discoveries. Open access facilitates collaboration, innovation, and the exchange of ideas, ultimately accelerating research progress. Moreover, it promotes transparency, public engagement, and evidence-based decision-making, fostering for more inclusive and informed society. By embracing open access initiatives, the academic society can unlock the full potential of research, maximize its impact, and pave the way for a more accessible and equitable future of knowledge dissemination.

The following are some of the key initiatives taken to promote open access globally.

i. **ERIC Database - Education Resources Information Centre (1966):** Sponsored by the Institute of Education Sciences of the United States Department of Education. It has 1.5 million bibliographic records of journal articles and other education-related contents – and contains various publication types, including journal articles, books, conference papers, technical reports, dissertations, etc.

ii. **arXiv (1991):** arXiv is a preprint server that allows researchers to share their scientific papers before formal peer review. It covers disciplines such as physics, mathematics, computer science, and more, making research findings rapidly available.

iii. **The Networked Digital Library of Theses and Dissertations (NDLTD) (1996):** An international organization dedicated to promoting the adoption, creation, use, dissemination, and preservation of ETDs. In 2003 incorporated as a nonprofit organization – members include universities around the world, and partner organizations including Adobe, OCLC, ALA, etc.

iv. **Scientific Electronic Library Online (SciELO) (1997):** SciELO is a network of open-access journals primarily focused on Latin America, the Caribbean, Spain, Portugal, and South Africa. It provides free access to a diverse range of scientific articles in multiple disciplines.

v. **OpenEdition (1999):** OpenEdition is a digital publishing platform for humanities and social sciences research. It includes open access journals, books, and other academic content, fostering the dissemination of knowledge in these fields.

vi. **Public Library of Science (PLOS) (2000):** PLOS is a prominent nonprofit publisher that advocates for open access to scientific research. It publishes a range of peer-reviewed journals in various disciplines, enabling researchers to freely share their work.

vii. **PubMed Central (PMC) (2000):** PMC is a digital repository of freely accessible biomedical and life sciences literature. It offers open access to a vast collection of research articles, including content funded by the National Institutes of Health (NIH).

viii. **BioMed Central (2000):** BioMed Central is a leading open access publisher covering various fields in biomedicine and the life sciences. It publishes a wide range of peer-reviewed journals, ensuring that research is freely available to the scientific community.

ix. **Directory of Open Access Journals (DOAJ) (2002): A** comprehensive directory that indexes and promotes quality open access journals. It serves as a vital resource for researchers, facilitating easy access to a wide range of open access scholarly publications.

x. **Directory of Open Access Repositories (OpenDOAR) (2005):** It is a collaborative project between the University of Nottingham and Lund University, funded by OSI, JISC, SPARC Europe, and CURL. The quality-assured - global Directory of Open Access Repositories - repositories that provide free, open access to academic outputs and resources.

xi. **OpenAIRE (2010):** OpenAIRE is a European initiative that supports open access to research outputs. It provides a platform for researchers, institutions, and projects to share their research results and promotes open science practices.

xii. **Directory of Open Access Books (DOAB) (2012):** DOAB is a directory that indexes and promotes quality open-access books from various disciplines. It offers researchers and readers a valuable resource for accessing scholarly books freely.

xiii. **Open Library of Humanities (OLH) (2015):** OLH is a charitable organization that publishes open access journals and books in the humanities. It operates on a library-funded model, ensuring that humanities research is freely accessible to all.

xiv. **The Initiative Open Access 2020 (OA2020):** A global alliance of scientific and research organizations, is founded. It is committed to accelerating the transition from the subscription system for scholarly publications to new open access models. The goal of the OA2020 initiative is to bring about a situation where research articles are published without embargo periods, and the costs behind their dissemination are transparent, just, and economically sustainable.

xv. **Plan S (2018):** Plan S is an influential initiative launched by cOAlition S, aiming to drive the transition to full and immediate open access to scholarly publications. The initiative has sparked global discussions and collaborations, playing a pivotal role in shaping the future of open access publishing and advancing the principles of open science.

3.9.1. Open Access Initiatives in India

Prior to the Delhi Declaration, several other initiatives were taken in India to promote open access. Recognizing the importance of open access, India is promoting and aims to break down barriers to accessing scholarly research, scientific knowledge, and educational resources. Open access encourages the sharing of information freely and openly, removing subscription fees and paywalls that often restrict access to valuable research findings. This move empowers researchers, students, and the general public to access and utilize research outputs, leading to increased collaboration, interdisciplinary research, and accelerated progress. India recognizes that open access can democratize knowledge, bridge the digital divide, and enable individuals from diverse backgrounds to contribute to scientific advancements. By embracing open access, India seeks to create a more equitable and inclusive research ecosystem that benefits society as a whole.

The following initiatives are some of the remarkable landmarks of India's open access movement.

i. **National Programme on Technology Enhanced Learning (NPTEL) (2003):** Collectively initiated by seven Indian Institutes of Technology (Bombay, Delhi, Kanpur, Kharagpur, Madras, Guwahati and Roorkee) along with the IISc, Bangalore. Initially started as a project to take quality education to all corners of the country, NPTEL now offers close to 600+ courses for certification every semester in about 22 disciplines. They have 3000+ unique courses available for self study and courses in web/video format were developed - Since March 2014 (nptel.ac.in, 2023).

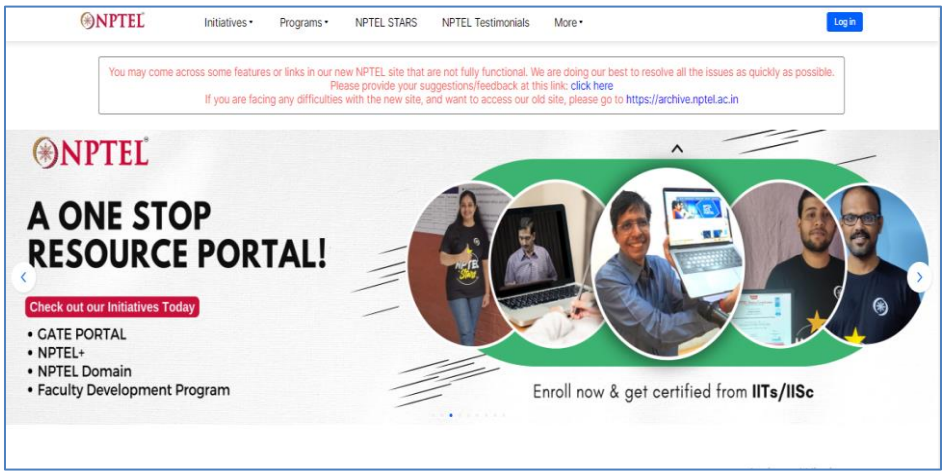

Figure 3.5: Homepage of NPTEL's Website

(Source: https://nptel.ac.in/)

ii. **Open Access and Institutional Repository Workshop, Chennai (2004):** Two workshops were organized by the M.S. Swaminathan Research Foundation, Chennai with a view to develop a cadre of open access experts in Indian higher educational institutions and government laboratories (MSSRF, 2004).

iii. **UGC Mandates M.Phil. & Ph.D. thesis deposition (2009) and launching Shodhganga:** The University Grants Commission (UGC) mandates that following the successful completion of the evaluation process and before the announcement of the award of the M.Phil./Ph.D. degree(s), the Institution concerned shall submit an electronic copy of the M.Phil. dissertation /Ph. D. thesis to the INFLIBNET, for hosting the same to make it accessible to all Institutions/Colleges (UGC, 2009). UGC's thesis repository, Shodhganga, which is in place due to the Ministry of Education directives, encourages authors to tag their submissions with Creative Commons Licence Attribution-NonCommercial-ShareAlike 4.0 International (CC BY-NC-SA 4.0).

iv. **National Knowledge Commission (NKC) recommendation (2009)**: The National Knowledge Commission, an esteemed advisory body in the field of education, has put forth a groundbreaking recommendation endorsing Open Educational Resources (OER). Recognizing the immense potential of digital

resources, the Commission highlights the transformative impact OER can have on the accessibility and quality of education in India (NKC, 2009).

v. **Open Access India (2011):** The Open Access India initiative was launched in 2011 with the aim of addressing the challenges posed by restricted access to scholarly research and knowledge in the country. It was established to promote the principles of open access and to advocate for policies and practices that facilitate free and unrestricted dissemination of research outputs. The initiative recognizes that access to knowledge is crucial for scientific progress, innovation, and societal development. It strives to empower researchers, students, and the general public by providing them with free and unrestricted access to scholarly information.

vi. **CSIR constitutes a committee for implementation of Open Access policy (2011):** In 2011, the Council of Scientific & Industrial Research (CSIR) constituted a committee for the implementation of an open access policy in CSIR (CSIR, 2011).

vii. **Legal Information Institute of India (2011):** The Legal Information Institute of India (LIIofIndia) is an international standard, free access and nonprofit, a comprehensive online collection of India's legal information. It provides free, independent and non-profit access to 172 databases of Indian law (LIIofIndia.org, 2023).

viii. **ICAR adopted an Open Access policy (2013):** In 2013, the Indian Council of Agricultural Research (ICAR) adopted an open access policy for the establishment of open access institutional repositories in the ICAR institutes, and the National Repository of Open Educational Resources was established.

ix. **National Repository of Open Educational Resources (2013):** NROER was developed by CIET, NCERT. It was launched during the National Conference on ICT for School Education on 13th August 2013 in New Delhi in collaboration with the Department of School Education and Literacy, Ministry of Human Resource Development, Government of India.

Metastudio, the platform hosting the repository is an initiative of Knowledge Labs, Homi Bhabha Centre for Science Education, Mumbai. NROER hosts a large number of educational resources in many subjects and different Indian languages for Primary, Secondary and Senior Secondary classes. Resources are available in different formats like Video, Image, Audio, Document, and Interactive.

x. **ePathshala (2015):** ePathshala is a portal/app developed by the CIET and NCERT. It was initiated jointly by the Ministry of Human Resource Development (Now Ministry of Education), CIET, and NCERT, and launched in November 2015. It hosts educational resources for teachers, students, parents, researchers and educators.

Figure 3.6: Homepage of e-Pathshala Website
(Source: https://epathshala.nic.in)

xi. **e-PG Pathshala (2015):** e-PG Pathshala is an initiative of the Ministry of Human Resource Development (MHRD), now the Ministry of Education, under its National Mission on Education through ICT (NME-ICT). It is an educational dedicated portal available in open access. This portal is an MHRD Project that is being developed by a dedicated team of the NME-ICT department under the guidelines of UGC. The prime objective is to meet curriculum and course content requirements for every postgraduate learner.

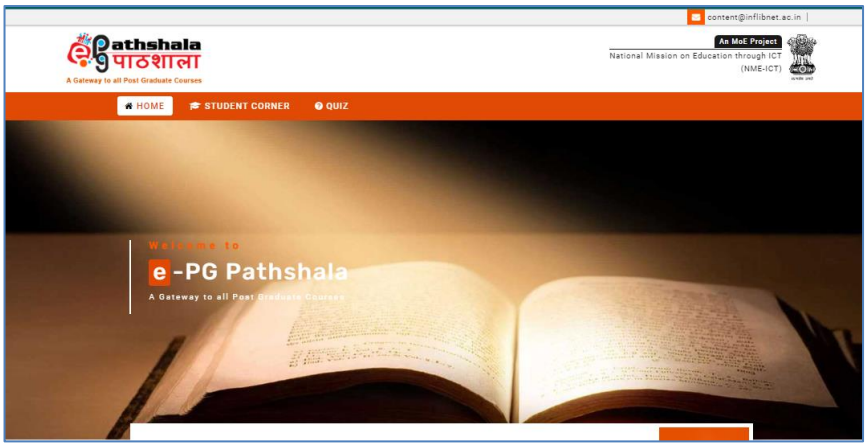

Figure 3.7: Homepage of e-PG Pathshala Website
(Source: https://epgp.inflibnet.ac.in/)

xii. SWAYAM (2017): SWAYAM (meaning 'Self' in Sanskrit) is an acronym that stands for "Study Webs of Active-Learning for Young Aspiring Minds". It is an Indian government Massive open online course (MOOC) platform providing educational opportunities for a vast number of university and college learners.

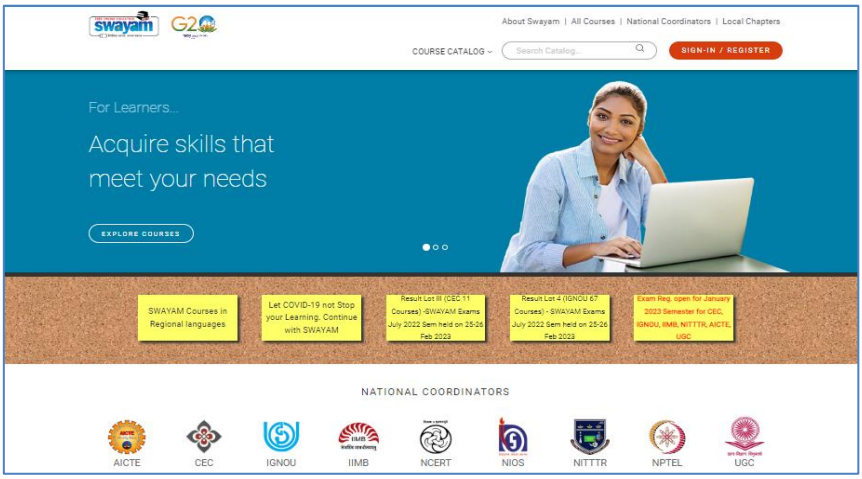

Figure 3.8: Homepage of the SWAYAM Website
(Source: https://swayam.gov.in/)

xiii. National Digital Library of India (2018): It is a digital repository containing journal articles, textbooks, lecture notes, videos, audio books, fiction, and other learning media, and provides free-of-cost access to too many books in the Indian languages and English. The National Digital Library of India (NDLI) is a project under the Ministry of Education, Govt. of India developed, operated and maintained by the IIT, Kharagpur.

Figure 3.9: Homepage of the NDLI Website
(Source: https://ndl.iitkgp.ac.in/)

xiv. **IndiaRxiv (2019):** India's preprint repository launched by the Open Access India community hosted by the Society for Promotion of Horticulture, Bengaluru.

xv. **Open Access India joins AmeliCA (2019):** Open Access India joins AmeliCA in taking forward the 'non-profit publishing model to preserve scholarly communications' in India. AmeliCA (Latin American Initiative for Open Access) is a regional initiative dedicated to promoting open access to scientific knowledge in Latin America and beyond. By joining AmeliCA, Open Access India gains the opportunity to collaborate with like-minded organizations and individuals, share best practices, and learn from the experiences of other regions (AmeliCA, 2019).

Apart from that, many of the journals published in India belong to learned societies and associations that publish their journals without the involvement of any commercial publisher (Arunachalam, 2008). As of July 7 2023, there are 336 Indian journals are indexed in the DOAJ (DOAJ, 2023). Many academic institutions have successfully implemented and provided limitless open access services to users through IRs and digital libraries or archives.

3.10. Open Access Policies and Mandates

Many research funders and individual organizations have policies making published work available open access. These policies vary in their scope and requirements, but they generally aim to ensure that research outputs are freely accessible to the public. Some of the popular open access policies are given below:

a) **WHO Policy on Open Access:** WHO is a member of cOAlition S and its open access policy is in line with the principles of Plan S (WHO, 2023). The policy applies to:
    i. Articles or chapters that are authored or co-authored by WHO staff or by individuals or institutions funded in whole or in part by WHO and published by external publishers;
    ii. Publications published by WHO.
b) **National Institutes of Health (NIH) Open Access policy:** Requires that all research funded by NIH grants be made openly accessible through PubMed Central within 12 months of publication (NIH, 2023).
c) **United Nations Educational, Scientific and Cultural Organization (UNESCO):** Supports open access initiatives and advocates for the accessibility of educational and scientific information (UNESCO, 2023).
d) **ROARMAP**: The Registry of Open Access Repository Mandates and Policies provides a database of institutional and funder open access policies.
e) **Harvard Open Access Project (HOAP):** Advocates for open access and provides information about open access policies and practices (HOAP, 2011).
f) **SPARC (Scholarly Publishing and Academic Resources Coalition):** Advocates for open access policies and provides resources for institutions, researchers, and policymakers.
g) **Coalition S:** An international group of research funders that supports Plan S, an initiative to make all publicly funded research publications open access (ESF, 2023).

India has also been making efforts to promote open access to research and scholarly information. Various government bodies, research institutions, and funding agencies in India have implemented open access policies to enhance the accessibility and dissemination of research outputs. The following are some key open access policies in India:

a) **Department of Science and Technology (DST) Open Access Policy:** The DST, which is a part of the Ministry of Science and Technology, Government of India, released an open access policy in 2014. It encourages researchers receiving funding from DST to deposit their research publications in institutional or subject repositories (DST, 2014).
b) **Indian Council of Medical Research (ICMR) Open Access Policy:** ICMR, the apex body in India for the formulation, coordination, and promotion of biomedical research, has an open access policy that encourages its researchers to deposit their publications in open access repositories.
c) **Council of Scientific and Industrial Research (CSIR) Open Access Policy:** CSIR, which is one of the leading scientific and industrial research organizations in India, has implemented an open access policy that aims to make its research publications freely accessible through institutional repositories (CSIR, 2011; CSIR, nd).
d) **National Knowledge Commission (NKC, 2007):** The NKC advocates for an open access policy to ensure equitable and widespread access to research and knowledge resources for the advancement of education, research, and innovation.
e) **ShodhGanga: Reservoir of Indian Theses:** It is one of the major breakthroughs in India to make available the theses produced by Indian universities in the open domain for the scholarly community to access. It is the digital repository of Indian electronic theses and dissertations set-up by the INFLIBNET Centre at Ahmedabad.
f) **ePrints@IISc:** It is a digital repository developed and maintained by the Indian Institute of Science (IISc), one of India's premier research institutions. The repository serves as a platform for the institution's researchers to archive

and share their scholarly work, such as research papers, preprints, conference presentations, theses, and other types of academic output.

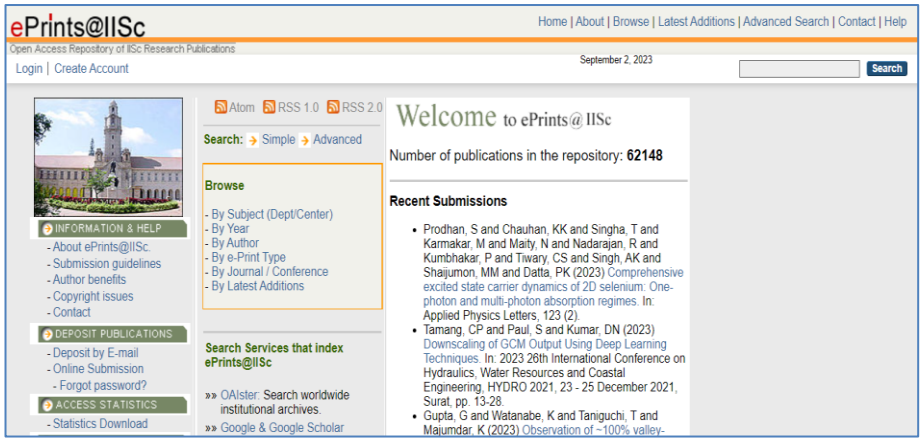

Figure 3.10: Homepage of the ePrints@IISc Website
(Source: https://eprints.iisc.ac.in/)

Apart from these, many research organizations and academic institutions have their own open access policy and mandate to make their publications/funded publications available in the public domain. The institutions such as the Indian National Science Academy (INSA), Jawaharlal Nehru University (JNU), National Institute of Technology (NIT), Indian Institute of Technology (IIT), etc. have adopted and implemented open access policies.

3.11. Types/Approaches of Open Access

Types of open access refer to the different paths or methods through which researchers can make their scholarly work freely available to the public. These approaches typically include green gold, bronze, and hybrid. These approaches offer researchers options to ensure their work is accessible to a broader audience, promoting the dissemination of knowledge and fostering collaboration.

These are briefly discussed below:

i. **Gold Open Access:** Gold OA makes the final version of an article freely and permanently accessible for everyone immediately after publication. The authors retain the copyright for the article, and most of the permission barriers are removed. Gold OA articles can be published either in fully OA journals (where all the content is published OA) or hybrid journals (a

subscription-based journal that offers an OA option which authors can choose if they wish). It simply means that the article is free for readers to access from the journal itself under a Creative Commons license.

ii. **Green Open Access**: Green OA, also called self-archiving, places a version of an author's manuscript into a repository, making it freely accessible to everyone. The version that can be deposited into a repository depends on the funder or publisher. Unlike Gold OA, the copyright for these articles usually sits with the publisher of, or the society affiliated with, the title, and there are restrictions on how the work can be reused. Individual self-archiving policies by journals or publishers determine the terms and conditions, e.g., which article version may be used and when the article can be made openly accessible in the repository (also called an embargo period). An embargo period is usually set by the publisher, such as 6, 12 or even 24 months.

iii. **Bronze Open Access:** It is another route to open access, less commonly known than gold and green open access. It involves publishing articles in journals that offer free access to readers, but authors do not pay article processing charges (APCs). However, free access typically lasts for a limited period, and the publisher can stop the free articles anytime. Moreover, authors do not retain the copyright to their articles, and as a result, bronze open access articles are generally not available for downloading or distribution.

iv. **Hybrid Gold Open Access:** It is a publishing option combination of gold and green open access elements. In this model, authors can publish their articles in a subscription-based journal that offers an open access option. This means that the final published version of the article is permanently and freely available online for anyone to read, but an article processing charge (APC) is usually applicable. The author or their institution pays the APC, which covers the cost of publishing the article in an open access format. In this model, the author also has the option not to choose open access route and opt for subscription-based journals.

v. **Delayed Open Access**: It refers to scholarly articles in subscription journals made available openly on the web directly through the publisher at the expiry of a set embargo period.

vi. **Gratis Open Access**: This access refers to the publisher optionally making a paper free to read at no charge to the author – usually for marketing and promotional activities. The Gratis Open Access may not be permanent. Copyright/licensing is still determined by traditional formats. This is not 'true' Open Access.

vii. **Libre Open Access**: This is a blanket term for 'true' Open Access; where the paper is made available under an open license, allowing it to be shared and reused, depending on which license is used.

viii. **Diamond Open Access:** This refers to the form of Gold Open Access in which there are no author fees (APC). Funding for the journal publishing operations comes from alternate sources and is not charged to the authors.

ix. **Black Open Access:** Black open access refers to the unauthorized sharing or distribution of copyrighted research articles without the permission of the copyright holders or publishers. This form of open access emerges as a response to the high costs and limited accessibility associated with subscription-based journals (Björk, 2017).

3.12. Advantages of Open-Access Publications

Open access brings several advantages to the field of research and scholarly communication. The following are some of the key advantages of open access.

i. **Visibility and Accessibility:** Open access enables research to reach a wider audience, increasing its visibility and accessibility. It allows anyone with internet access to freely read and download research articles (Suber, 2012).

ii. **Higher Citation Impact:** Numerous studies have shown that open access articles receive higher citation counts compared to their closed-access counterparts. This increased visibility and accessibility can lead to more citations and a greater impact on researchers (Eysenbach, 2006).

iii. **Collaboration and Interdisciplinary Research:** Open access encourages collaboration and interdisciplinary research by facilitating the sharing of

knowledge and resources across disciplines. It allows researchers from different fields to access and build upon each other's work more easily. (Björk & Solomon, 2012).

iv. **Rapid Dissemination of Knowledge:** Open access eliminates the barriers of traditional publishing, enabling research findings to be disseminated more quickly. This speed of dissemination helps accelerate the pace of scientific progress and innovation. (Björk et al., 2010).

v. **Cost Savings:** Open access eliminates the need for expensive journal subscriptions, making research more affordable for institutions and individuals. It can reduce financial burdens and allow institutions to allocate resources more effectively. (Solomon & Björk, 2012).

vi. **Preservation of Research:** Open access repositories often provide long-term preservation of research articles, ensuring their availability even if publishers cease to exist or change their access policies. This promotes the preservation and accessibility of scientific knowledge. (Borgman, 2015).

vii. **Global Equity and Inclusivity:** Open access promotes global equity and inclusivity by removing barriers to access for researchers and students in developing countries or with limited resources. It helps bridge the knowledge gap and promotes equal participation in the scientific community (Suber, 2012).

viii. **Innovation and Progress:** Open access fosters innovation by allowing researchers to build upon existing knowledge without restrictions. It promotes interdisciplinary collaboration, and faster feedback cycles, and encourages the development of new ideas and research directions (Björk & Solomon, 2012).

ix. **Data Sharing and Reproducibility:** Open access encourages the sharing of research data, promoting transparency and reproducibility in scientific research. It allows other researchers to validate and build upon findings, enhancing the credibility and reliability of scientific knowledge. (Piwowar & Vision, 2013).

x. **Policy and Societal Impact:** Open access research can have a broader policy and societal impact, as policymakers, practitioners, and the general public can access and utilize the findings to inform decisions and actions.

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CHAPTER 4

Central Universities in North East India: An Overview

4.1. Introduction

The word ‘education’ has a variety of Latin terms such as ‘educare’ means ‘to nourish;’ ‘educo’ means ‘to lead out’; ‘educere’ which means ‘to draw out’ and ‘educatum’ signifying ‘act of training’. Shiksha, an Indian term that means ‘to discipline’, ‘to govern’, ‘to instruct’, and ‘to teach’ that’s been derived from Sanskrit (Parankimalil, 2014). The purpose of education is to develop a person’s physical, mental, emotional, social, moral, and intellectual facets of life (Patra, n.d.). Albert Einstein quoted education in his book ‘Ideas and Opinions’, as ‘education is that which remains if one has forgotten everything he learned in school’ (Einstein, 1922). Every child goes through several transformations starting in kindergarten to help them become more sensible individuals. However, the pursuit of higher education is the real pinnacle of education, and it is this experience that ushers in a new era in a person’s life. Since, individuals carry their university education with them until the very end (UBP, 2018).

All educational-related activities, such as higher education activities, infrastructure development, funding allocation, etc., are governed by the Ministry of Education (MoE) through various organizations, i.e., UGC and other statutory bodies.

4.2. Ministry of Education, Government of India (GoI)

The Ministry of Education, formerly known as the Ministry of Human Resource Development (MHRD), plays a pivotal role in shaping the educational landscape of India. As the central authority overseeing the nation’s educational policies and programs, the Ministry of Education is tasked with formulating strategies, implementing reforms, and ensuring the equitable distribution of quality education across the country. Its mission extends beyond primary and secondary education to encompass higher education, vocational training, and research initiatives.

One of the key objectives of the Ministry is to enhance access to education for all segments of society, irrespective of their socio-economic background. It focuses on bridging the education gap between urban and rural areas, promoting gender equality, and ensuring education is inclusive for differently-abled individuals. The Ministry of Education works closely with state governments, educational institutions, and

various stakeholders to design and implement schemes that address these issues and foster holistic development (MoE, 2023).

Ministry of Education (MoE) was formed on September 26, 1985, through the 174th amendment to the Government of India (Allocation of Business) Rules, 1961. Currently, the Ministry of Education (MoE) works through two departments. These are briefly discussed below:

i. **Department of School Education & Literacy (SE&L):** The Department of School Education & Literacy is responsible for developing school education and literacy in the country. It has its eyes set on the "universalisation of education" and making better citizens out of our young brigade. For this, various new schemes and initiatives are taken up regularly, and recently, those schemes and initiatives have also started paying dividends in the form of growing enrolment in schools. Department of School Education and Literacy through its autonomous/Statutory bodies, i.e., CBSE, KVS, JNV, NIOS, and NCTE, and its centrally sponsored scheme of Samagra Shiksha, PM Poshan, Padhna Likhna Abhiyan and central sector scheme of National Means cum Merit Scholarships is committed to creating a quality education system, with particular focus on historically marginalized, disadvantaged, and underrepresented groups that acts as a great leveller and is the best tool for achieving economic and social mobility, inclusion, and equality (MoE, 2023).

ii. **Department of Higher Education:** The Department of Higher Education, MoE, is responsible for the overall development of the basic infrastructure of the Higher Education sector in terms of policy and planning. Under a planned development process, the Department looks after expanding access and qualitative improvement in Higher Education through world-class Universities, Colleges, and other Institutions (MoE, 2023). The following are the Vision and Mission of the Department of Higher Education:

   Vision:

   To realize India's human resource potential to its fullest in the Higher Education sector, with equity and inclusion.

Mission:

a) Provide greater opportunities for access to Higher Education with equity to all eligible persons and in particular to the vulnerable sections.

b) Expand access by supporting existing institutions, establishing new institutions, and supporting State Governments and Non-Government Organizations/civil society to supplement public efforts aimed at removing regional or other imbalances that exist at present.

c) Initiate policies and programmes for strengthening research and innovations and encourage institutions - public or private to engage in stretching the frontiers of knowledge.

d) Promote the quality of Higher Education by investing in infrastructure and faculty, promoting academic reforms, improving governance and institutional restructuring toward the inclusion of the hitherto deprived communities.

Figure 4.1: Homepage of the Department of Higher Education Website
(Source: https://www.education.gov.in/higher_education)

4.2.1. Objectives of the Ministry of Education (MoE)

The main objectives of the Ministry of Education are (MoE, 2023):

i. Formulating the National Policy on Education and to ensure that it is implemented in letter and spirit
ii. Planned development, including expanding access and improving the quality of educational institutions throughout the country, including in the regions where people do not have easy access to education.
iii. Paying special attention to disadvantaged groups like the poor, females and minorities
iv. Provide financial help in the form of scholarships, loan subsidies, etc to deserving students from deprived sections of society.
v. Encouraging international cooperation in the field of education, including working closely with UNESCO and foreign governments as well as Universities, to enhance the educational opportunities in the country.

The Ministry of Education (MoE), Government of India, works closely with the University Grants Commission (UGC) on various matters related to higher education policy formulation, reforms, and quality assurances.

4.3. University Grants Commission (UGC)

The University Grants Commission (UGC) holds a pivotal role in shaping the landscape of higher education in the country. It was established in 1956 as a statutory body under the Ministry of Education (MoE), Government of India, with the primary objectives of promoting, coordinating, and maintaining education standards across universities. Over the years, it has evolved into a dynamic organization that not only disburses grants to universities and colleges but also monitors their academic performance and guides them toward excellence.

One of the core functions of the UGC is to provide financial assistance to universities and colleges for their development and expansion. Through various grant schemes and funding programs, UGC supports research initiatives, infrastructure enhancement, faculty development, and the improvement of educational facilities.

This financial aid has been crucial in fostering the growth of educational institutions, enabling them to enhance their quality of education and research output.

In addition to financial support, the UGC plays a significant role in maintaining academic standards and ensuring the quality of education. It formulates guidelines for curriculum development, faculty recruitment, and assessment methodologies. The UGC's role extends to the accreditation and assessment of institutions to ensure they meet established benchmarks. These measures foster a competitive and globally recognized higher education system within India.

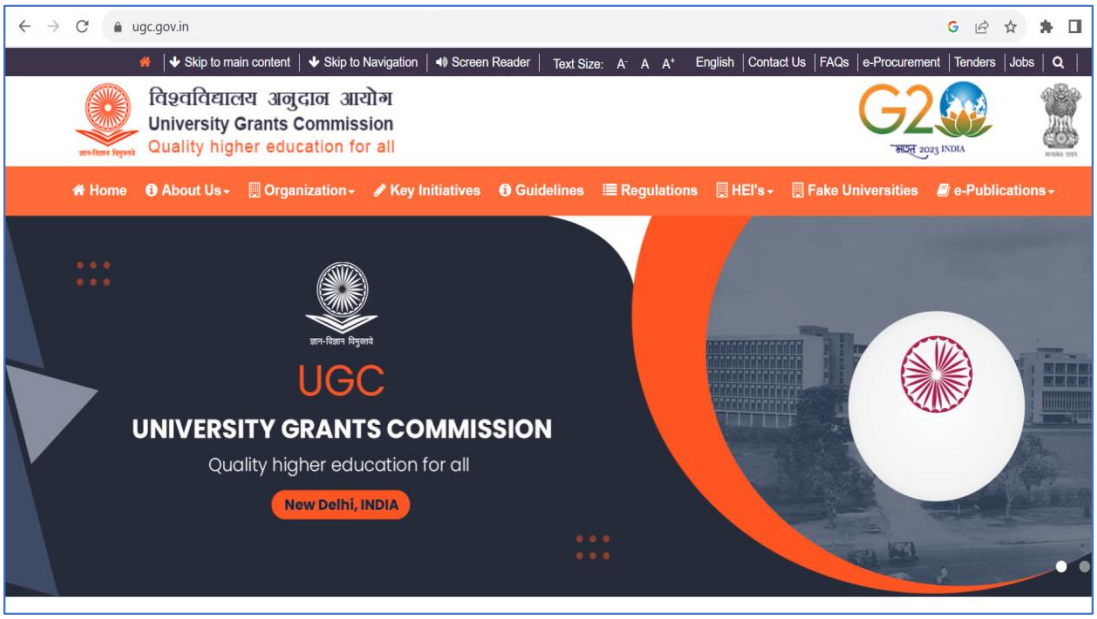

Figure 4.2: Homepage of the UGC Website
(Source: https://www.ugc.gov.in/)

The University Grants Commission (UGC) works closely with universities in the country. The University Grants Commission (UGC) Act, 1956 defines "University" as an education system registered or incorporated by or under a Central Act, a Provincial Act, or a State Act. It also involves any educational establishment that might be acknowledged by the Commission in compliance with the rules made in this regard under this Act after consultation with the University (GOI). India's higher education system has expanded at a spectacular pace, especially after independence (Nigavekar, 2003). India had 20 universities and 500 colleges when it gained its independence, with 2,30,000 students enrolled in total. Up until December 2011–12, this number has expanded to 659 universities (Sheikh, 2017). At present, the numbers

have increased to 460 state universities, 128 deemed to be universities, 430 private universities, and 56 central universities (UGC, 2023).

4.3.1. State University: These Universities were founded by an act of the relevant State Legislature, and the State Government supports and administers them.

4.3.2. State Private Universities: A State Private University is a university established through a State/Central Act by a sponsoring body viz. a Society registered under the Societies Registration Act 1860, or any other corresponding law for the time being in force in a State or a Public Trust or a Company registered under Section 25 of the Companies Act, 1956 (DHE, 2016).

4.3.3. Deemed to be University: On the recommendation of UGC and in accordance with Section 3 of the UGC Act, 1956, the Government of India has declared these institutions to be deemed universities.

4.3.4. Private University: These universities are self-supporting institutions that were formed by an act of the relevant state legislature.

4.3.5. Central University: It is an academic institution that has been incorporated and established under the act of The Central Universities Act, 2009 for academic development and research activity in various states of the country. The main aim of this university is *'to disseminate and advance knowledge by providing instructional and research facilities in such branches of learning as it may deem fit; to make special provisions for integrated courses in humanities, social sciences, science and technology in its educational programmes; to take appropriate measures for promoting innovations in teaching-learning process and inter-disciplinary studies and research; to educate and train manpower for the development of the country; to establish linkages with industries for the promotion of science and technology; and to pay special attention to the improvement of the social and economic conditions and welfare of the people, their intellectual, academic and cultural development'.*

4.3.5.1. State-Wise Central Universities

According to the consolidated list of Central Universities provided by the University Grants Commission (UGC) as of January 1st, 2023, there are 56 central universities distributed in countless regions across the country. Among these, ten central universities are primarily under the purview of various ministries.

Table 4.1: List of State-Wise Central Universities till January 1st, 2023

State	University	Estd.	Specialization
Andhra Pradesh	Central Tribal University of Andhra Pradesh	2019	Tribal General
	Central University of Andhra Pradesh	2019	General
	National Sanskrit University	1956	Sanskrit
Arunachal Pradesh	Rajiv Gandhi University	1985	General
Assam	Assam University	1994	General
	Tezpur University	1994	General
Bihar	Central University of South Bihar	2009	General
	Mahatma Gandhi Central University	2016	General
	Nalanda University	2010	International University
	Dr. Rajendra Prasad Central Agriculture University	1905	Agriculture
Chhattisgarh	Guru Ghasidas Vishwavidyalaya	1983	General
Delhi	Central Sanskrit University	1970	Sanskrit
	Indira Gandhi National Open University	1985	Distance education
	Jamia Millia Islamia	1920	General
	Jawaharlal Nehru University	1969	General
	Shri Lal Bahadur Shastri National Sanskrit University	1962	Sanskrit
	South Asian University	2010	International University
	University of Delhi	1922	General
Gujarat	Central University of Gujarat	2009	General
	Gati Shakti Vishwavidyalaya	2022	Transport
Haryana	Central University of Haryana	2009	General
Himachal Pradesh	Central University of Himachal Pradesh	2009	General
Jammu and Kashmir	Central University of Jammu	2011	General
	Central University of Kashmir	2009	General
Jharkhand	Central University of Jharkhand	2009	General
Karnataka	Central University of Karnataka	2009	General
Kerala	Central University of Kerala	2009	General
Ladakh	Sindhu Central University	2021	General
Madhya Pradesh	Dr. Hari Singh Gour University	1946	General
	Indira Gandhi National Tribal University	2007	General
Maharashtra	Mahatma Gandhi Antarrashtriya Hindi Vishwavidyalaya	1997	Hindi Language
Manipur	Central Agricultural University	1993	Agriculture

	Manipur University	1980	General
	National Sports University	2018	Sports
Meghalaya	North Eastern Hill University	1973	General
Mizoram	Mizoram University	2000	General
Nagaland	Nagaland University	1994	General
Odisha	Central University of Odisha	2009	General
Puducherry	Pondicherry University	1985	General
Punjab	Central University of Punjab	2009	General
Rajasthan	Central University of Rajasthan	2009	General
Sikkim	Sikkim University	2007	General
Tamil Nadu	Central University of Tamil Nadu	2009	General
	Indian Maritime University	2008	Marine Science
Telangana	English and Foreign Languages University	1958	English and Foreign languages
	Maulana Azad National Urdu University	1998	Urdu Language
	University of Hyderabad	1974	General
Tripura	Tripura University	1987	General
Uttar Pradesh	Aligarh Muslim University	1920	General
	University of Allahabad	1887	General
	Babasaheb Bhimrao Ambedkar University	1996	General
	Banaras Hindu University	1916	General
	Rajiv Gandhi National Aviation University	2013	Aviation Science
	Rani Lakshmi Bai Central Agricultural University	2014	Agriculture
Uttarakhand	Hemwati Nandan Bahuguna Garhwal University	1973	General
West Bengal	Visva-Bharati University	1921	General

(Source: University Grants Commission)

4.3.5.2. Needs of Central Universities

Central universities in India play a crucial role in providing higher education to students nationwide. An Act of Parliament establishes these universities and is under the purview of the Department of Higher Education in the Ministry of Education (MoE). Central universities are essential for several reasons:

i. **Quality Education:** Central universities are known for providing quality education to students. They have well-qualified faculty members, state-of-the-art infrastructure, and modern teaching methods (Gupta, 2021).

ii. **Diversity:** Central universities attract students from all over India, which leads to a diverse student population. This diversity helps students learn about different cultures, traditions, and languages (Marisha et al., 2017).

iii. **Research Opportunities:** Central universities offer excellent research opportunities to students. They have well-equipped laboratories, research centres, and libraries that provide students with access to the latest research in their field of study (Marisha et al., 2017; Panneerselvam, 2017).

iv. **Government Funding:** Most central universities in India are directly funded by the government, which ensures that they have the necessary resources to provide quality education to students (UGC, nd)

4.3.5.3. Ranking and Accreditation of Higher Education Institutions

The accreditation and ranking of higher education institutions are essential for ensuring the quality and credibility of the country's vast and diverse educational landscape. Accreditation bodies like the National Assessment and Accreditation Council (NAAC) play a vital role in assessing and certifying the quality of institutions while ranking agencies such as the National Institutional Ranking Framework (NIRF) provide a valuable comparative perspective.

a) **National Assessment and Accreditation Council (NAAC):** In the dynamic landscape of higher education, the pursuit of excellence and quality assurance is of paramount importance. Recognizing this need, the National Assessment and Accreditation Council (NAAC) emerged as a pioneering body in India dedicated to evaluating and accrediting institutions of higher learning. The National Assessment and Accreditation Council (NAAC) is an autonomous body of the University Grants Commission (UGC). This institution was established in 1994 by the recommendations of the National Policy on Education, 1986, and the Programme of Action (POA), 1992, emphasizing the quality of higher education in India. As stated in the NAAC's Memorandum of Association (MoA), NAAC's primary mission is to assess and accredit higher educational institutions, universities, colleges, or some of their departments, schools, institutions, and programs. Education

administrators, policymakers, and senior academicians from a cross-section of higher education are represented on the NAAC's General Council and Executive Committee (NAAC, 2023).

In addition to assessing and accrediting higher education institutions, NAAC encourages them to maintain rigorous academic standards and improve quality. Accreditation by NAAC recognizes an institution's commitment to providing excellent educational experiences and ensuring its programs meet defined standards. NAAC evaluates curriculum design, teaching-learning methodologies, research output, infrastructure, governance, and student support services through its assessment processes. Institutions gain valuable insight into their strengths and areas for improvement through this comprehensive evaluation.

Benefits of Accreditation

NAAC accreditation offers several benefits to educational institutions, students, faculty, and other stakeholders. Here are some of the key benefits (NAAC, 2023):

- Institutions to know their strengths, weaknesses, and opportunities through an informed review process
- Identification of internal areas of planning and resource allocation
- Collegiality on the campus
- Funding agencies look for objective data for performance funding
- Institutions to initiate innovative and modern methods of pedagogy
- A new sense of direction and identity for institutions
- Society looks for reliable information on quality education offered
- Employers look for reliable information on the quality of education offered to prospective recruits
- Intra and inter-institutional interactions

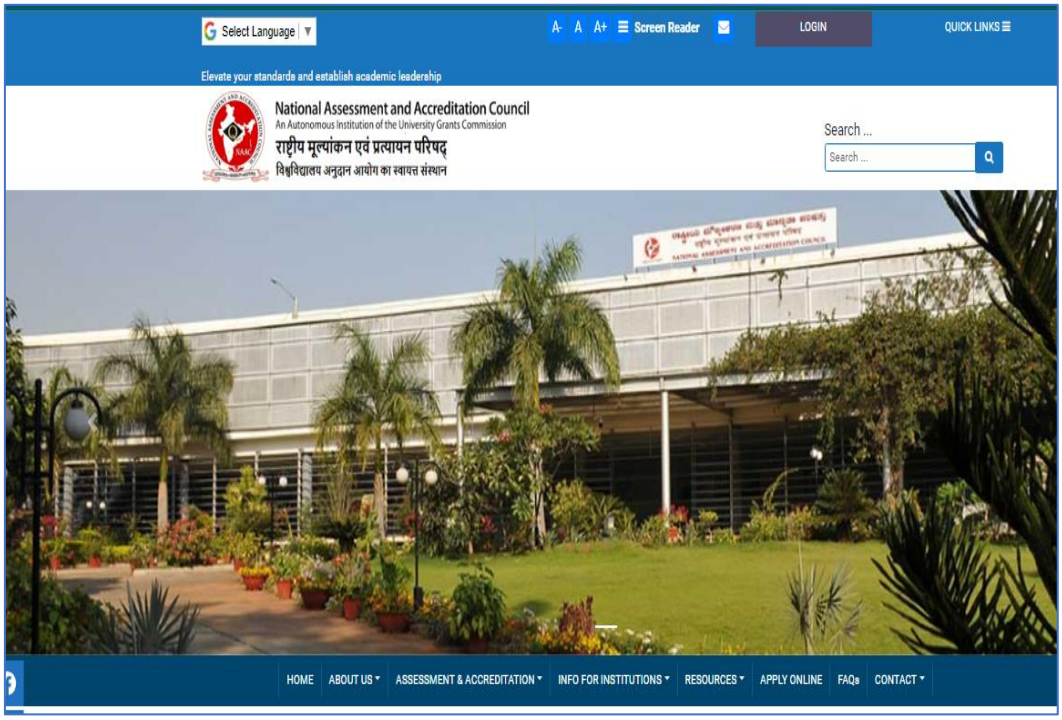

Figure 4.3: Homepage of NAAC's Website
(Source: http://www.naac.gov.in/index.php/en/)

b) National Institutional Ranking Framework (NIRF): The National Institutional Ranking Framework (NIRF) is a notable initiative introduced by India's Ministry of Education (MoE) to assess and rank higher education institutions nationwide. NIRF was launched on 29th September 2015. It serves as a valuable tool for evaluating the quality and performance of higher education institutions based on a set of well-defined parameters, including teaching and learning resources, research output, graduation outcomes, outreach and inclusivity, and peer perception. These rankings are published annually and play a crucial role in aiding students, parents, and educators to make informed decisions about higher education choices. Moreover, NIRF fosters a spirit of competition among institutions, motivating them to continually improve and excel in various aspects of education and research, thereby contributing to the overall enhancement of the higher education landscape in India.

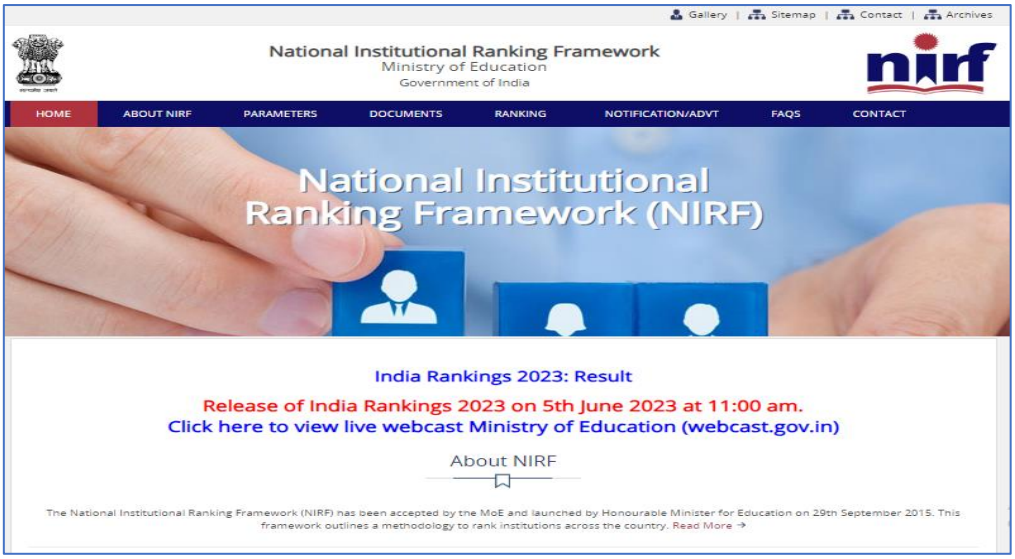

Figure 4.4: Homepage of NIRF's Website
(Source: https://www.nirfindia.org/Home)

The overall parameters of ranking higher education institutions are (NIRF, 2023):

i. ***Teaching, Learning & Resources (TLR)***
   - Student Strength including Doctoral Students (SS)
   - Faculty-student ratio with emphasis on permanent faculty (FSR)
   - Combined metric for Faculty with PhD (or equivalent) and Experience (FQE)
   - Financial Resources and their Utilisation (FRU)

ii. ***Research and Professional Practice (RP)***
   - Combined metric for Publications (PU)
   - Combined metric for Quality of Publications (QP)
   - IPR and Patents: Published and Granted (IPR)
   - Footprint of Projects and Professional Practice (FPPP)

iii. ***Graduation Outcomes (GO)***
   - Metric for University Examinations (GUE)
   - Metric for Number of Ph.D. Students Graduated (GPHD)

iv. ***Outreach and Inclusivity (OI)***
   - Percentage of Students from Other States/Countries (Region Diversity RD)
   - Percentage of Women (Women Diversity WD)

- Economically and Socially Challenged Students (ESCS)
- Facilities for Physically Challenged Students (PCS)
- Perception (PR) Ranking

v. Peer Perception

- Academic Peers and Employers (PR)

4.4. Profile of Selected Central Universities

The present study is confined to the nine central universities located in the Northeastern region of India.

4.4.1. Assam University, Silchar

Assam University was founded in 1994 under the adoption of the Central University Act 1989. Assam University, which is a central institution, promotes the national virtue of unity in diversity. Faculty members, staff members, and students come from all around the nation. Also, this organization appeals to international students as a prime location for achieving their academic goals. At present, AU has 41 departments under 16 schools distributed on the campuses in Silchar and Diphu. Also, the university has 77 associated colleges under its administration that are delivering top-notch education to more than 35,000 students who are interested in learning. With its ongoing academic efforts, the institution keeps itself up to date on the most recent advancements in the field of knowledge and is fully concentrating on its objective to generate high-quality skilled personnel. The university has also implemented a variety of interventions for the socio-economic advancement of the area through its outreach programs, in addition to several activities to ensure the comprehensive and integrated growth of its learners. Assam University works tirelessly to fulfil its vision and objective to rank among the top institutions in the nation. The hunt goes on for ‘unbroken excellence,’ even if the University has established a distinct position for itself in the academic world by drawing inspiration from Gurudev Rabindranath Tagore.

Figure 4.5: Homepage of Assam University Website
(Source: http://www.aus.ac.in/)

4.4.2. Manipur University, Imphal

According to the Manipur University Act (Manipur Act 8 of 1980), Manipur University was founded on June 5th, 1980. The university consists of eight schools, 37 postgraduate departments, and three centres of study for research and development. The University now has 108 colleges that are affiliated with it along with two medical institutions and one constituent Engineering college. In the storied city of Canchipur, where the former Manipur palace "The Langthabal Konung" once stood, the university campus occupies an area of 287.53 acres. The main mission of the university is to keep promoting quality in education and research, preserving the social significance of education, and preparing the region's students to be law-abiding citizens. Manipur University also plans to provide special consideration to the state's population's welfare, intellectual, academic, and cultural advancement, as well as the betterment of social and economic situations.

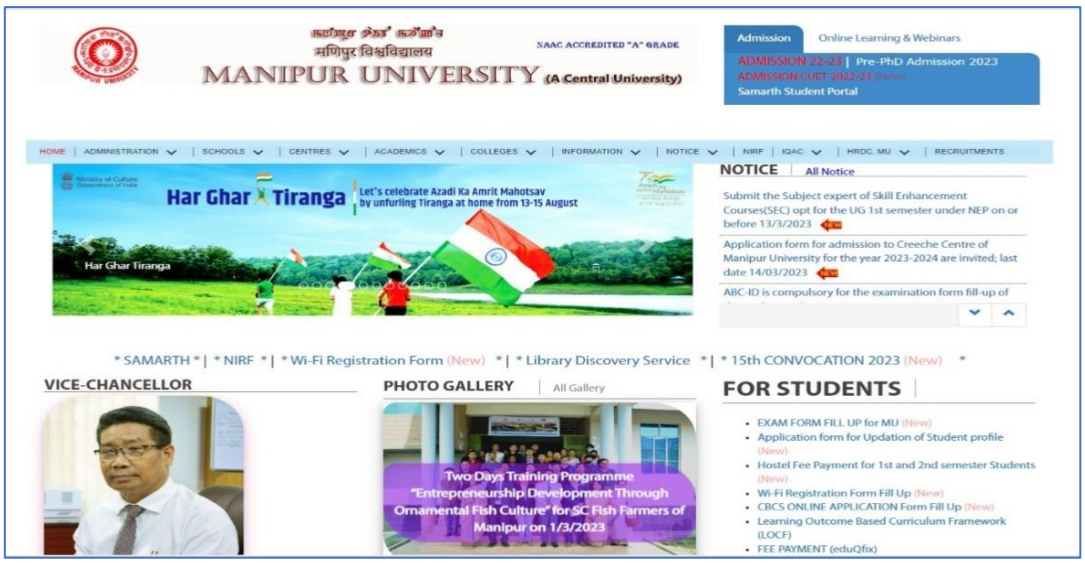

Figure 4.6: Homepage of Manipur University Website
(Source: https://www.manipuruniv.ac.in/)

4.4.3. Mizoram University, Aizawl

Mizoram University was established by Parliamentary Act No. 8 of 2000, and it began operational on July 2, 2001. The University is situated in Aizawl, the state capital of Mizoram, and occupies an area of 978.1988 acres on the outer limits of the town. Regarding infrastructure, academic programs, human resources, and support services, Mizoram University has achieved significant advancements within its last 17 years of existence. The University was listed among the top 100 universities in India in 2016, 2017, and 2018 according to the NIRF rankings under the Ministry of Human Resource Development. There are 8 Schools of Study and 35 operational academic departments at the university that provide UG, PG, M.Phil., and PhD programs and 3 centres. There is one constituent institution and 35 colleges affiliated to the university. Since 2013, the university has successfully established the country's premier choice-based credit system (CBCS), making it one of the nation's leading institutions. Based on their own research findings, the university instructors submitted 20 patent applications. The faculty has published approximately 900 books, book chapters in edited volumes, and conference papers in the last five years in addition to 1385 papers in reputable journals indexed in Scopus, Web of Science (WoS) and Indian Citation Index databases.

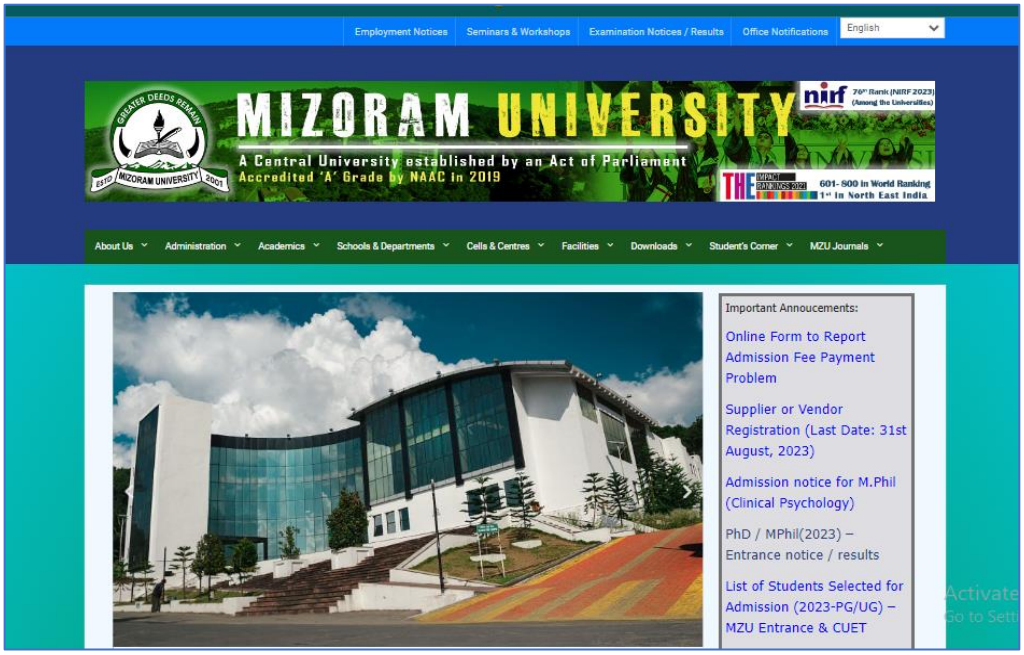

Figure 4.7: Homepage of Mizoram University Website
(Source: https://mzu.edu.in/)

4.4.4. Nagaland University, Kohima

Nagaland University was founded under an Act of the Indian Parliament (No. 35 of 1989) with the approval of the President of India through the Nagaland University Act 1989. The University currently has four campuses: the Lumami campus in Zunheboto district, the Kohima campus in Meriema, the Medziphema campus (School of Agricultural Sciences and Rural Development), and a momentary site in Dimapur (School of Engineering & Technology). There are 42 departments that offer undergraduate, graduate, doctoral, and postdoctoral programs in various fields of the arts, commerce, sciences, agricultural sciences, engineering & technology, and management streams along with 2 centres. Nagaland University is now associated with 69 colleges from all around the state of Nagaland. With the help of scientific and technical advancements, the university strives to prepare its students to tackle the changing world with confidence. The university also seeks to do research that will benefit both industry and society and to share the research results. The university aims to give extra consideration to the betterment of the social and economic circumstances and prosperity of the state's citizens, as well as to their intellectual, academic, and cultural growth.

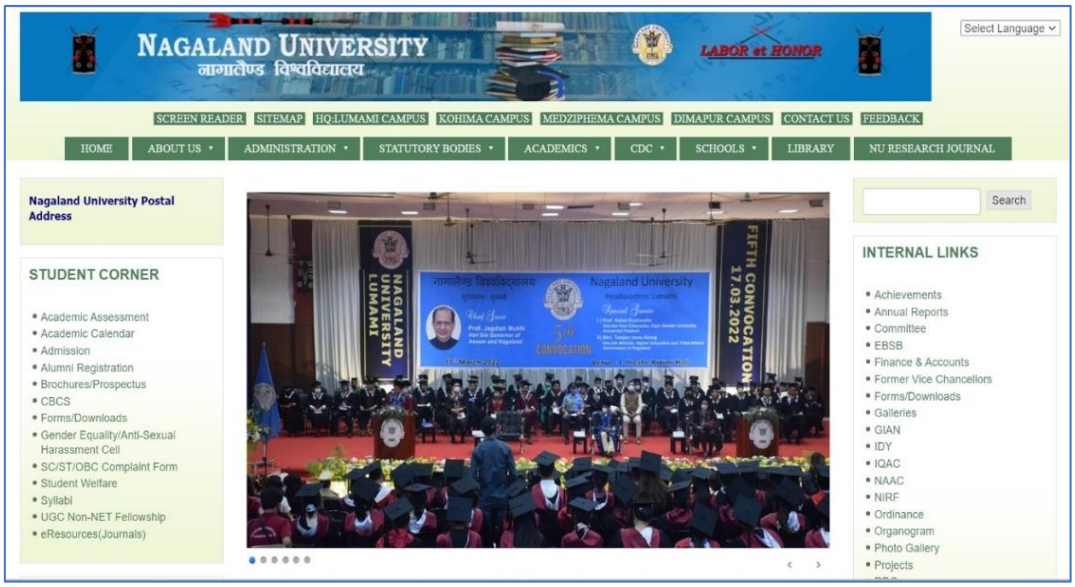

Figure 4.8: Homepage of Nagaland University Website
(Source: https://nagalanduniversity.ac.in/English/)

4.4.5. North Eastern Hill University (NEHU), Shillong

On May 26, 1973, the President of India issued the authorization to the North-Eastern Hill University Act (24 of 1973) for the establishment of North Eastern Hill University (NEHU), which had been enacted by both Houses of Parliament. The University's goals are to enhance learning and spread information by offering facilities for teaching and research in any field of study. The university also aims to provide special consideration to enhancing the social and economic circumstances and welfare of the people living in the hilly regions of the North Eastern region, with a focus on fostering their growth in the fields of education, culture, and the arts. NEHU has 47 functional departments on both campuses along with 2 centres. There are currently eight professional colleges among the 53 undergraduate institutions that are affiliated with the university. Over 1700 students are enrolled in master's programs and research scholars are pursuing M.Phil. and Ph.D. degrees. Over 18,000 students are enrolled in the undergraduate college associated with the university. The university has over 300 teaching faculty. NEHU has developed into a major academic, societal, and cultural organization with a distinctive future strategic approach over an exceptionally short period of time roughly within these 50 years.

Figure 4.9: Homepage of NEHU Website
(Source: https://www.nehu.ac.in/)

4.4.6. Rajiv Gandhi University, Itanagar

Rajiv Gandhi University is considered the leading learning platform for higher education in the state of Arunachal Pradesh with almost around for 25 years of operations. The university's founding stone was placed in Rono Hills on February 4, 1984, by the late Smt. Indira Gandhi, the then country's prime minister. On March 28, 1985, the University Grants Commission granted its academic status under Section 2(f), and on April 1, 1985, the University formally became operational. As announced by the Ministry of Human Resource Development, Government of India, the University was reformed into a Central University effective from April 9, 2007. The academic and research programs at the university are created with the intention of contributing favourably towards the socioeconomic and cultural advancement of the nation. The university provides Ph.D., Bachelor, Professional, and Postgraduate programs in addition to Certificate Courses and Diplomas. Moreover, the Department of Education provides a B.Ed. curriculum. The University has twenty-six functional departments and forty-five colleges as affiliates. Rajiv Gandhi University strives to be the most active, enthusiastic, relevant, and renowned university in India. It wants to be known internationally for its superior instruction, and research, and for offering the best educational opportunities to students from all backgrounds. The university's

goal is to develop each student's potential by encouraging intellectual development so that they can develop into well-rounded, ethically upright, multi-skilled, innovative, flexible, and global citizens who can serve mankind.

Figure 4.10: Homepage of Rajiv Gandhi University (RGU) Website
(Source: https://rgu.ac.in/)

4.4.7. Sikkim University, Gangtok

The Sikkim University was established under the Sikkim University Act, 2006 from the parliament as an agreement of the President on January 10th, 2007. The Sikkim University Act 2006 is an act to create and integrate an academic and affiliating University throughout the State of Sikkim, as well as to address matters pertaining to or supplementary to the institution. The main aim of the university is to provide teaching and research facilities in the departments of education that it may consider appropriate in order to spread and promote knowledge. It also helps to implement the necessary strategies for fostering innovations in the teaching methods, inter or multi-disciplinary investigation, and experiments. The university also attempts to provide special consideration to the growth of the nation's citizens' cognitive, academic, and cultural well-being as well as the betterment of their social and economic circumstances. A total of 18 colleges are affiliated to the university. 33 departments of Studies are available at the university, and they oversee administering the academic and research programs.

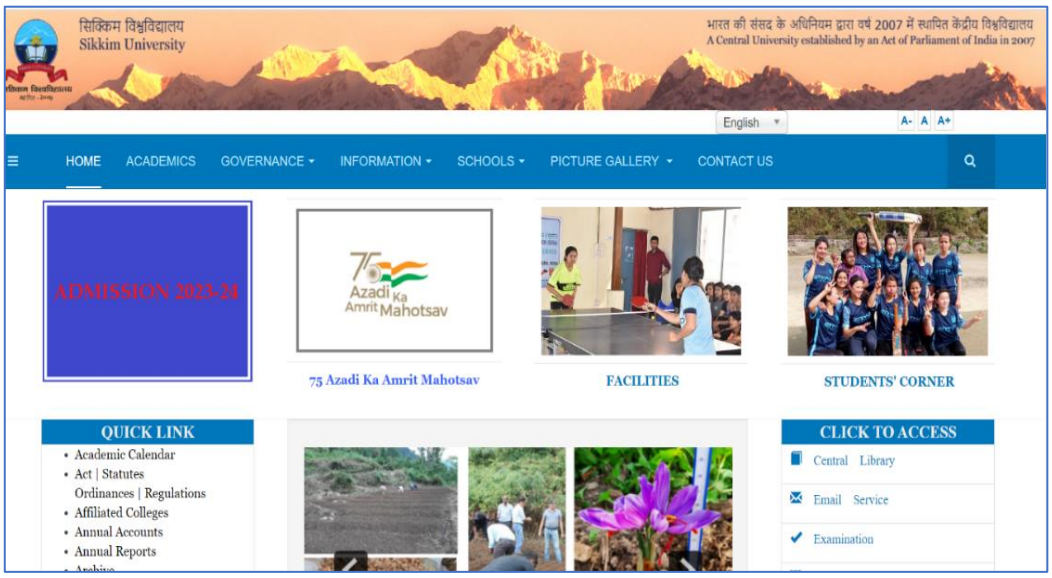

Figure 4.11: Homepage of Sikkim University Website
(Source: https://cus.ac.in/index.php/en/)

4.4.8. Tezpur University, Tezpur

Through an Act of the Indian Parliament, the Tezpur University Act, of 1993, established Tezpur University on January 21, 1994. (Act. No. 45). According to the university's mission, its academic courses place a strong emphasis on the humanities, social sciences, and science disciplines. The university has 27 departments for regular functional academic activities. The university now offers Masters programs in 23 subjects and Doctor of Philosophy (Ph.D.) programs in 17 fields. The university also includes a variety of cutting-edge labs, computing equipment, internet access, a specialized power supply line, and an extensive library with connections to digital libraries. While 12 well-designed dormitories are available for housing students, additional residential buildings are present for house instructors and non-teaching employees. In North East India, Tezpur University has become one of the most prestigious universities. The accomplishments made by the university during its first 21 years are something for which it has every right to be proud. The three main objectives are superior teaching, learning, and student experience; great research; and community responsibility. The university focuses on skill development in fields with social relevance for the community.

Figure 4.12: Homepage of Tezpur University Website
(Source: http://www.tezu.ernet.in/)

4.4.9. Tripura University, Tripura

Tripura University started modestly in 1976 as the Post-Graduate Wing of Calcutta University, becoming a state university in 1987, and finally becoming a Central University in 2007. The university has come a long way in its attempt to achieve excellence as a higher education institution throughout this relatively small sparsely populated state of Tripura. The University is committed to strengthening and advancing the people of this state and the surrounding area via the delivery of high-quality education and technical advancements in the realm of scientific and educational activities. Nowadays, the university has two schools, forty-six departments, four centres of study, and four departments that fall under the administration of distance education. The University is gradually transitioning to e-governance for effective, accurate, and environmentally responsible administration. 52 colleges are presently affiliated with the university. The university's mission is to disseminate and promote information through offering academic and research facilities in the state, but also nationally and internationally in fields of current importance to society.

Figure 4.13: Homepage of Tripura University Website
(Source: https://tripurauniv.ac.in/)

The above-mentioned Central Universities of North East India represent a crucial educational network in this region, contributing significantly to the development and advancement of education and research. They serve as academic hubs for students from diverse backgrounds, offering various programs, including undergraduate, postgraduate, and research-oriented courses. Due to their strategic locations in the Northeast, these universities play a pivotal role in promoting regional development, fostering cultural diversity, and addressing the unique challenges and opportunities of the region. They also engage in research initiatives focused on the socio-economic, cultural, and environmental aspects specific to North East India, contributing to the nation's overall academic and intellectual growth.

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CHAPTER 5

Data Analysis and Interpretation

5.1. Introduction

Data analysis is the crucial part of research that summarizes the collected data and presents it in a meaningful way in the form of results. It is a method of transforming the collected data into meaningful information (Taherdoost, 2020). Marshall and Rossman (1990) defined it as a process of making order, structure and meaning to the whole collected data. Ibrahim (2015) mentions some steps of data analysis such as *Classification & tabulation, Graphical representation, Measure of central tendency, Measure of variability, Measure of relationship, Estimating the unknown* and *Testing of hypothesis*. The *classification of data* includes classifying the data into similar attributes and tabulation signifies presenting the quantitative data into tabular structure in rows and columns. The *Graphical representation* includes displaying the data using graphs and charts like bar charts, pie diagrams, histograms, and scatter diagrams for detailed visual presentation. *Measure of central tendency* includes arithmetic mean, median and mode to identify the value of the data. The *measure of variation* is an important component of data analysis to show the dispersion of data like range variance and standard deviation. The *measure of relationship* examines the relation between variables and can be measured through regression and correlation. *Estimation* refers to estimating the indefinite parameters of the population.

5.2. Data Analysis and Interpretation

This chapter deals with the data analysis and interpretation about the attitude, purpose and productivity of publication in open access platforms by the faculties of central universities of Northeast India. It will describe the nature of the study in both quantitative and qualitative approaches. The data has been collected through online survey methods for primary data and the Scopus database for secondary data which has been displayed in table 5.1. The quantitative approach deals with the numerical data which are measurable through statistical and computational methods, while qualitative data deals with marking out meaning from the perceptions and behaviour of the faculty of the selected central universities.

Table 5.1: Objective-wise Framework for Data Collection

Research Objectives	Data Collection Sources
Objective 1: Find out the research contributions of the faculties of central universities of North East India	Scopus database
Objective 2: Assess the level of awareness about open access (OA) among the faculties	Questionnaire
Objective 3: Investigate the faculty's publications in OA in selected universities	Scopus database
Objective 4: Reveal the attitude and behaviour of faculty towards their OA publications	Questionnaire
Objective 5: Find out the preferred routes of OA publications by faculty	Scopus database
Objective 6: Identify the degree of satisfaction among the faculty's OA publications	Questionnaire
Objective 7: Rank the most productive central universities and the most prolific contributions in OA	Scopus database

PART A: DATA ANALYSIS AND INTERPRETATION FROM SCOPUS DATABASE

5.3. Distribution of Faculty Members with Scopus Publications

Table 5.2 represents the total number of faculty members of the selected central universities of North East India and the number of faculty members to publish in Scopus-indexed journals. Among all the universities, Assam University (AU) has the highest number of faculty yet only 50.55% of faculty have published in Scopus Indexed journals. Tezpur University (TZU) has the second highest number of faculty with 306 but it has the maximum share of faculty to publish in Scopus indexed journals with 68.95%. North Eastern Hill University (NEHU) has the second highest share of faculty to publish in Scopus Indexed journals with 67.02% which is followed by Mizoram University (MZU) with 52.61%. However, Nagaland University (NU) has the lowest share of faculty to publish in Scopus Indexed journals with 32.41% even

after having 216 total faculty members. All the undertaken central universities have a radical gap between the number of faculty present in the university and the number of faculty to have publications indexed in Scopus databases.

Table 5.2: Display of Faculty Members with Scopus Publications

Sl. No.	University	Total no. of faculty	Faculty with Scopus publication	Share (%)
1	**AU**	366	185	50.55
2	**MU**	287	140	48.78
3	**MZU**	268	141	52.61
4	**NU**	216	70	32.41
5	**NEHU**	282	189	67.02
6	**RGU**	171	66	38.60
7	**SKU**	208	90	43.27
8	**TZU**	306	211	68.95
9	**TRU**	217	98	45.16
Total		**2321**	**1190**	**51.27**

5.4. Distribution of Publications for Universities

Figure 5.1 displays the number of publications of the selected central universities of Northeast India until the year 2022. Among these nine central universities, Tezpur University (TZU) has the maximum number of publications with 5052 followed by North Eastern Hill University with 3242 publications and Assam University with 3156 articles. In the year 1968, the first publication was published in the Journal of Physics A: General Physics by U.K. De from North Eastern Hill University (NEHU). However, with the passage of time, the number of publications in the selected universities drastically increased. Yet Nagaland University and Rajiv Gandhi University had a certain lapse in this area, therefore, they should undertake some initiatives for the growth of scholarly publications to be able to stand with other central universities of North East India.

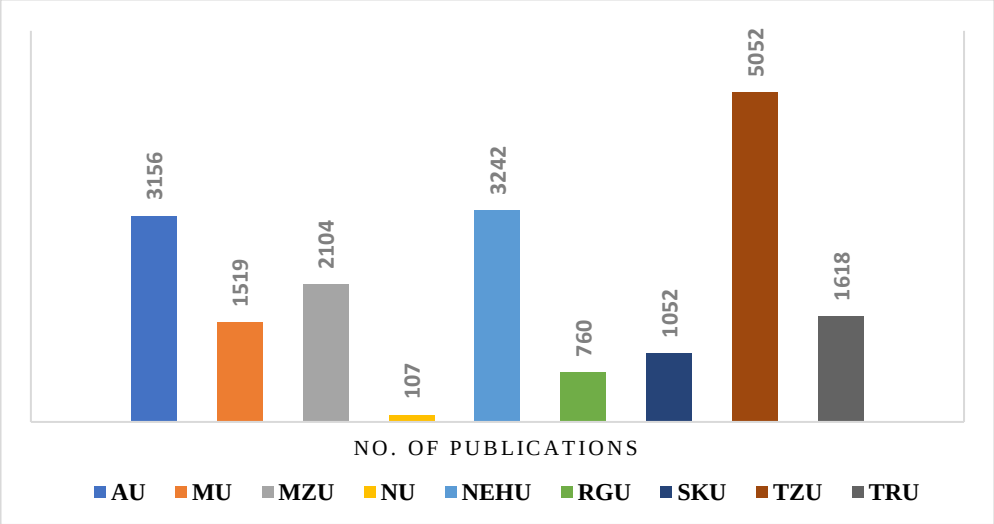

Figure 5.1: Display of Number of Publications per University

Figure 5.2 represents the aggregate amount of open access articles produced by the Northeast Indian central institutions till the end of 2022. Out of 3868 open access publications, Tezpur University (TZU) has the highest number of open access research outputs when compared to the other nine central universities, with 854, which is followed by Assam University with 767 OA articles and North Eastern Hill University with 651 OA publications. The first article was produced through open access publishing in 1988 in the journal Physical Review A entitled 'Liquid-mesophase-solid transitions: Systematics of a density-wave theory'. Nagaland University has the least number of open access publications that are being indexed in the Scopus database. The overall share of the open access publication from the total publication is minimum which is only 20.78 percent.

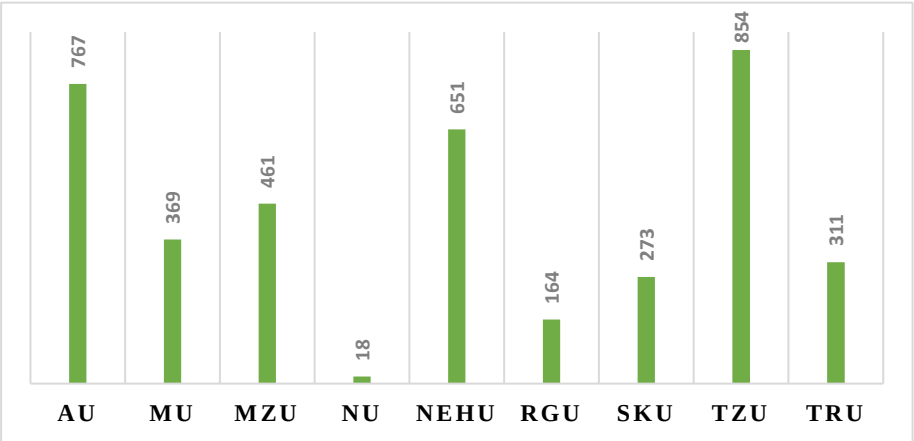

Figure 5.2: Display of Open Access Publications per University

5.5. Designation-wise Distribution of the selected Faculty

Table 5.3 discloses the distribution of designations of the faculty members who have published their work in Scopus Indexed journals of the undertaken central universities. The designation of the faculty has been divided into four categories such as Professor, Associate Professor, Assistant Professor, and Guest Faculty. Amongst 1190 faculty members, 565 (47.48%) of them are Assistant Professor, 417 (35.04%) are Professor and 160 (13.45%) are Associate Professor. While the ratio of guest lecturers is relatively low with 48 (4.03%). Assistant Professor of the undertaken central universities have more weightage than both Professor and Associate Professors.

Table 5.3: Display of Designation of the Undertaken Faculty

University	**Professor**	**Associate Professor**	**Assistant Professor**	**Guest Faculty**	**Total**
AU	55	23	106	1	**185**
MU	58	15	47	20	**140**
MZU	39	27	73	2	**141**
NU	29	6	32	3	**70**
NEHU	82	39	68	0	**189**
RGU	23	7	36	0	**66**
SKU	22	9	52	7	**90**
TZU	79	24	101	7	**211**
TRU	30	10	50	8	**98**
Total	**417**	**160**	**565**	**48**	**1190**
Percentage (%)	**35.04**	**13.45**	**47.48**	**4.03**	**100**

5.6. Distribution of Publications against Designation

5.6.1. Distribution of Total Publications against Designation

Figure 5.3 demonstrates the distribution of the total number of publications against designations. The distribution of scholarly publications among the faculty radiates the true essence and interest of the faculty toward academic and scientific growth.

Professors have the highest number of publications with 11561 (53.71%) despite having a lower number of faculty than Assistant professors. Assistant Professor has a total of 7106 (33.01%) publications which is then followed by Associate Professor with 2576 (11.97%) publications. Majorly, the Professors of Tezpur University have proclaimed to have a greater impact rather than other universities. Likewise, Associate Professor of NEHU and Assistant Professor of Assam University have a higher number of publications compared to other universities.

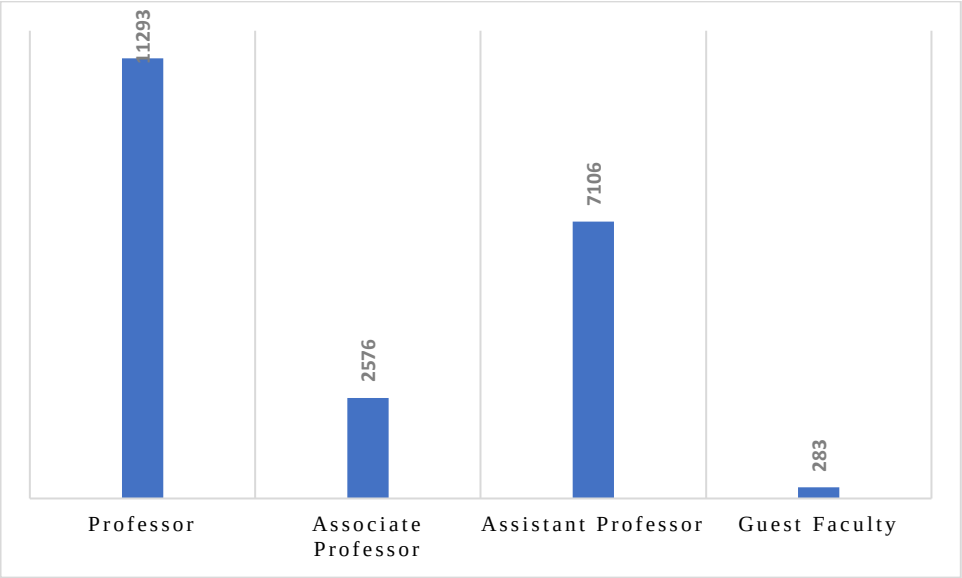

Figure 5.3: Distribution of Publications against Designation

5.6.2. Distribution of OA Publications against Designation

Figure 5.4 depicts the distribution of open access publications against the designations of the selected universities. If compared within the extracted dataset, the open access publication was first affirmed in the year 1988 amongst the central universities of North East India. The faculty ratio considerably decreases when compared to open access publications indexed in the Scopus database. The scholarly publications published in open access platforms belong mostly to the Professors of the universities with 2143 numbers of open access publications. The Assistant Professors of the undertaken central universities lead in publishing open access articles with 1639 after professors, however, open access publications affiliated to Associate Professors are very undersized when compared to other designations with 607 publications. In open

access scholarly publications, the Professor of NEHU leads the highest number of publications (571). Whereas, Assam University beats other participating central universities in terms of open access publication on both the designation of Assistant Professor (484) and Associate Professor (130).

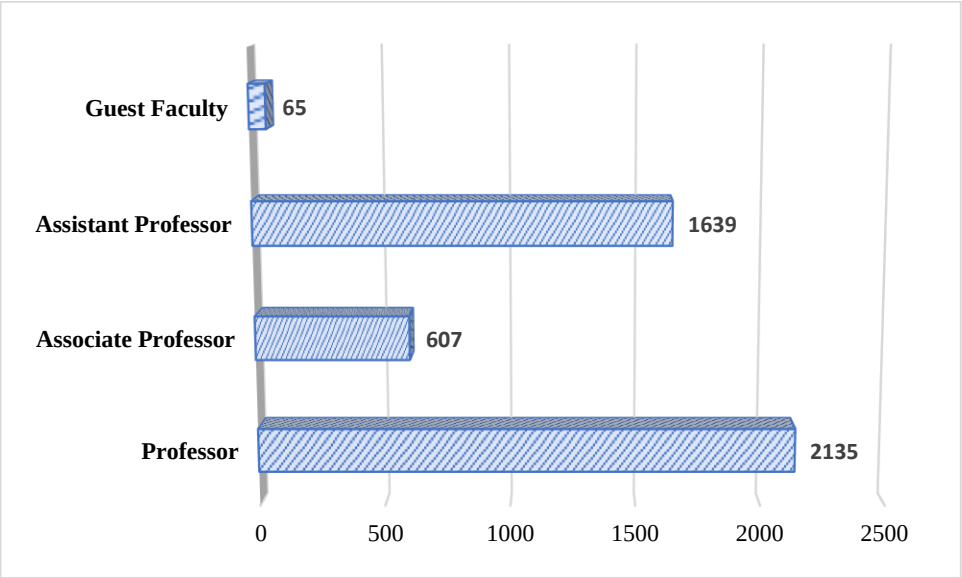

Figure 5.4: Distribution of Open Access (OA) Publications against Designation

5.6.3. Distribution of Publications per Designation

5.6.3. (a) Professor

Table 5.4 describes the distribution of scholarly publications for professors per university. A professor is a person with the highest academic rank in a university. Table 5.3 reveals the total number of professors of each university along with the total number of publications. It also gives out the number of open access publications produced by the professor of the designated central university. The overall selected central universities consist of 417 professors in total in various departments of each university where the central university NEHU has the highest number of professors with 82 which is followed by Tezpur University with 79 professors and Manipur University with 58 professors. However, in terms of the number of publications, Tezpur University stands out to be in the top position with 3829 publications followed by NEHU with 2269 publications. The top universities to have the highest open access publications among the professors are Tezpur University (571) followed by NEHU

(419) and Mizoram University (259). It is also seen that Sikkim University has the lowest number of professors (22) yet it has a good number of publications in both total publications (418) and open access publications (116). Nagaland University or Rajiv Gandhi University has a poor number of publications even after procuring a good number of professors compared to Sikkim University.

Table 5.4: Scholarly Publication Distribution of Professor

Sl. No.	Universities	Professor			
		No. of faculties	No. of Publication (Share)	No. of OA faculties	No. of OAP (Share)
1	AU	55	1403 (25.51)	33	281 (8.52)
2	MU	58	980 (16.90)	33	220 (6.67)
3	MZU	39	1191 (30.54)	25	259 (10.36)
4	NU	29	276 (9.52)	7	8 (1.14)
5	NEHU	82	2269 (27.67)	55	419 (7.62)
6	RGU	23	262 (11.39)	14	69 (4.93)
7	SKU	22	418 (19)	13	116 (8.92)
8	TZU	79	3829 (48.47)	61	571 (9.36)
9	TRU	30	933 (31.1)	23	200 (8.70)
Total		**417**	**11561 (27.72)**	**264**	**2143 (8.12)**

OA=Open Access
OAP= Open Access Publication

5.6.3. (b) Associate Professor

Table 5.5 reveals the distribution of associate professors along with their scholarly publications and open access publications. Associate professors are academic professionals with considerable teaching and research experiences in both universities and colleges. A total number of 160 associate professors are constituted in the nine central universities of North East India. Among 160 associate professors, NEHU has the maximum number of associate professors with 39 numbers followed by Mizoram University (27) and Tezpur University (24). In terms of scholarly publications, NEHU ranks top with 523 publications however, ranks second with regards to open access publications with 127 publications. Tezpur University becomes evident in second position for scholarly publications with 519 publications followed by Mizoram University (454) and Assam University (407). On the contrary, regarding open access

publications, Assam University has the maximum number of publications with 130 publications followed by NEHU (127) and Tezpur University (77). The special highlight remains on Nagaland University, which has the lowest number of associate professors (06) and its scholarly publication distribution (30) but has no associate faculties and publications in the open access category.

Table 5.5: Scholarly Publication Distribution of Associate Professor

Sl. No.	Universities	Associate Professor			
		No. of faculties	No. of Publication (Share)	No. of OA faculties	No. of OAP (Share)
1	AU	23	407 (17.7)	15	130 (8.67)
2	MU	15	201 (13.4)	8	35 (4.38)
3	MZU	27	454 (16.81)	18	72 (4)
4	NU	6	30 (5)	-	-
5	NEHU	39	523 (13.41)	22	127 (5.77)
6	RGU	7	59 (8.43)	2	21 (10.5)
7	SKU	9	166 (18.44)	5	46 (9.2)
8	TZU	24	519 (21.63)	14	77 (5.5)
9	TRU	10	217 (21.7)	8	70 (8.75)
Total		**160**	**2576 (16.1)**	**92**	**578 (6.28)**

OA=Open Access
OAP= Open Access Publication

5.6.3. (c) Assistant Professor

Table 5.6 shows the distribution of assistant professors among the selected central universities of North East India along with their dispensation of scholarly articles. Assistant Professors are the academicians often regarded as the initial stage of the academic rank in a university or college. Amongst 565 assistant professors of the central universities, Assam University levels up with 106 numbers of Assistant professors also with the maximum number of scholarly articles (1815) and open access publications (484). The second-ranked university is Tezpur University with 101 assistant professors distributing 1476 total publications and 333 open access publications. The third-ranked university is Mizoram University with 73 assistant professors enhancing 868 scholarly publications and 195 open access publications.

The university with the least number of assistant professors is Nagaland University with 32 numbers that produced 195 scholarly articles among which only 8 scholarly articles are published through open access platform.

Table 5.6: Scholarly Publication Distribution of Assistant Professor

Sl. No.	Universities	Assistant Professor			
		No. of faculties	No. of publication (Share)	No. of OA faculties	No. of OAP (Share)
1	AU	106	1815 (17.12)	71	484 (6.82)
2	MU	47	354 (7.53)	23	115 (5)
3	MZU	73	868 (11.89)	47	195 (4.15)
4	NU	32	195 (6.09)	4	8 (2)
5	NEHU	68	746 (10.97)	40	176 (4.4)
6	RGU	36	474 (13.17)	26	95 (3.65)
7	SKU	52	489 (9.4)	26	125 (4.81)
8	TZU	101	1476 (14.61)	63	333 (5.29)
9	TRU	50	689 (13.78)	34	108 (3.18)
Total		**565**	**7106 (12.58)**	**334**	**1639 (4.91)**

OA=Open Access
OAP= Open Access Publication

5.6.3. (d) Guest Faculty

Table 5.7 resembles the distribution of scholarly literature among the guest faculty associated with the selected central universities. Guest faculty or lecturers are the academic professionals as assistant professors in a university or college however on a contract basis. With a sum of 48 guest lecturers amongst all the undertaken central universities, Manipur University leads when compared to other universities with 20 guest lecturers giving out 103 scholarly publications. Among those 103 publications, 34 articles are published through open access publishing. Tripura University is the second lead to have the maximum number of guest lecturers in the university (8) yet lacks scholarly publications production than Tezpur University in the case of open access publications, in this category, this university has shown very poor performance. The highlight is that NEHU and Rajiv Gandhi University have nil guest lecturers meaning no publication in this category.

Table 5.7: Scholarly Publication Distribution of Guest Faculty

Sl. No.	University	Guest Lecturer			
		No. of faculties	No. of Publication (Share)	No. of OA faculties	No. of OAP (Share)
1	AU	1	6 (6)	0	0
2	MU	20	103 (5.15)	8	34 (4.25)
3	MZU	2	5 (2.5)	1	1 (1)
4	NU	3	26 (8.67)	1	2
5	NEHU	0	0	0	0
6	RGU	0	0	0	0
7	SKU	7	25 (3.57)	2	8 (4)
8	TZU	7	83 (11.86)	5	18 (3.6)
9	TRU	8	35 (4.38)	2	2 (1)
Total		**48**	**283 (5.9)**	**19**	**65 (3.42)**

OA=Open Access
OAP= Open Access Publication

5.7. Year-wise Distribution of Publications

5.7.1. Year-wise Distribution of Total Publications

Figure 5.5 demonstrates the year-wise distribution of scholarly publications of the undertaken central universities. The publication ratio starts from the year 1968 that is indexed in the Scopus database affiliated with North Eastern Hill University (NEHU). The publication graph was merely consistent until 1984, after 1985 the graph of publication started to inhibit dynamic growth. With a total scholarly publication of 18616, the year 2021 has reached the highest growth peak with 1898 publications followed by the year 2022 with 1725 publications and the year 2019 with 1580 articles. As seen in the figure, the trend of scholarly articles has taken a higher peak in recent years.

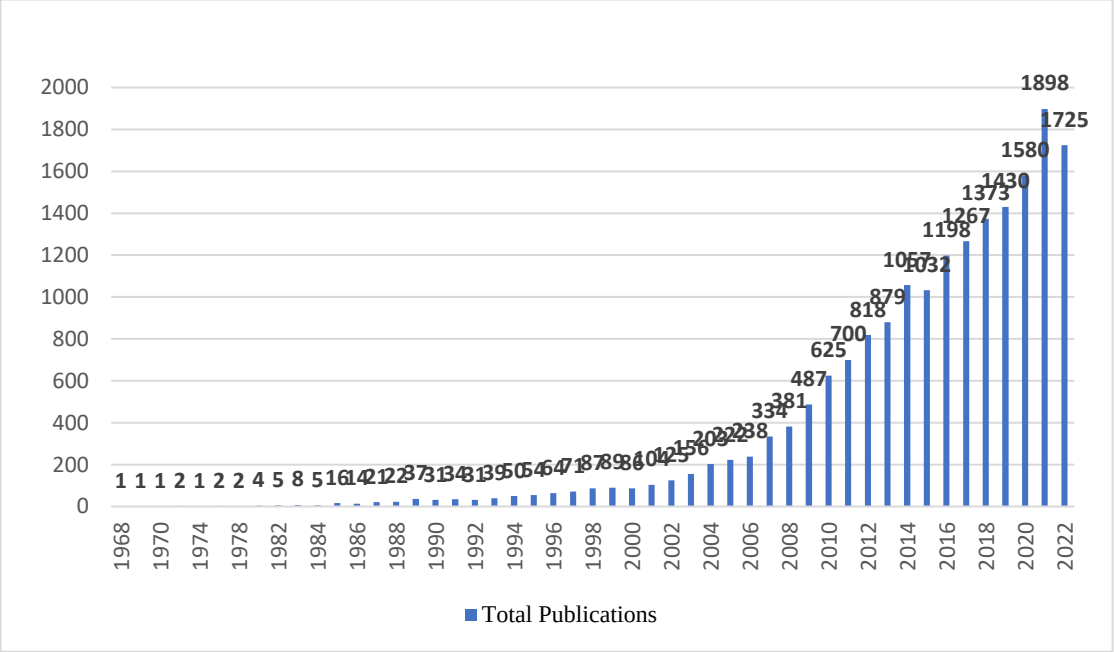

Figure 5.5: Year-wise Distribution of Total Publications

5.7.2. Year-wise Distribution of OA Publications

Figure 5.6 shows the year-wise distribution of open access publications of the selected central universities. The trendline for the open access publications has started from the year 1988 until 2022. It is seen that the open access publications have started to undertake right after twenty years of scholarly articles which was in 1968. The peak point having the highest open access publication was the year 2021 with 525 OA publications. The second most productive year was 2022 with 455 OA articles followed by year 2020 with 397 and year 2019 (334) even after being affected by the COVID-19 pandemic. The trend of open access publication is seen to be gradually increasing with time yet there is a has a huge gap to fill to be equivalent with overall scholarly articles.

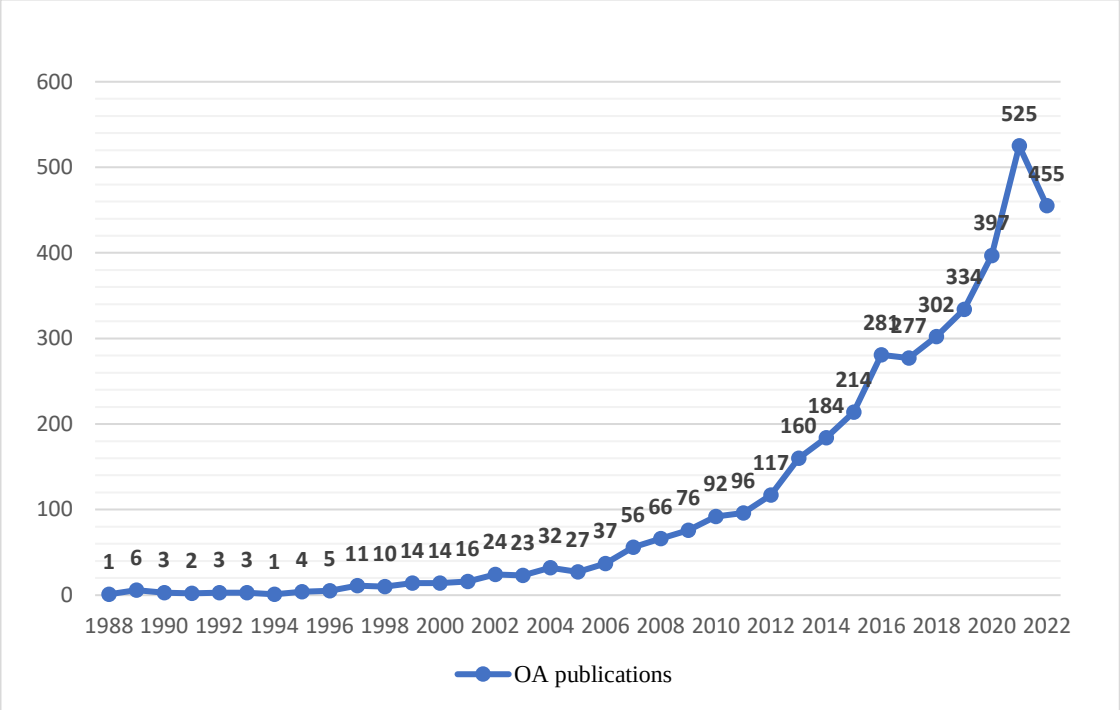

Figure 5.6: Year-wise Distribution of Open Access Publications

5.7.3. Year-wise Distribution of Publications per University

5.7.3. (a) Annual Publication of Assam University (AU)

Figure 5.7 represents the year-wise distribution of Assam University based on their total publication and OA publication. The two-lined graph displayed all two different distributions of publications published by the faculties of Assam University. As displayed in the figure, the publication indexed in the Scopus database started in the year 1989 with two numbers of publications. The scholarly publication had a linear growth trend up to the year 2001 but after 2002, the publication trend started to have dynamic growth. Regarding open access (OA) publications, the publication trend started in the year 1991 with one publication however with certain years of gap, the OA publication started its trend from 1997 yet the publication was constant for many years. However, the OA publications have undertaken dynamic growth since 2010. In the year 2021, both scholarly articles and OA publications were recorded to have the highest publication indexed with 316 and 114 articles respectively.

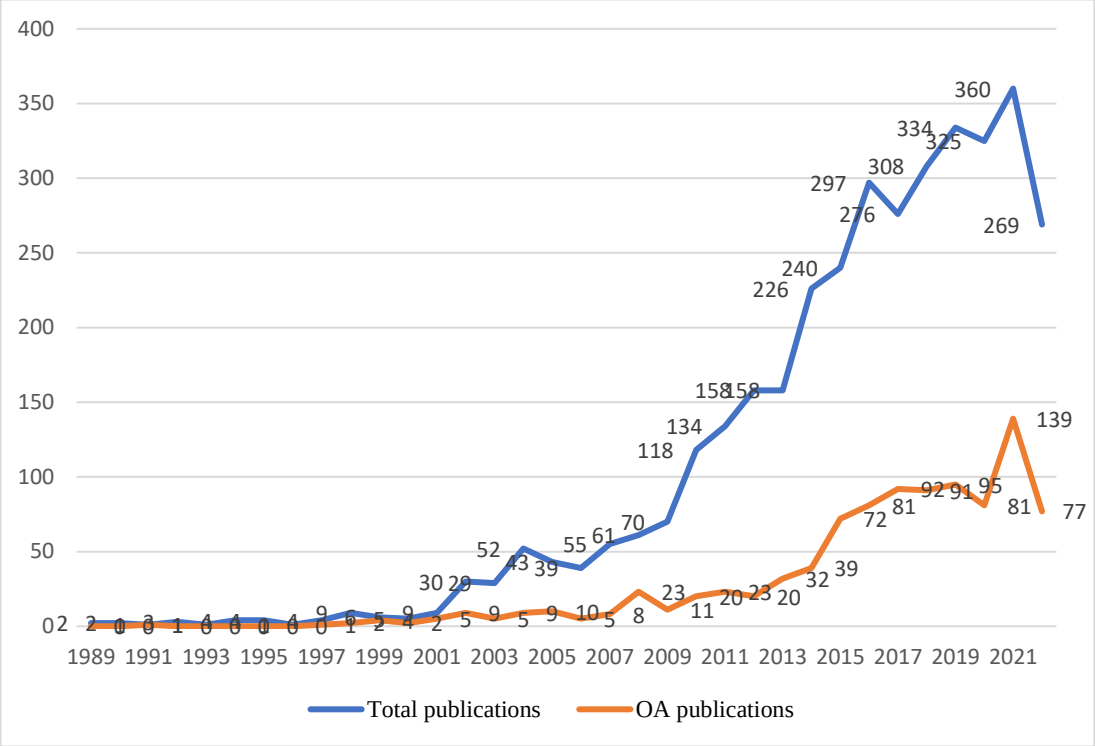

Figure 5.7: Year wise Distribution of Assam University

5.7.3. (b) Annual Publication of Manipur University (MU)

Figure 5.8 displays the year-wise distribution of Manipur University. As displayed in the figure, the two-lined graph indicates the total scholarly publications and open access publications published by the faculties of the university. In the Scopus database, the university initiated its first publication in the year 1977 with two publications however this is not the case with OA publications. The OA publication was first indexed in 1990 with one publication in this university. The publication extended its growth from year 2003 with 26 articles however for open access publication, the growth took up from the year 2013 with 27 articles. As seen in the publication trend of Assam University, the year with the highest indexed articles for both total and open access publications was the year 2021 with 112 and 37 articles respectively.

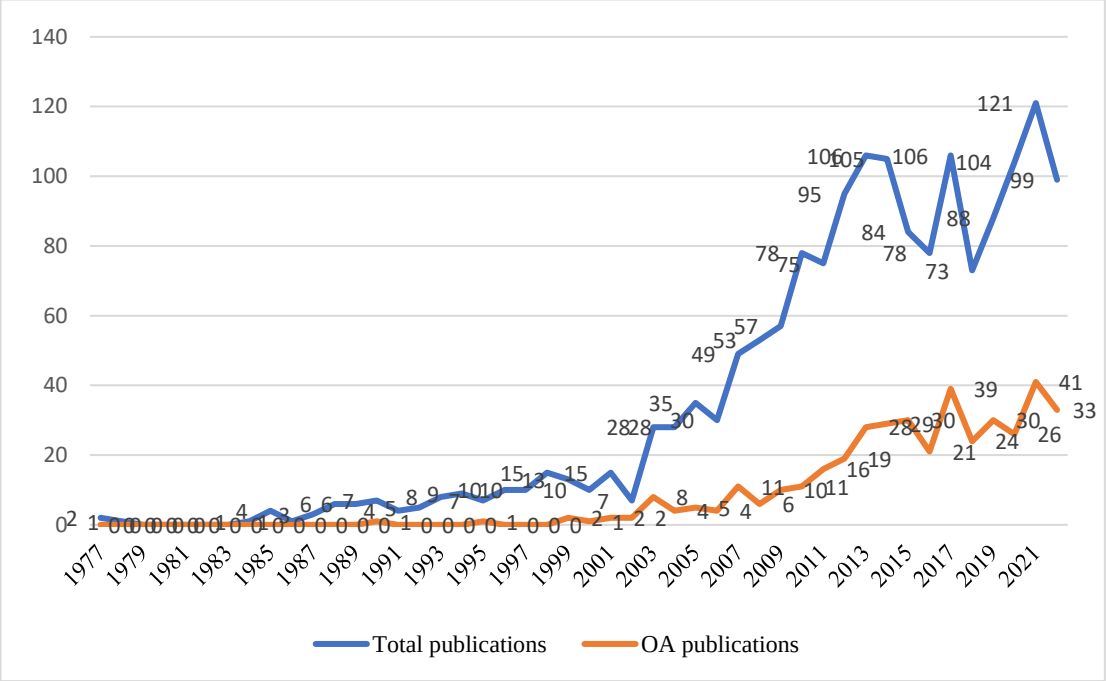

Figure 5.8: Year-wise Distribution of Manipur University

5.7.3. (c) Annual Publication of Mizoram University (MZU)

Figure 5.9 reveals the annual growth trend of both total publication and open access publication published by the faculties of Mizoram University. From the year 1987, the first article was indexed in the Scopus database however, for open access publication, the first article was indexed in 1998. The trend started to uptake growth in 2004; but for OA publications, from 2012 only, the number of OA articles started to increase with 13 articles. In 2021, both total and OA publications had the maximum number of publications with 333 articles and 79 articles respectively. The year with the second highest scholarly publication was 2020 with 252 articles but in terms of OA publications, the next highest OA publications are the year 2022 with 75 articles.

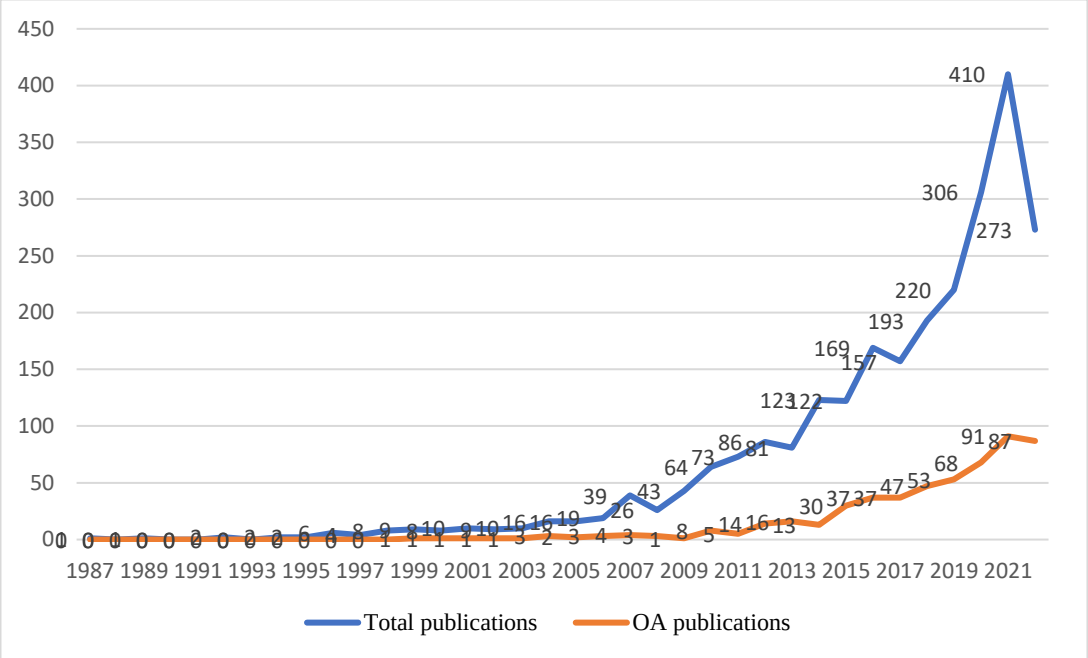

Figure 5.9: Year-wise Distribution of Mizoram University

5.7.3. (d) Annual Publication of Nagaland University (NU)

Figure 5.10 depicts the annual growth distribution of publications in Nagaland University published by the faculties of the university. As stated in figure 5.1, Nagaland University is the institution to have the lowest number of publications published by its faculties as compared to other undertaken central universities of North East India. The first article to be indexed in the Scopus database was in 1999, since then the number of publications had a constant growth but in 2010, the publication reached its peak with only 15 articles. After 2010, the next year to have the highest number of publications was 2017 with 13 articles. In terms of open access publications, the first article to be indexed was in 2001, yet the OA publications sometimes discontinued publishing any articles for certain years. However, the highest OA publication was in the year 2010 followed by 2017 with four and three publications respectively which is relatively lower than the other universities.

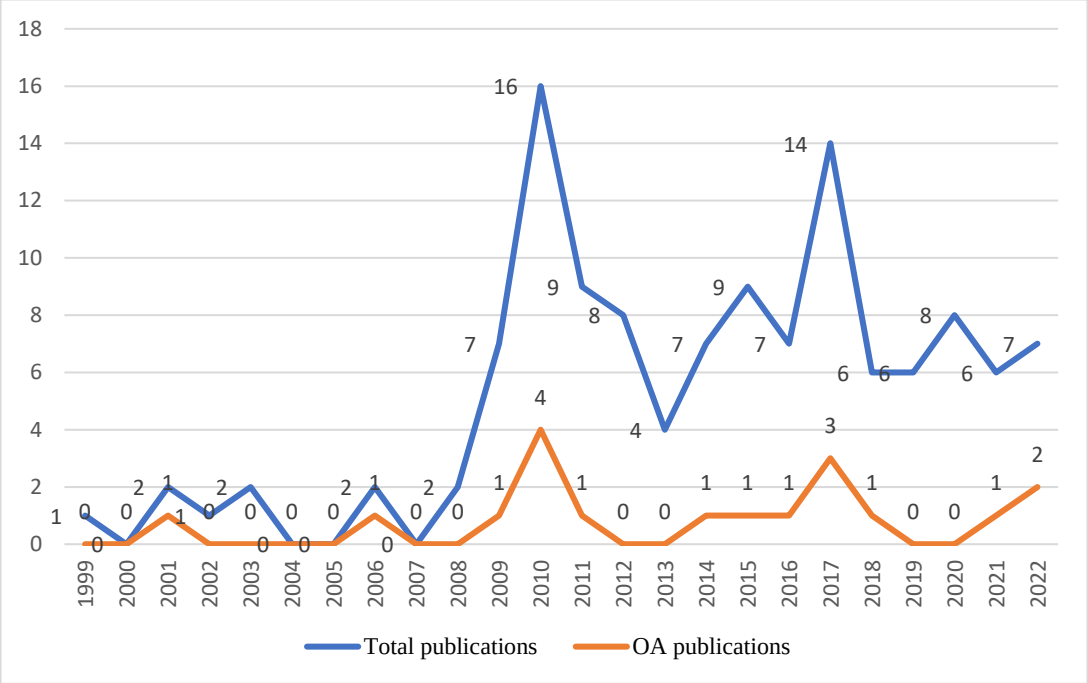

Figure 5.10: Year-wise Distribution of Nagaland University

5.7.3. (e) Annual Publication of North Eastern Hill University (NEHU)

Figure 5.11 shows the yearly growth distribution of North Eastern Hill University publications issued by the university's faculties. The two-lined graph in the illustration shows the total number of academic publications and open access articles produced by the university's faculties. NEHU is one of the top universities to publish articles in both total and open access platforms compared to the other selected central universities of North East India. The first article was listed in the Scopus database starting in 1968, but it was not until 1988 that it was indexed for open access publications. The publication continued its expansion from the year 1993 with 20 articles, but for open access publications, the growth increased from the year 2009 with 16 articles. 2021 was the year with most publications with 296 papers and 79 articles in total publication and open access publications respectively.

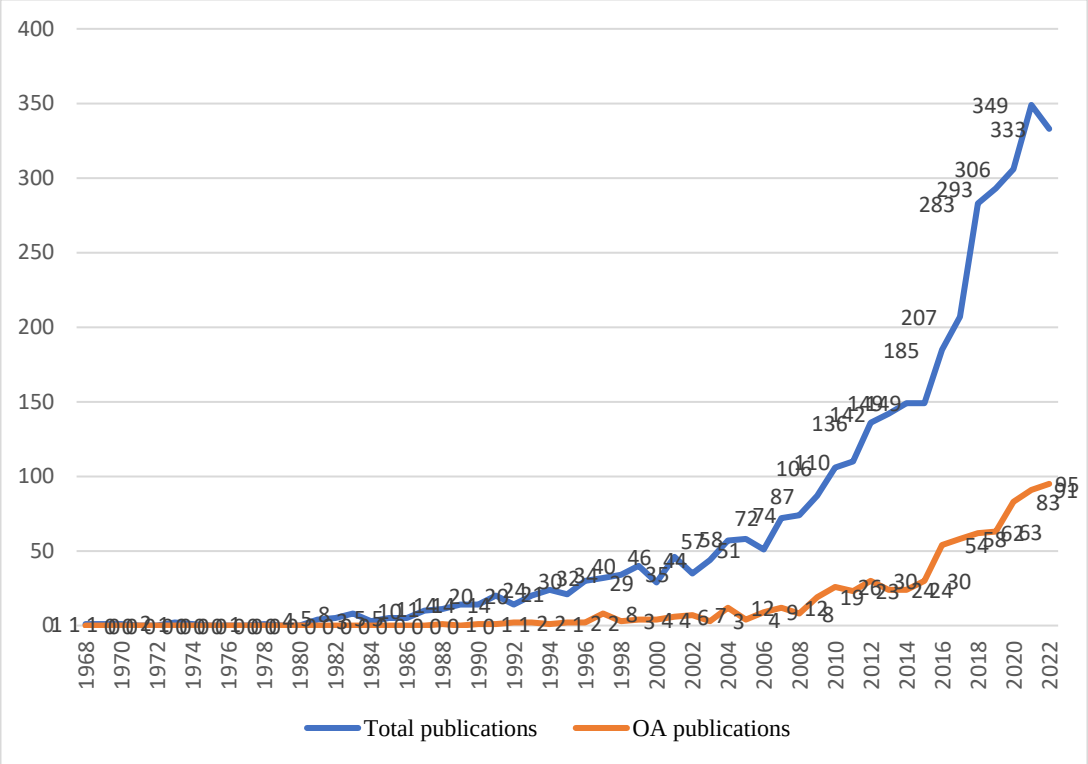

Figure 5.11: Year-wise Distribution of North Eastern Hill University (NEHU)

5.7.3. (f) Annual Publication of Rajiv Gandhi University (RGU)

The annual growth ratio of the faculty-published works at Rajiv Gandhi University is depicted in Figure 5.12. The university publication began from the year 1985. From that year up to 2006, the total publication of the university had a persistent growth from 1-10 articles. But from the year 2007, the academic publications of the university started to increase gradually from 11 to 92 in terms of total publications. However, for open access publications, the faculties commenced articles in the OA platform in 1989 yet its regularity of published articles was not maintained. As seen in the graph, it can be highlighted that there is a huge gap between the total and open access publications. Unlike other universities, the top publishing year was 2022 for both total and open access publications with 92 and 31 academic articles respectively.

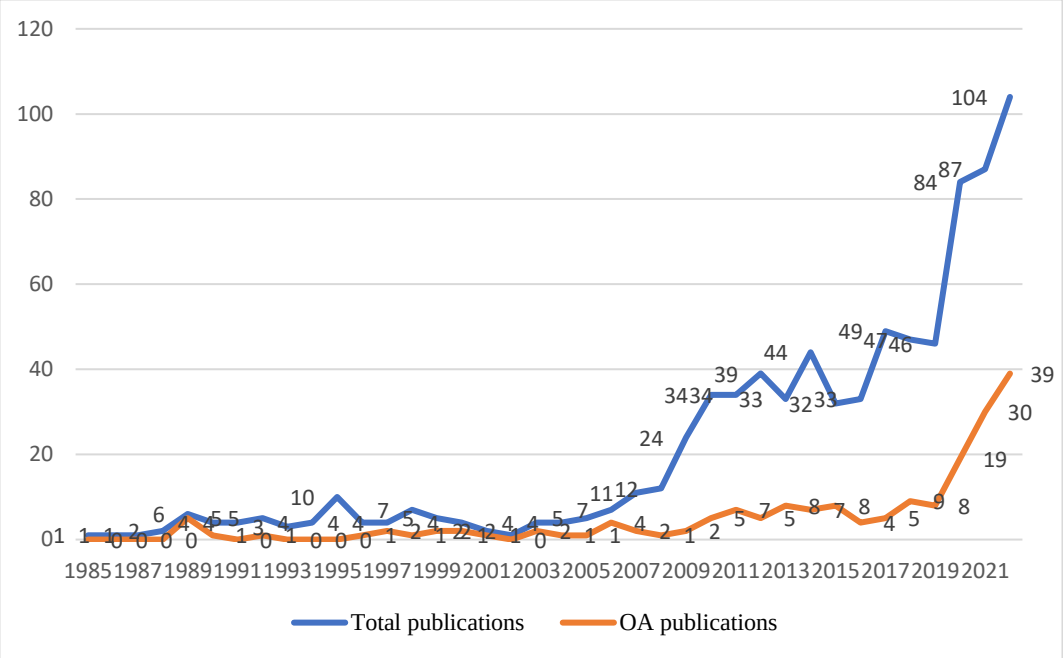

Figure 5.12: Year-wise Distribution of Rajiv Gandhi University

5.7.3. (g) Annual Publication of Sikkim University (SKU)

The yearly growth trend of the faculty members of Sikkim University's total papers and open access articles is shown in figure 5.13. Since 1988, the university publication has been in existence. The total number of publications published by the institution increased steadily from the initial year to 2005. The faculties started publishing articles in the OA platform in 1993 for open access papers, but the frequency of the articles was not up to mark. In terms of overall publications and open access publications, 2021 had the greatest quantity of publications with 125 articles and 42 papers, accordingly. The next-highest number of scientific publications was in the year 2022 with 118 articles for total publication whereas 38 papers were for open access publications. The graph makes clear that there is a significant difference between total and open access articles.

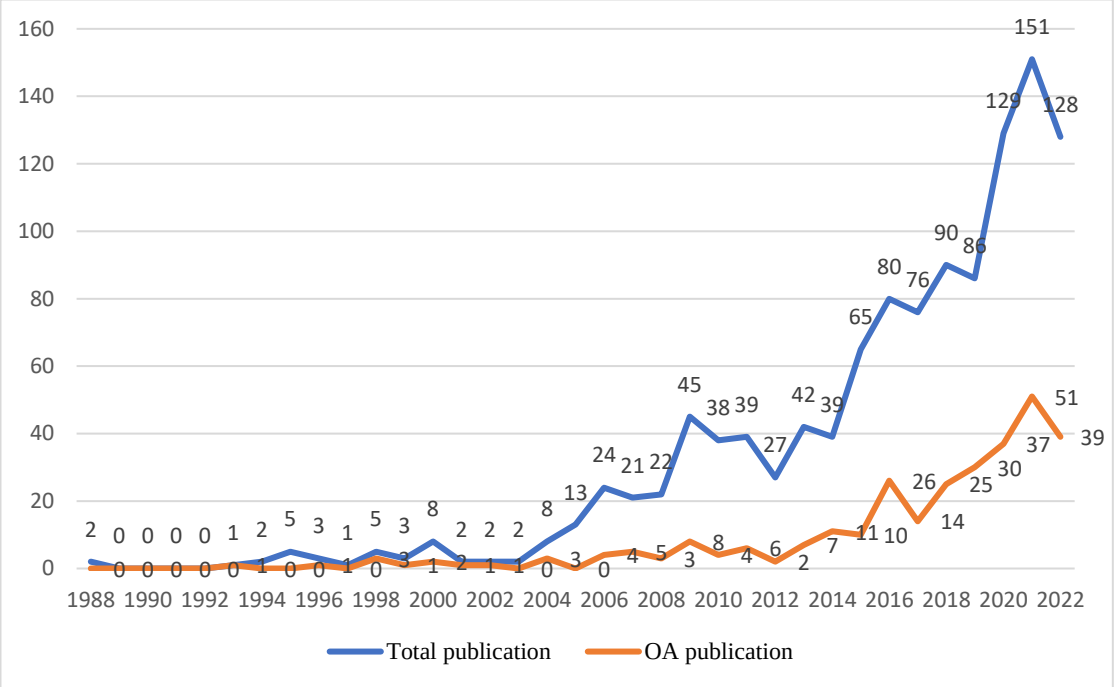

Figure 5.13: Year-wise Distribution of Sikkim University

5.7.3. (h) Annual Publication of Tezpur University (TU)

Figure 5.14. represents the yearly publishing and open access publication distribution of Tezpur University. The two-lined graph in the illustration reflects the number of academic publications and open access publications that the university's faculty have collectively produced. When examined alongside with other North East Indian central institutions that have been chosen for the study, Tezpur University is the highest-ranked university for publishing papers in both total and open access platforms. The initially submitted article was presented in the Scopus database in 1985, but it was not until 2000 that articles were listed for open access publishing. Beginning in 2000, the university's academic publications progressively increased from 16 to 507 in terms of total publishing. The maximum number of publications in total publications was seen in 2022 i.e., 507 articles whereas for open access publishing, the highest quantity of articles was in 2021 with 120 papers.

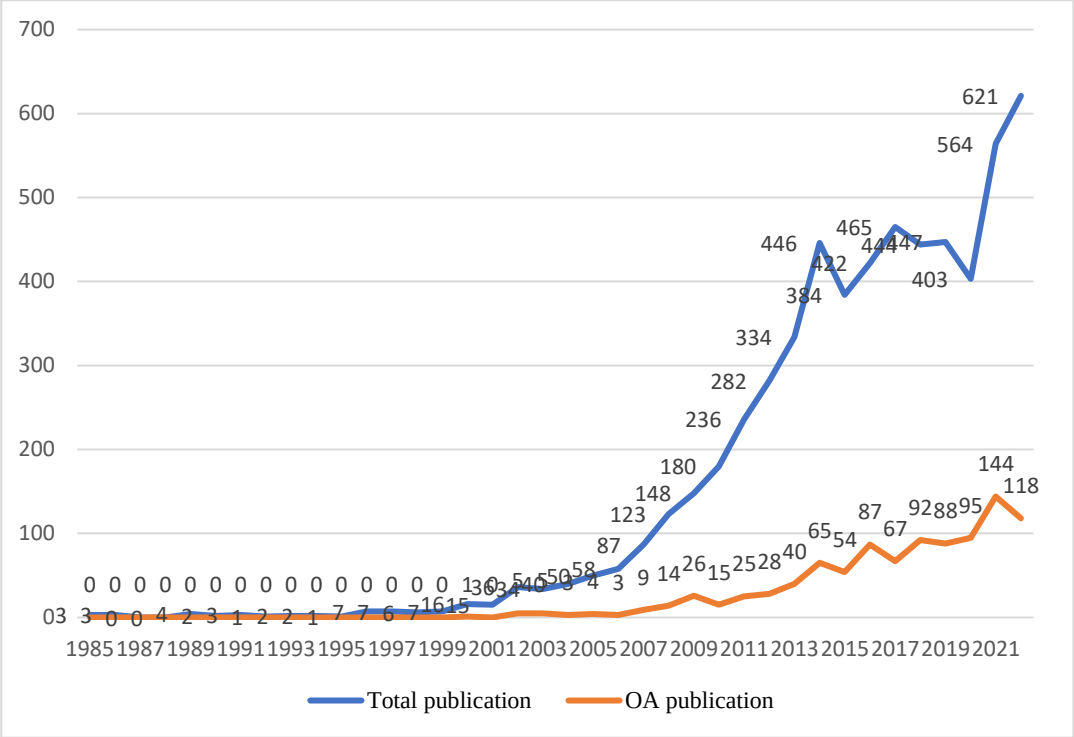

Figure 5.14: Year-wise Distribution of Tezpur University

5.7.3. (i) Annual Publication of Tripura University (TRU)

Figure 5.15 displays the annual growth trend of the total papers and open access articles written by academic members at Tripura University. The first issue indexed in the Scopus database began in 1984 followed by 1985 with one and three numbers of papers. In 1989, the faculties began releasing articles on the OA platform although the publications' frequency lagged below expectations. 2022 ranks as the highest publishing year for both total and open access publications with 187 and 41 academic papers in each case. The graph makes clear the stark disparity between the overall number of articles and those that are in open access platform.

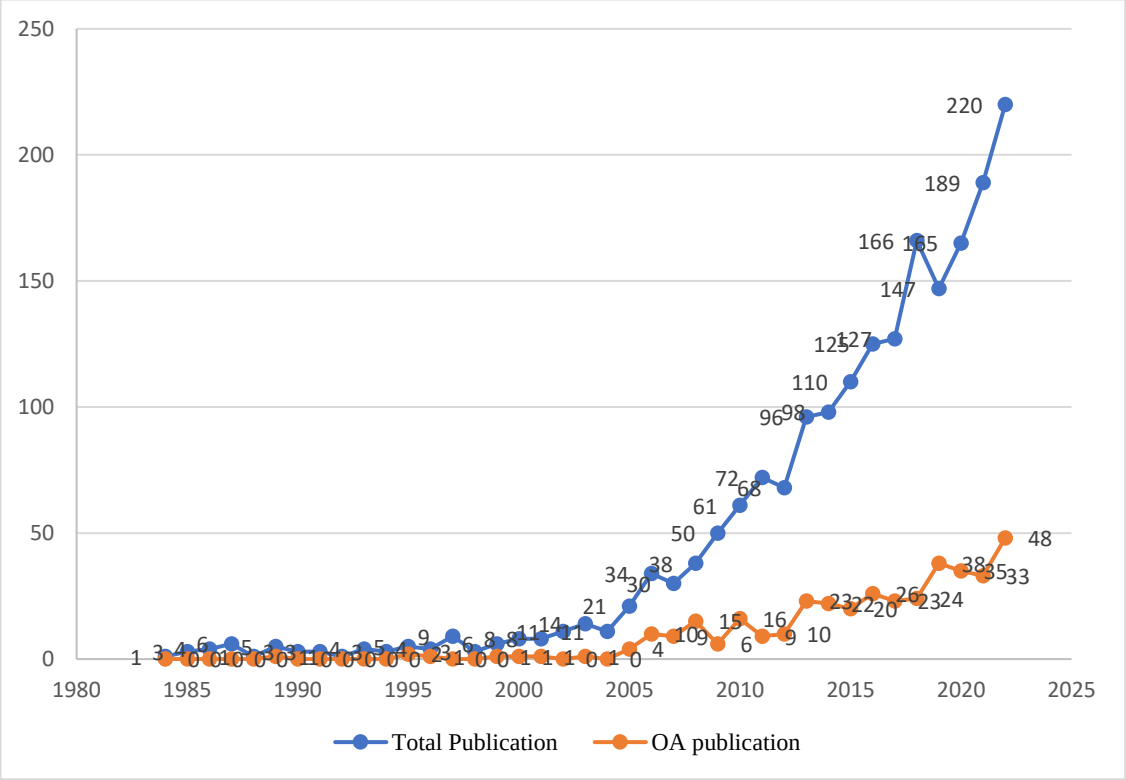

Figure 5.15: Year-wise Distribution of Tripura University

5.8. Gender-wise Distribution

5.8.1. Overall Distribution of Gender

Figure 5.16 displays the overall proportion of faculty members by gender of the undertaken central university of North Eastern University. According to WHO, the socially created qualities of men, women, girls, and boys are referred to as gender. In research organizations and higher education institutions, men and women fill a variety of responsibilities, including performing research, teaching, managing employees and structures, or putting processes into place. Therefore, this study tries to identify the variation of gender in terms of research activities and publications. As shown in the chart, the male gender has clearly outnumbered the female gender in the selected central universities. The Female faculty account for just 22.18% of these universities, while male faculty constitute about 77.82%.

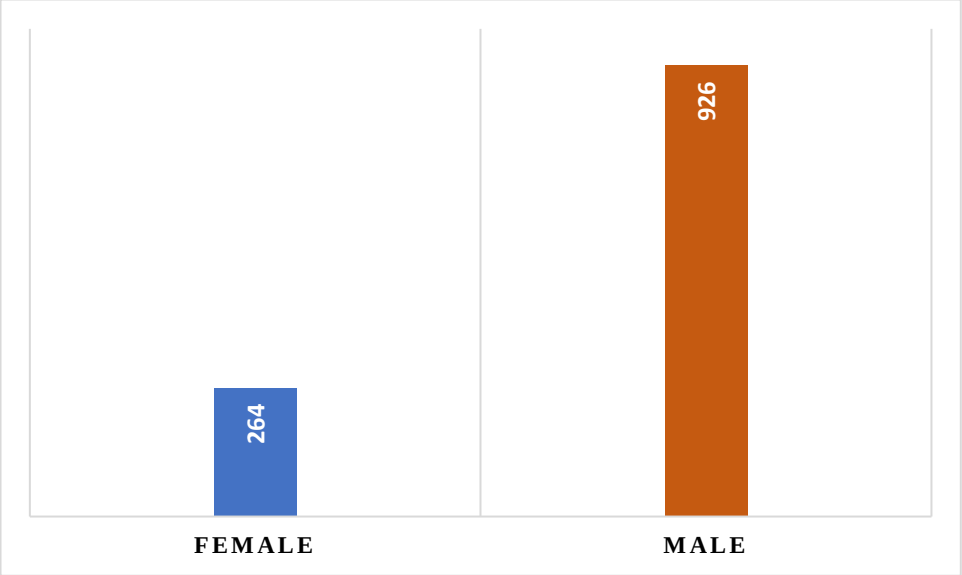

Figure 5.16: Overall Gender wise Faculty Distribution

5.8.2. Faculty Distribution of Gender per University

Figure 5.17 represents gender distribution among faculty members per university. The figure describes the variation of male and female faculties of each university. It is seen that each university has more male faculty than female faculty. Mizoram University has the greatest percentage of male faculty (82.98%) while also having the lowest percentage of female faculty (17.02%). Tripura University is the next university with the highest percentage of male faculty (80.61%) and the lowest percentage of female faculty (19.39%). The university to have the maximum percentage of female faculties is Nagaland University with 28.57% which is followed by Manipur University (25.71%) and Sikkim University (25.56%). The number of female faculties in all universities is relatively very low compared to male faculty. Therefore, the universities ought to motivate females to actively engage in and be an integral component of the academic atmosphere.

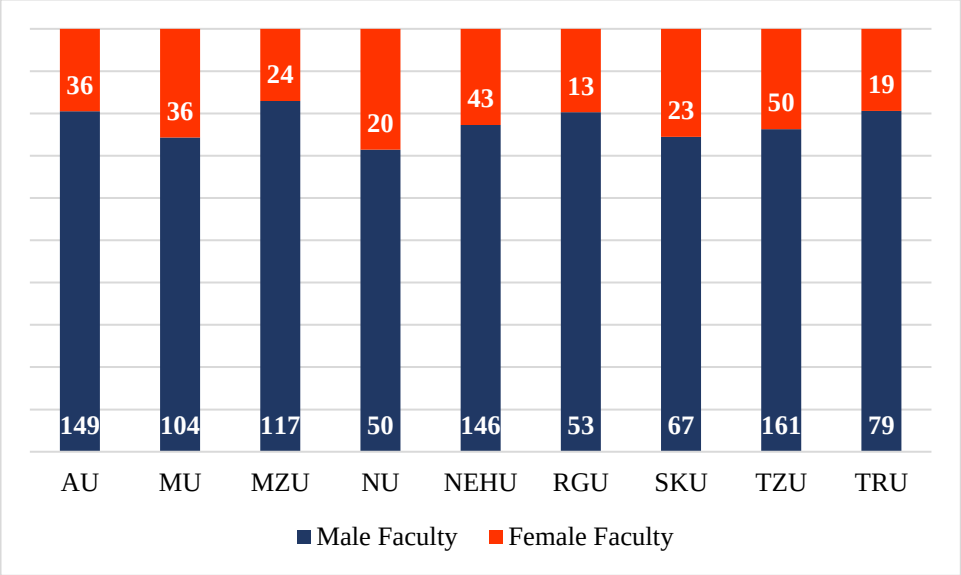

Figure 5.17: Faculty Distribution of Gender per University

5.8.3. Gender-wise Distribution of both Total and OA publications

Figure 5.18 depicts the publication details of total and OA publications for both male and female faculties of the undertaken central university. Since the number of female faculty at the selected universities is low. As a result, the number of publications published by female academics is low. The articles generated by male academics are excellent since the institution selected has a large number of male academicians. The overall number of documents produced by male faculty members is 18961 articles, whereas female academics have created 2565 papers. In regards to open access publishing, the overall number of open access publications included in the Scopus database by male academics of the participating institutions is 3825 articles, meanwhile, female faculties have generated 600 papers. However, female faculties had a higher proportion (share) of open access papers (23.39%) than male faculties (20.17%).

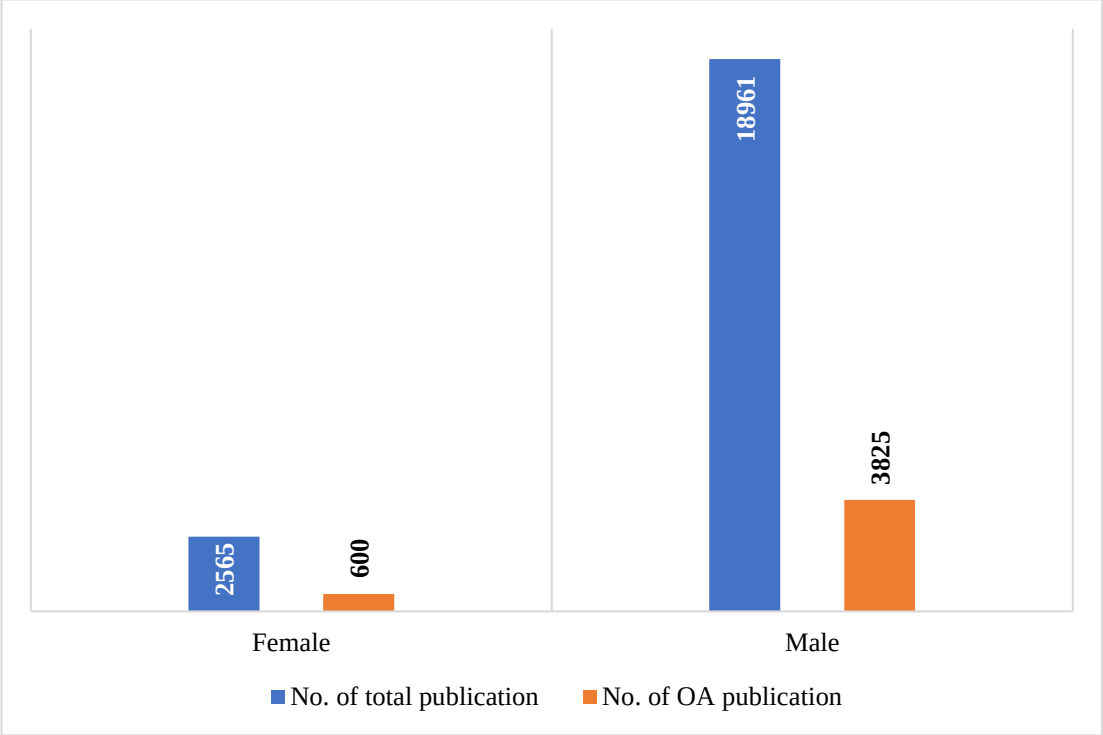

Figure 5.18: Gender-wise Distribution of both Total and OA Publications

5.8.4. Gender-wise Distribution of Total Publications per University

Figure 5.19 demonstrates the variation of total publication and open access publications of both male and female academicians of the undertaken central universities. The male faculty of Tezpur University has produced the most publications with 5184 papers which are followed by North Eastern Hill University and Assam University with 3170 and 3053 articles respectively. Howbeit, male faculties of Nagaland University and Rajiv Gandhi University have the least number of articles with 414 and 712 articles respectively compared to other undertaken central universities. In regards to female faculties publications, again Tezpur University has the maximum publications with 723 articles which is trailed by Assam University with 578 and North Eastern Hill University with 368 articles. The female academics of Sikkim University (74), Rajiv Gandhi University (83) and Tripura University (101) are the lowest performers in terms of overall publications. The female faculties need to focus more on research activities and publications to accomplish an equilibrium position in these universities.

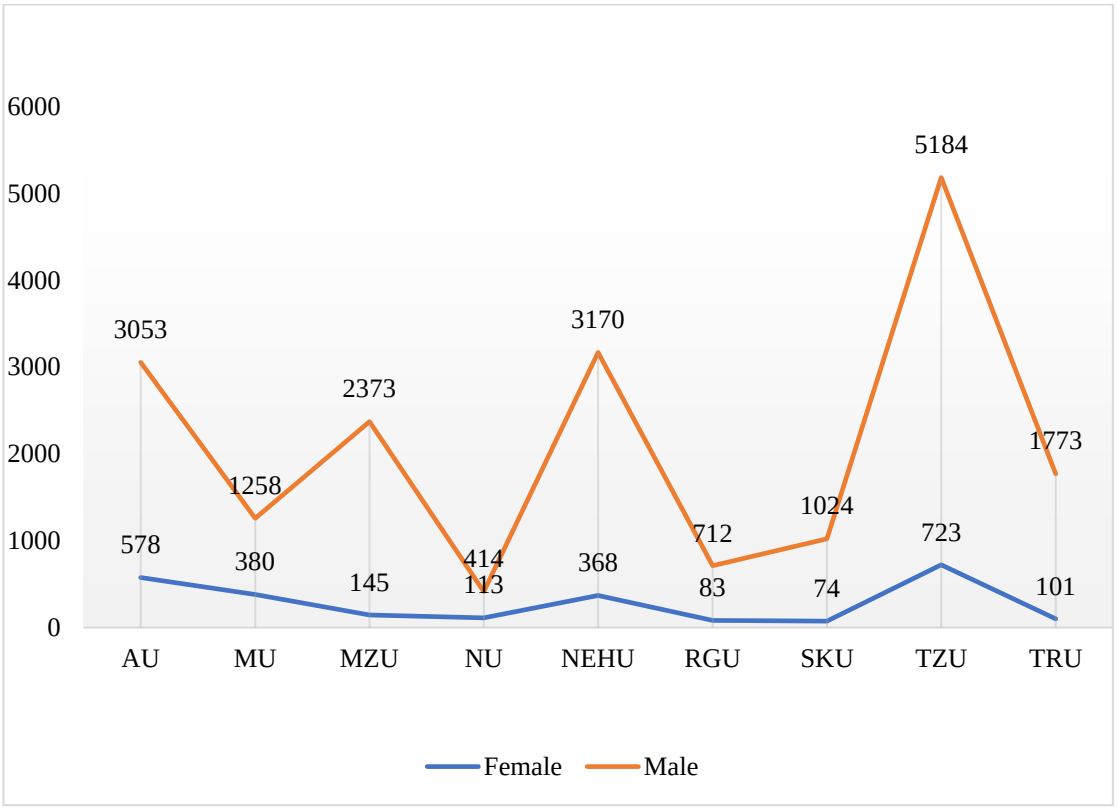

Figure 5.19: Gender-wise Distribution of Total Publications per University

5.8.5. Gender-wise Distribution of OA Publications per University

Figure 5.20 reveals the open access publication variants of the male and female academicians amongst the chosen universities for the study. Based on the number of open access publications, the female academicians of Assam University generated the most publications with 197 articles which is then tailed by Tezpur University with 145 papers and North Eastern Hill University with 85 publications. The female faculty of Nagaland University and Sikkim University produced the tiniest quantity of open access papers when rivalled with other universities. In case of male academe, Tezpur University stands out amongst all undertaken central universities bearing 854 open access articles which is then followed by Assam University (698 OA papers) and North Eastern Hill University (637 papers). Nagaland University is the minimal producer of open access publications with regards to both male (16 OA articles) and female (02 OA articles) academe.

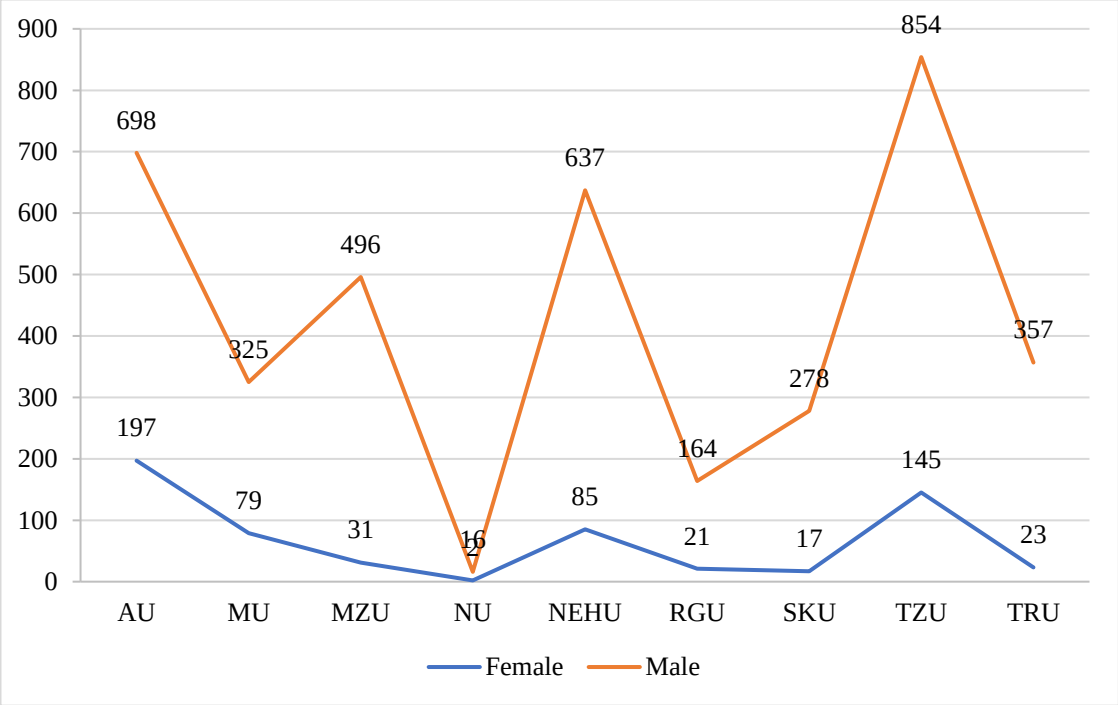

Figure 5.20: Gender-wise Distribution of Open Access Publications per University

5.9. Department wise Distribution

5.9.1. Overall department-wise Distribution of Faculty

Table 5.8 represents the faculty distribution across the departments of the undertaken central universities for the study. Altogether, there are a total of 121 numbers of departments in the undertaken central universities. Within those departments, the distribution of faculties of each university is different. The below table signifies the sum of the number of faculties of every selected university. The Department of Physics has the maximum number of faculties altogether with 76 academies including both male and female academies. The second highest department to have the maximum faculty is Chemistry with 65 faculty which was then trailed by the Department of Botany (45) Zoology (45); and Computer Science & Engineering (41). Mainly the Department of Natural Sciences and Biological Sciences have more numbers of faculty members when compared to the Departments of Social Sciences or Humanities. The departments with the least number of faculty members are the ones that are unique like departments of different languages like Limbu, Mizo, Nepali; Physical Education; Yoga; Music; and many more.

Table 5.8: Overall Department-wise Distribution of Faculty

Department	No. of Faculty	Department	No. of Faculty	Department	No. of Faculty
Agri-Business Management and Food Technology	1	Energy Engineering	2	Mathematical Sciences	13
Agricultural Chemistry & Soil Science	1	English	29	Mathematics	33
Agricultural Economics	2	English and Cultural Studies	1	Mathematics and Computer Science	6
Agricultural Engineering	8	Entomology	3	Mechanical Engineering	16
Agricultural Extension	1	Environmental Science	20	Medical & Paramedical Sciences	1
Agricultural Sciences	1	Environmental Studies	4	Microbiology	13
Agronomy	1	Extension Education and Rural Development	1	MIMS-Management Studies	1
Anthropology	27	Food Engineering and Technology	10	Mizo	2
Applied Science	9	Food Technology	1	Molecular Biology and Bioinformatic	1
Applied Science and Humanities	3	Foreign Languages	2	Molecular Biology and Biotechnology	15
Assamese	1	Forestry	10	Music	1
Basic Sciences & Social Science	11	Forestry and Biodiversity	3	Nanotechnology	2
Bengali	1	Forestry Environmental Science	8	National Security Studies	2
Biochemistry	13	Genetics and Plant Breeding	1	NEPALI	1
Biomedical Engineering	7	Geography	28	Neuroscience	1
Biotechnology	25	Geography and Disaster Management	5	Peace And Conflict Studies	3
Biotechnology & Bioinformatics	5	Geography and Resource Management	10	Physical Education	1
Botany	45	Geology	11	Pharmaceutical Science	11
Business Administration	18	History	15	Pharmacy	3

Business Management	5	History & Archaeology	5	Philosophy	6
Chemical and Polymer Engineering	2	History and Ethnography	1	Physical Education & Sports Science	1
Chemical Sciences	18	Horticulture	17	Physics	76
Chemistry	65	Horticulture, Aromatic & Medicine	4	Planning & Architecture	2
Civil Engineering	15	Hospitality & Tourism Management	2	Plant Pathology	4
Commerce	30	Human Physiology	4	Political Science	12
Computer Applications	9	Indian Comparative Literature D	1	Psychology	8
Computer Engineering	3	Industrial Chemistry	5	Rural Development and Agriculture	4
Computer Science	21	Information Technology	23	Rural Development and Planning	1
Computer Science & Engineering	41	Journalism and Mass Communication	3	Rural Studies	2
Cultural Studies	5	Law	10	Social Work	12
Dance (Manipuri)	1	Library & Information Science	20	Sociology	21
Earth Science	10	Life Science & Bioinformatic	17	South East Asian Studies	1
Ecology & Environmental Science	6	Limbu	1	Statistics	12
Economics	38	Linguistics	7	Teacher Education	2
Education	12	Linguistics and Language Technology	3	Tourism	1
Educational Science	8	Livestock Production and Management	3	Tourism & Hospitality Management	1
Electrical Engineering	12	Management	12	Tourism and Hotel Management	3
Electronics & Communication Engineering	38	Mass Communication	5	Tribal Studies	4

Electronics & Telecommunication	4	Mass Communication and Journalism	2	Yoga	3
Energy	8	Material Science and Engineering	2	Zoology	45
		Materials Science	1	**Total**	**1190**

5.9.2. Department-wise Distribution of overall Total and OA publications

Table 5.9 explains the complete distribution of total publications and open access publications along with the share amount of open access publications towards the total publications of each department. The undertaken central universities have 121 variations of departments which have a vast dispersal of publications generated by the faculties indexed in the Scopus database varying in both total and OA publishing. As represented in the table, the department to produce the highest quantity of papers with regards to both total and OA publication is the Physics department with 2686 papers and 700 papers respectively. The next department to have the maximum number of total publications and OA publications is Chemistry with 2507 and 302 papers respectively. The following top department to have high publication is Chemical Sciences and Electronics & Communication Engineering with 1535 and 1119 publications respectively. While for open access publications, the next top departments are Biotechnology (284), Zoology (230), Life Sciences (228), Botany (198) and many more. In case of open access publications shared from the total publications, the department such as Assamese, Dance (Manipuri), Music, History and Ethnography, Genetics and Plant Breeding and Physical Education & Sports Science are the ones with the least number of publications have the 100 per cent share ratio of open access publication. Rather than that Yoga is the department with 65.63 per cent of the OA share followed by the Education department with 57.69 per cent.

Table 5.9: Department-wise Distribution of Overall Total and OA Publications

Sl. No.	Department	No. of Total Publications	No. of OA Publications	OA Share (%)
1	Physics	2686	700	26.06
2	Chemistry	2507	302	12.05
3	Biotechnology	813	284	34.93
4	Zoology	861	230	26.71
5	Life Science & Bioinformatics	666	228	34.23
6	Botany	845	198	23.43
7	Microbiology	441	188	42.63
8	Molecular Biology and Biotechnology	565	176	31.15
9	Mathematics	385	140	36.36
10	Computer Science & Engineering	1029	127	12.34
11	Electronics & Communication Engineering	1119	105	9.38
12	Chemical Sciences	1535	102	6.64
13	Food Engineering and Technology	373	101	27.08
14	Biochemistry	266	96	36.09
15	Mathematical Sciences	220	92	41.82
16	Environmental Science	429	83	19.35
17	Pharmaceutical Science	310	83	26.77
18	Biotechnology & Bioinformatics	254	75	29.53
19	Information Technology	400	59	14.75
20	Biomedical Engineering	216	53	24.54
21	Energy	319	52	16.30
22	Basic Sciences & Social Science	153	52	33.99
23	Anthropology	195	51	26.15
24	Applied Science	158	48	30.38
25	Forestry	206	41	19.90
26	Ecology & Environmental Science	169	41	24.26
27	Economics	288	40	13.89
28	Geography	168	39	23.21
29	English	86	35	40.70
30	Computer Applications	193	30	15.54
31	Statistics	95	27	28.42
32	Electrical Engineering	238	26	10.92
33	Human Physiology	97	26	26.80

34	Mechanical Engineering	268	25	9.33
35	Computer Science	189	24	12.70
36	Commerce	186	23	12.37
37	Horticulture, Aromatic & Medicine	116	23	19.83
38	Applied Science and Humanities	90	22	24.44
39	Yoga	32	21	65.63
40	Horticulture	98	20	20.41
41	Geology	115	19	16.52
42	Molecular Biology and Bioinformatic	64	19	29.69
43	Pharmacy	53	18	33.96
44	Industrial Chemistry	93	16	17.20
45	Education	26	15	57.69
46	Agricultural Engineering	98	14	14.29
47	Library & Information Science	126	13	10.32
48	Earth Science	113	13	11.50
49	Forestry and Biodiversity	75	13	17.33
50	Mathematics and Computer Science	68	13	19.12
51	Forestry Environmental Science	62	13	20.97
52	Psychology	35	13	37.14
53	Geography and Resource Management	136	10	7.35
54	Environmental Studies	37	9	24.32
55	Energy Engineering	29	9	31.03
56	Electronics & Telecommunication	104	8	7.69
57	Material Science and Engineering	70	8	11.43
58	Food Technology	28	8	28.57
59	Management	48	7	14.58
60	Nanotechnology	46	7	15.22
61	Linguistics and Language Technology	17	7	41.18
62	Geography and Disaster Management	16	7	43.75
63	Civil Engineering	91	6	6.59
64	Educational Science	71	5	7.04
65	Business Management	40	5	12.50
66	Rural Development and Agriculture	37	5	13.51

67	Tourism and Hotel Management	32	5	15.63
68	Agri-Business Management and Food Technology	14	4	28.57
69	Mass Communication and Journalism	8	4	50.00
70	Business Administration	47	3	6.38
71	Sociology	45	3	6.67
72	Social Work	35	3	8.57
73	Cultural Studies	17	3	17.65
74	Plant Pathology	9	3	33.33
75	Rural Studies	6	3	50.00
76	Medical & Paramedical Sciences	6	3	50.00
77	History	60	2	3.33
78	Computer Engineering	46	2	4.35
79	Chemical and Polymer Engineering	19	2	10.53
80	Hospitality & Tourism Management	4	2	50.00
81	History and Ethnography	1	2	200.00
82	Political Science	31	1	3.23
83	Livestock Production and Management	22	1	4.55
84	Tourism & Hospitality Management	13	1	7.69
85	Mass Communication	11	1	9.09
86	Agricultural Economics	11	1	9.09
87	Tourism	3	1	33.33
88	Teacher Education	2	1	50.00
89	Indian Comparative Literature D	2	1	50.00
90	Assamese	1	1	100.00
91	Dance (Manipuri)	1	1	100.00
92	Genetics and Plant Breeding	1	1	100.00
93	Music	1	1	100.00
94	Physical Edu & Sports Sc	1	1	100.00
95	Law	14	0	0.00
96	Linguistics	11	0	0.00
97	Philosophy	11	0	0.00
98	History & Archaeology	10	0	0.00
99	Tribal Studies	10	0	0.00
100	Bengali	6	0	0.00
101	Agricultural Chemistry & Soil Science	5	0	0.00

102	Entomology	4	0	0.00
103	Peace and Conflict Studies And	4	0	0.00
104	Extension Education and Rural Development	4	0	0.00
105	Journalism and Mass Communication	3	0	0.00
106	Foreign Languages	3	0	0.00
107	Agricultural Extension	3	0	0.00
108	Agronomy	3	0	0.00
109	Mims-Management Studies	3	0	0.00
110	South East Asian Studies	3	0	0.00
111	Mizo	2	0	0.00
112	National Security Studies	2	0	0.00
113	Planning & Architecture	2	0	0.00
114	Agricultural Sciences	2	0	0.00
115	Limbu	2	0	0.00
116	Materials Science	2	0	0.00
117	Rural Development and Planning	2	0	0.00
118	English and Cultural Studies	1	0	0.00
119	Nepali	1	0	0.00
120	Neuroscience	1	0	0.00
121	Physical Education	1	0	0.00
Total		**21526**	**4425**	**20.56**

5.9.3. Department-wise Distribution of Publications per University

5.9.3. (a) Department-wise Distribution of Publications of Assam University

Figure 5.21 reveals the distribution of total and open access publications along with the number of faculty of Assam University. According to the Scopus database, Assam University has indexed a total of 35 departments within which the Department of Life Science has the maximum number of faculties (17) and simultaneously produces the maximum quantity of total publications and open access publications with 666 and 228 papers respectively. The Department of Chemistry is the next department to produce the second maximum amount of total publications with 441 papers followed by the Department of Physics and Biotechnology with 398 and 329 articles respectively. As for open access publications, the departments to generate the highest publications after the Life Science Department are Physics (149), Microbiology (116),

Biotechnology (84), Pharmaceutical Science (83), Ecology and Environmental Science (41), etc. It is very much appreciable to the Department of Biotechnology which has generated 329 publications only with five faculty members.

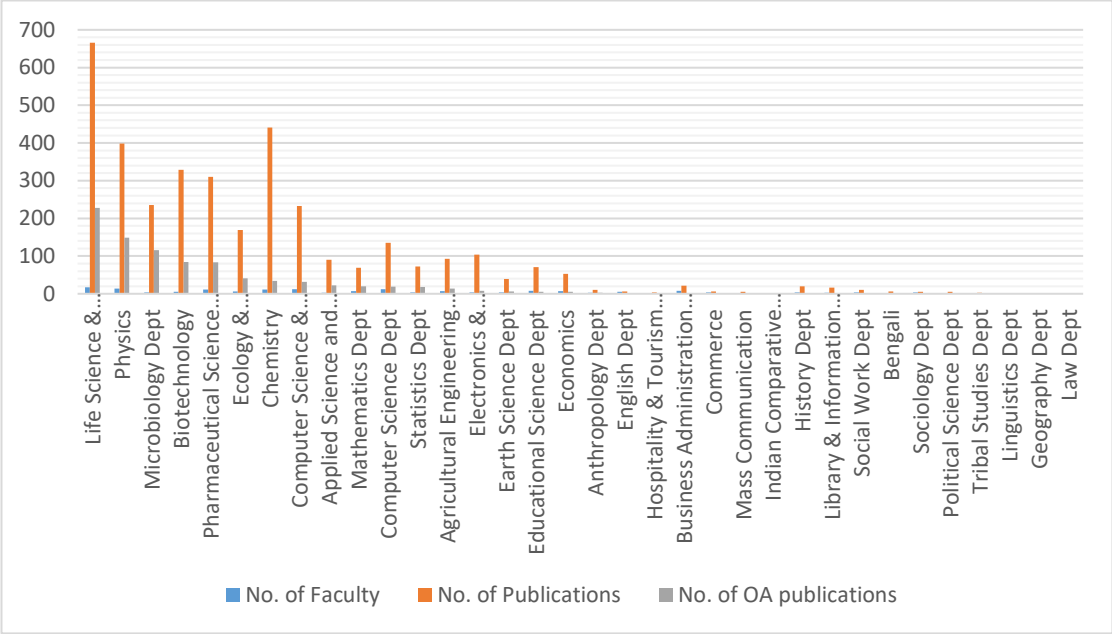

Figure 5.21: Department-wise Distribution of Publications of Assam University

5.9.3. (b) Department-wise Distribution of Publications of Manipur University

Figure 5.22 depicts the distribution of total and open access publications, as well as the total amount of faculties of Manipur University. In accordance with the Scopus database, Manipur University comprises 31 branches, with the Department of Physics department having the most faculty (12) and producing the most total and open access publications (395 and 129 papers, respectively). The Department of Chemistry follows closely behind with 367 total documents generated by 12 faculty, preceded by the departments of Biotechnology and Botany with 133 and 120 articles, respectively. After the Physics department, the disciplines with the most open access papers are Biotechnology (63), Mathematics (36), and Chemistry (34). Twelve departments of the university have not published a single open access paper such as History, Political Science, Statistics, Agricultural Science, Philosophy and others.

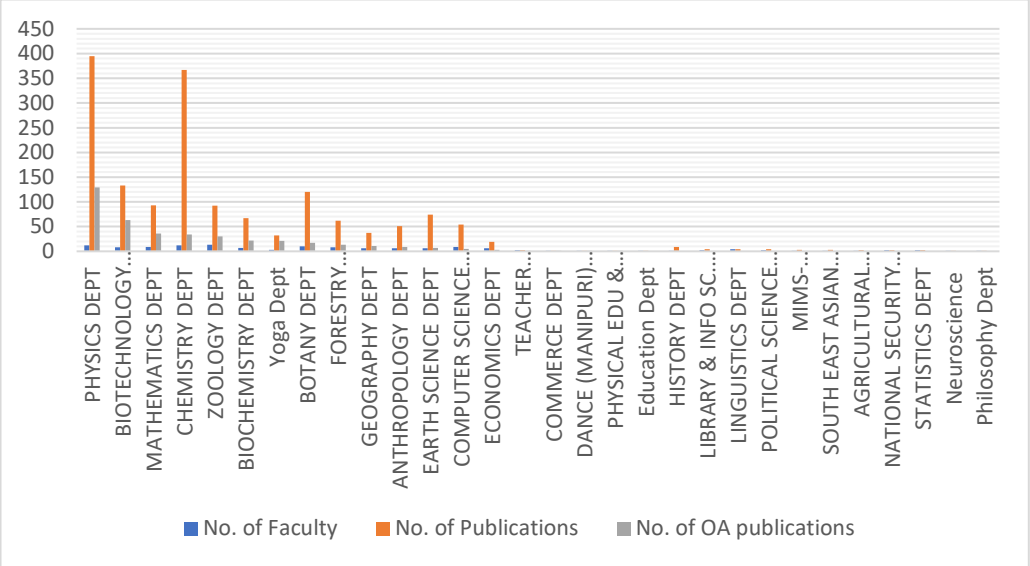

Figure 5.22: Department-wise Distribution of Publications of Manipur University

5.9.3. (c) Department-wise Distribution of Publications of Mizoram University

Figure 5.23 displays the distribution of total and open access publications, in addition to the total number of Mizoram University's faculty members. Mizoram University, with regard to the Scopus database, includes 33 branches. The Department of Biotechnology produces the most overall publications and open access publications at the same time, with 328 and 129 papers, respectively with nine numbers of faculties. The Department of Chemistry comes in second place with 310 total papers created by 8 teachers, surpassed by the Departments of Electronics & Communication Engineering and Zoology with 303 and 212 publications, respectively. The subjects having the greatest number of open access articles after Biotechnology are Zoology (62), Chemistry (56), Forestry (41), Environmental Science (37) and others. The university's nine departments, including Commerce, Political Science, Mass Communication, Mizo, Management, and others have not created any individual open access work.

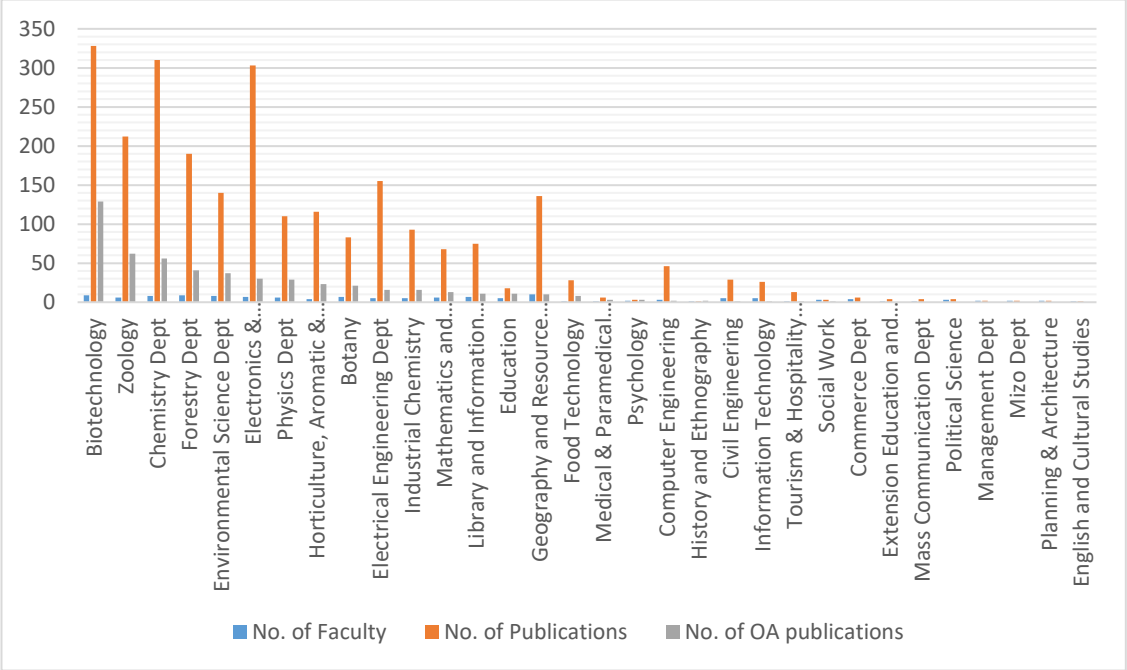

Figure 5.23: Department-wise Distribution of Publications of Mizoram University

5.9.3. (d) Department-wise Distribution of Publications of NEHU

Figure 5.24 shows the amount of total and open access papers, as well as the aggregate amount of academic members at North Eastern Hill University. With regard to the Scopus database, North Eastern Hill University offers 35 departments. By comprising 15 faculties, the Department of Chemistry generates the highest number of complete publications and open access articles, with 896 and 115 papers, correspondingly. The zoology department is the second department with the highest number of articles with 360 total articles published by 9 faculty, followed by Information Technology and Biotechnology & Bioinformatics with 264 and 254 papers, respectively. After Chemistry, the branch with the most open access papers includes Zoology (90), Biotechnology & Bioinformatics (75), Biochemistry (74), Biomedical Engineering (53) and many more. There has been no individual open access research generated by the seven departments of the institution, which include Library and Information Science, Philosophy, Law, Sociology, Linguistics, History and Archaeology, Journalism and Mass Communication.

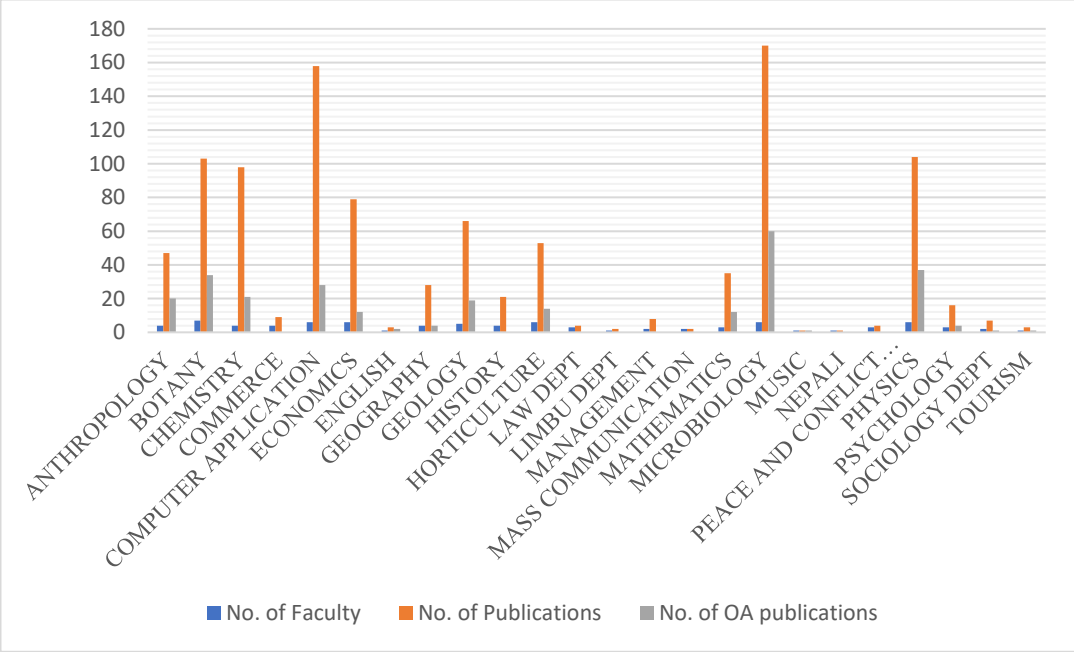

Figure 5.24: Department-wise Distribution of Publications of NEHU

5.9.3. (e) Department-wise distribution of Publications of Nagaland University

Figure 5.25 illustrates the proportions of total and open access papers, and it also displays the number of Nagaland University faculty members. According to the Scopus database, Nagaland University is represented by 29 departments, featuring the Department of Chemistry generating the most total papers with 119 papers produced by six faculty members. The next highest producer of the entire publications is Botany with 77 articles which is then followed by Geology (49), Zoology (41), Environmental Science (39), Physics (34) and many others. In case of open access publishing, the Biotechnology branch is the one with the maximum number of OA papers with 8 numbers followed by Plant Pathology with 3 OA papers. The rest of the seven departments to produce OA articles such as Environmental Science, Horticulture and others have generated single OA papers. Prominent departments like Zoology, Chemistry, Geology, Physics and many more of Nagaland University have not produced a single OA publication.

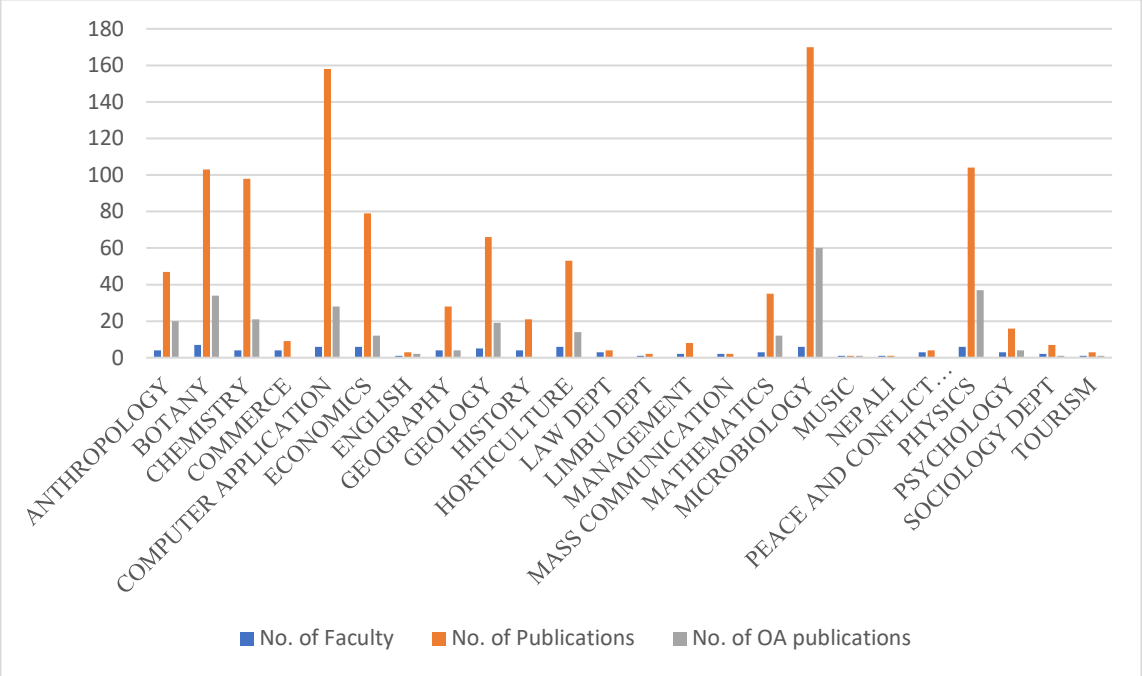

Figure 5.25: Department-wise Distribution of Publications of Nagaland University

5.9.3. (f) Department-wise distribution of Publications of Rajiv Gandhi University

Figure 5.26 depicts the ratios of total and open access articles, and it also demonstrates the number of academic members at Rajiv Gandhi University. With regard to the Scopus database, Rajiv Gandhi University has 20 branches, with the Department of Chemistry producing the most total publications (113) with five members of the faculty. Physics is the next greatest generator of total publications, with 112 papers, coming in behind are Mathematics (107), Botany (94), Commerce (88), Zoology (58) and several other fields. In the category of open access publication, the Botany and Mathematics branches have the most OA articles with 37 each, subsequent to Zoology (21), Commerce (18), Chemistry (16), English (15) and others. Evidently, there has been no particular open access research produced by the departments of Tribal Studies, Political Science, Education and Statistics.

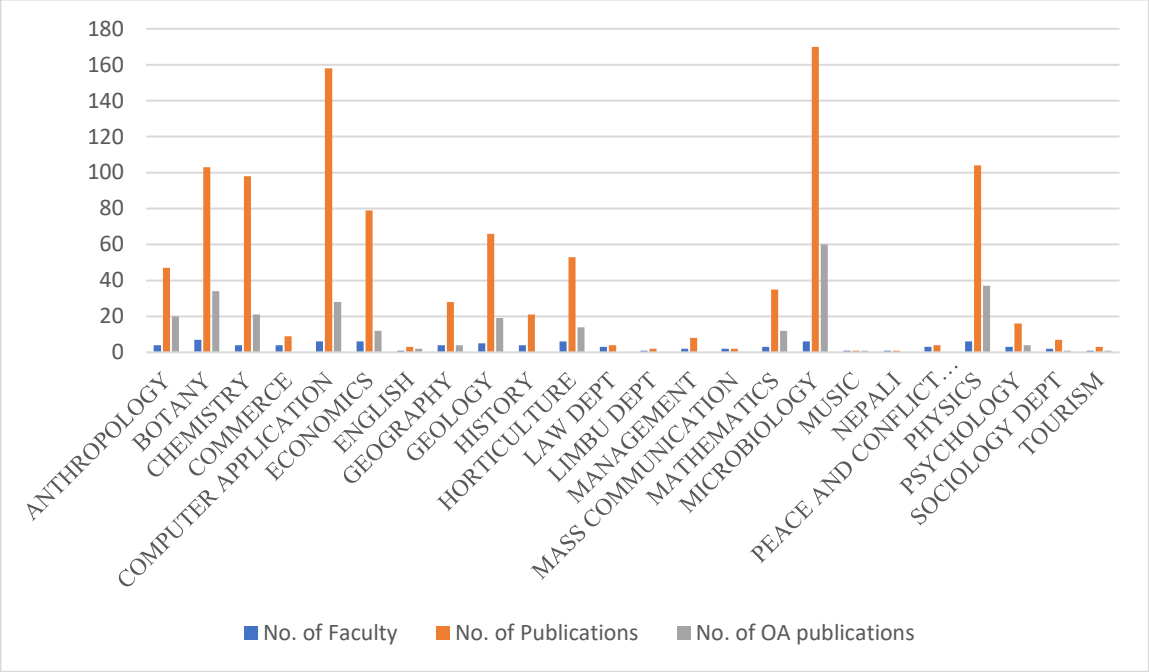

Figure 5.26: Department-wise Distribution of Publications of Rajiv Gandhi University

5.9.3. (g) Department-wise Distribution of Publications of Sikkim University

The corresponding proportions for both entire publications and open access papers are depicted in Figure 5.27, and also the diversity of faculty at Sikkim University. As per Scopus database indexed data, Sikkim University has 25 branches, among them, the Microbiology department offers the largest number of total and open access articles (170 and 60 simultaneously) with six faculty members. Computer Applications is the second highest producer of overall publications, with 158 articles, next to Physics (104), Botany (103), Chemistry (98), Economics (79), and numerous other subjects. The physics branch has the maximum open access articles in the open access category, with 37 articles, and the departments afterwards are Botany (34), Computer Applications (28), Zoology (25), Chemistry (21), and several other departments. Needless to say, no specific open access research has been generated by eight departments such as History, Commerce, Management, and others.

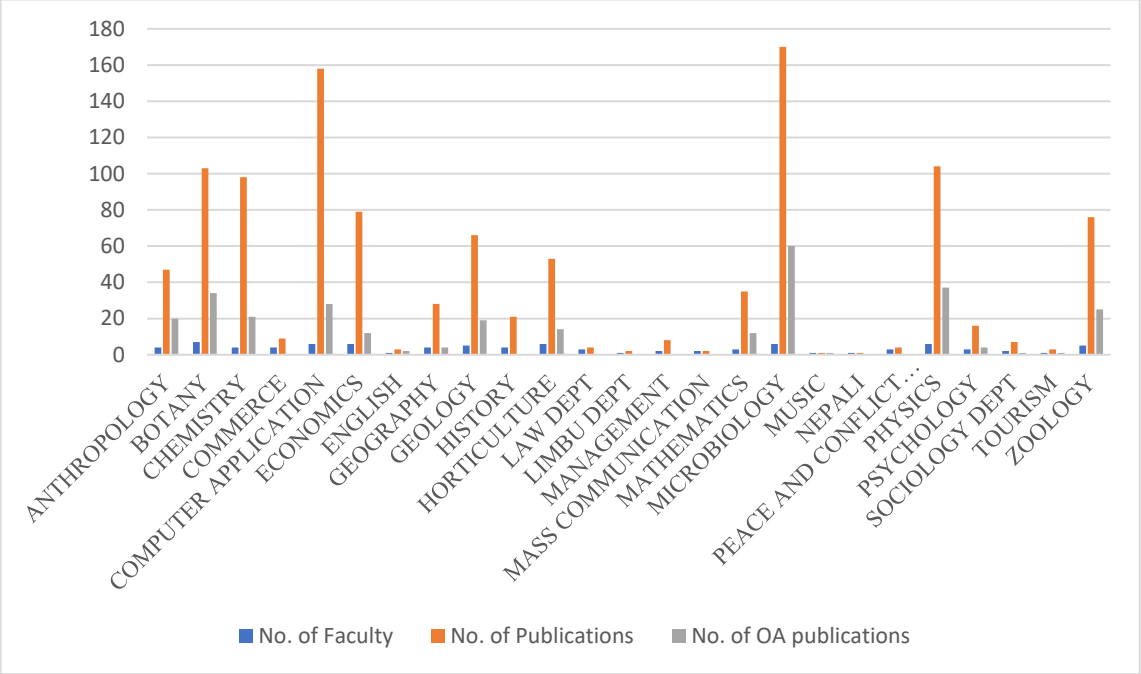

Figure 5.27: Department-wise Distribution of Publications of Sikkim University

5.9.3. (h) Department-wise distribution of Publications of Tezpur University

Figure 5.28 exhibits the comparable proportions for the whole publications and open access articles, as well as the variety of instructors at Tezpur University. In accordance with Scopus database indexed records, Tezpur University has 25 branches, featuring the Chemical Sciences department having the greatest amount of total publications with 1535 articles produced by 18 faculty members. With 822 papers, Physics is the second greatest creator of total publications, shortly after Computer Science & Engineering (622), Molecular Biology and Biotechnology (565), Electronics & Communication Engineering (495), Food Engineering and Technology (373), and a variety of other fields. In terms of open access publication, the Physics branch has the majority of OA papers 198 in total, subsequently surpassed by Molecular Biology and Biotechnology (176), Chemical Sciences (102), Food Engineering and Technology (101), Mathematical Sciences (92) and many others. Apparently, it appears that no specific open access research was carried out by the departments of Social Work, Foreign Language, and Law.

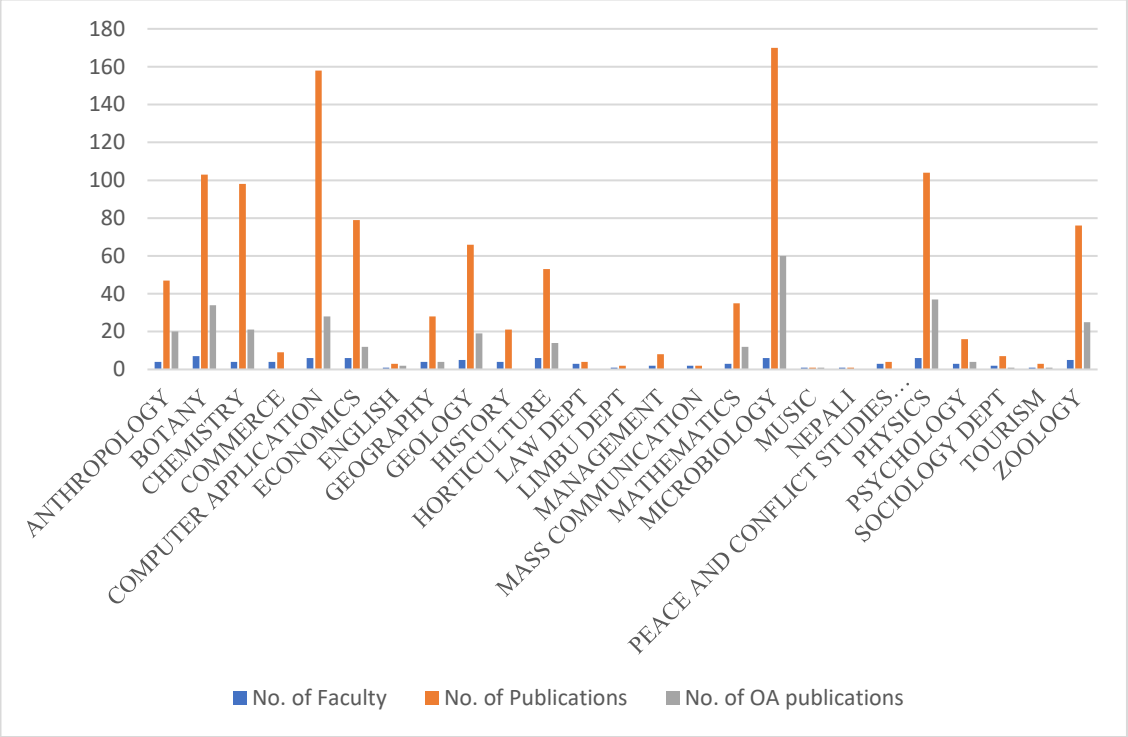

Figure 5.28: Department-wise Distribution of Publications of Tezpur University

5.9.3. (i) Department-wise Distribution of Publications of Tripura University

Figure 5.29 demonstrates corresponding ratios for total documents, open access papers, and the number of academics at Tripura University. Based on Scopus database indexed statistics, Tripura University has 31 departments, among them the Physics department having the most total and open access articles with 535 and 105 concurrently with six teaching academic members. Botany is one of the departments to generate the second highest number of open access publications (49 articles), which is accompanied by Chemistry, Human Physiology, Mathematics (26 articles each), Molecular Biology and Bioinformatics (19), Pharmacy (18), Computer Science & Engineering and Forestry and Biodiversity (13 OA papers each) and others. Undoubtedly to point out, no particular open access research has been produced by six departments including Economics, Materials Science, Journalism and Mass Communication and many more.

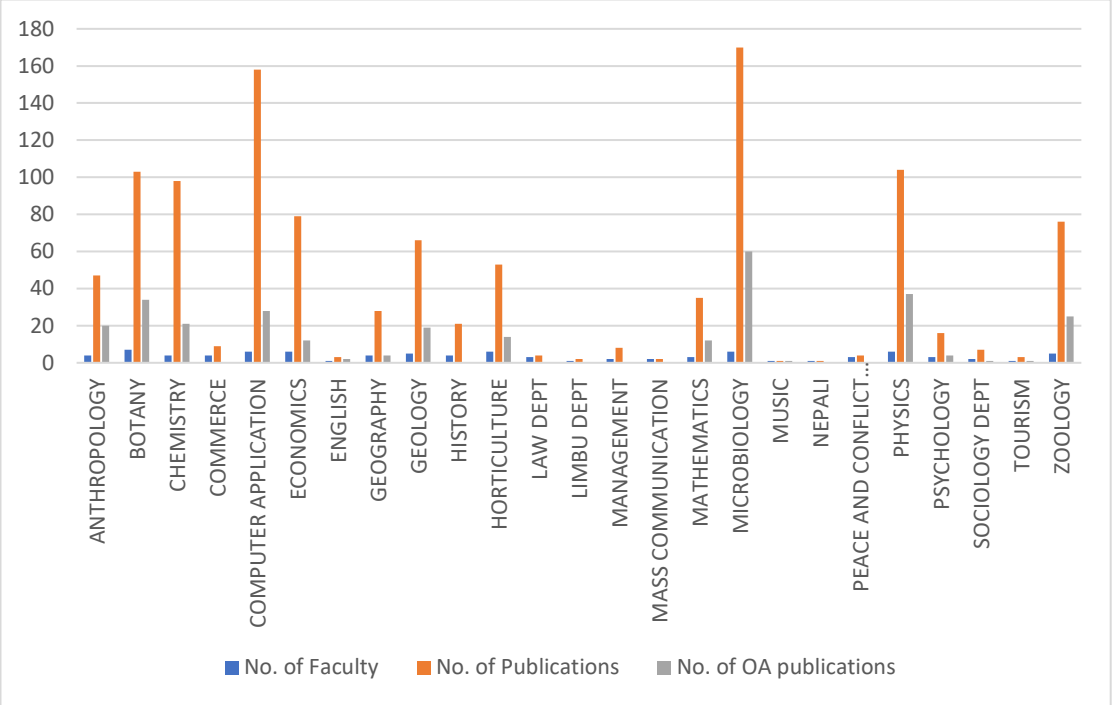

Figure 5.29: Department-wise Distribution of Publications of Tripura University

5.10. Distribution of various OA Routes

5.10.1. Overall Distribution of various OA Routes by the selected Universities

Table 5.10 resembles the overall distribution of different approaches to open access platforms adopted by selected central universities of North-East India. Since the Scopus database is the source of data collection for the study, the distribution of open access routes is also indicated according to the database. Mainly, four open access routes are presented in the database such as Gold, Green, Bronze and Hybrid. However, certain open access articles undergo two or three major OA routes/approaches, so the collaboration of open access routes is presented in the table. According to the above table, the gold, and green OA routes emphasize the maximum number of OA publications with 988 articles which is subsequent to the Green OA route with 917 OA articles and Bronze with 796 OA articles. The collaboration of the Hybrid, Gold, Green approach with only 87 OA papers has the least number of publications preceded by Hybrid, Gold (108) and Bronze, Green (262). As per the analysis, it is observed that the faculties of the selected central universities mostly prefer the gold and green route for publishing open access publications.

Table 5.10: Distribution of Various OA Routes

Sl. No.	University	Bronze	Bronze, Green	Gold	Gold, Green	Green	Hybrid, Gold	Hybrid, Gold, Green
1	**AU**	150	74	129	244	132	20	18
2	**MU**	61	26	52	65	143	10	12
3	**MZU**	99	26	105	155	51	17	8
4	**NU**	3	-	6	7	2	-	-
5	**NEHU**	134	36	101	168	182	18	12
6	**RGU**	30	7	53	32	34	7	1
7	**SKU**	37	17	70	85	52	8	4
8	**TZU**	198	59	136	173	248	20	20
9	**TRU**	84	17	58	59	73	8	12
Total		**796**	**262**	**710**	**988**	**917**	**108**	**87**

5.10.2. Bronze OA publication

5.10.2. (a) Year-wise variation of Bronze OA Publication

Figure 5.30 demonstrates the annual proportion of bronze open access approaches preferred by the faculties of the undertaken central universities. The bronze open access route is the platform where the publications are hosted and maintained by the publisher without a reusable license. The first open access publication was recorded by the Scopus database in 1989 and published in the journal Cytologia. The maximal amount of OA publications generated by academics was in the year 2019 with 86 publications which are followed by the year 2020 with 83 OA articles and the year 2018 with 74 OA publications. The yearly growth range of OA publishing has been steadily increasing from periodically till the recent year.

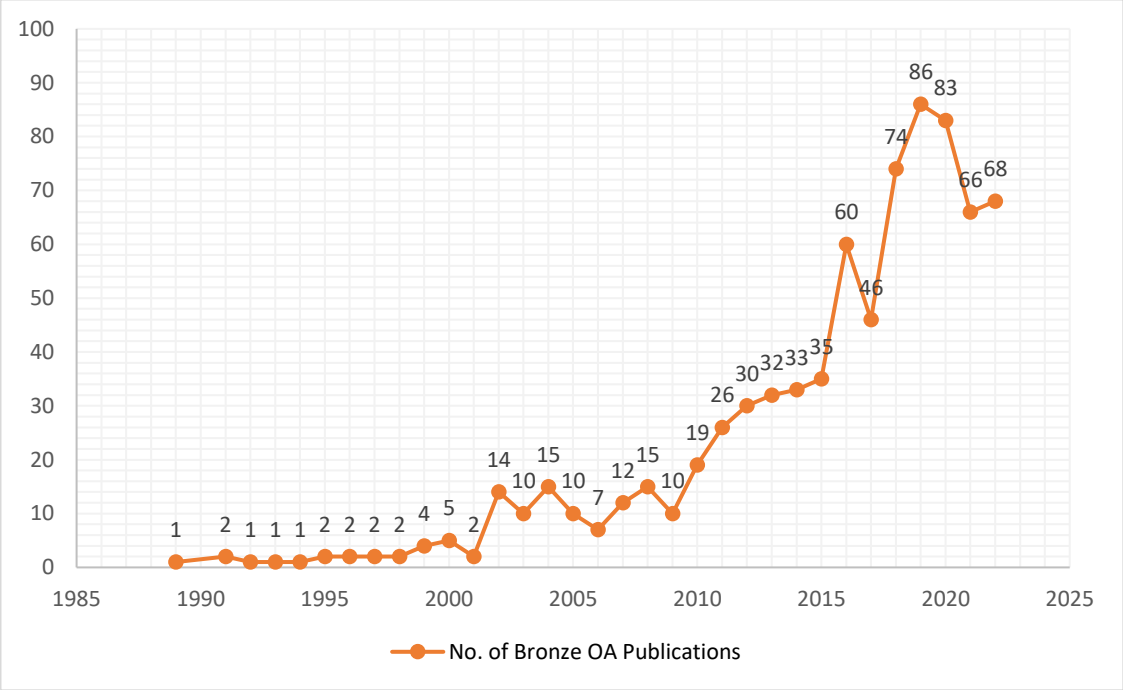

Figure 5.30: Year-wise Distribution of Bronze OA Publication

5.10.2. (b) Citations received by Bronze OA Publication

Figure 5.31 represents the citation gained by the publications published in the bronze OA route. The first OA paper published in the year 1989 in bronze OA route is 'Cytological Effects of Phosalone on Root Meristem of Allium Cepa L' which received five citations until recently. The OA article to receive the maximum amount of citations in this category is 'Vacuolar compartmentalization as indispensable component of heavy metal detoxification in plants' with 294 citations in the year 2016 published in the Journal of Plant Cell and Environment by Blackwell Publishing Limited publisher. The year 2016 was the one to receive the highest number of citations 1161 by 60 bronze publications which was followed by the year 2018, which received 646 citations from 74 OA papers. 1997 and 1989 is the year to gain the least citations by only 2 and 5 citations respectively.

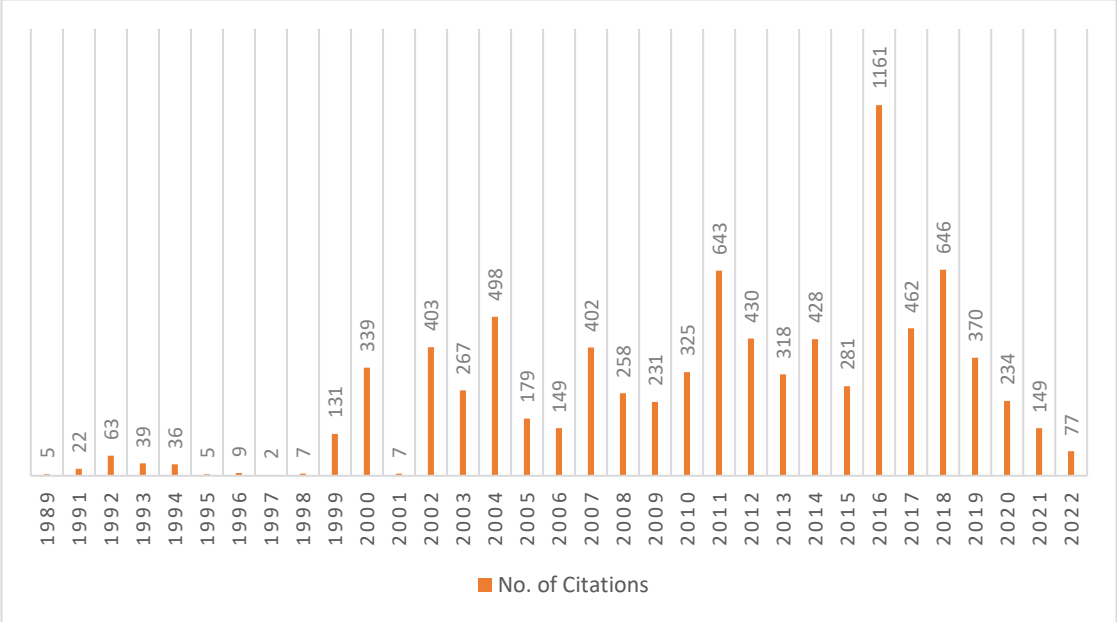

Figure 5.31: Citation gained by Bronze OA Publication

5.10.2. (c) Top Journals to publish in Bronze OA Publication

Figure 5.32 ranks the top journals published in bronze OA journals along with their citations. Out of 796 bronze OA publications, certain journals have been observed frequently in different sets of publications. Likewise, the Journal of Chemical Sciences is the most frequently popped-up journal 35 times in the bronze articles. The next ranked journal is the Journal of Physics: Conference Series occurring 26 times and the Bulletin of Materials Science appearing continuously 22 times. The Bulletin of Materials Science has earned the maximum number of citations among all the top five journals with 745 citations. The journal Cytologia has appeared 14 times gaining only 65 citations however gaining the fifth position in terms of several frequencies.

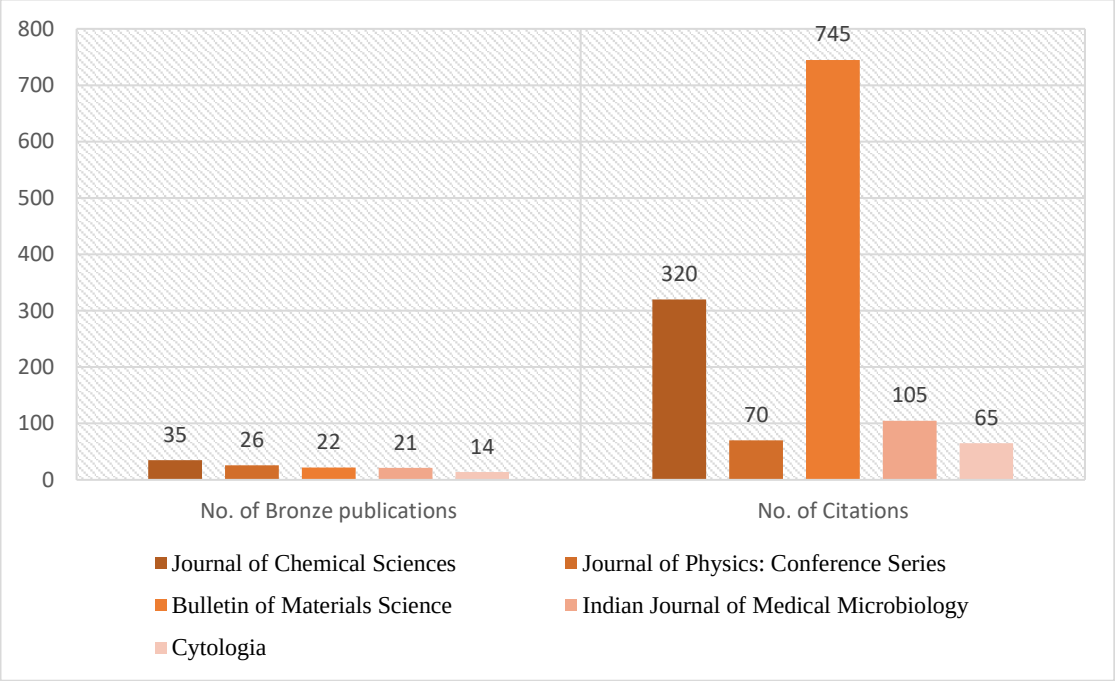

Figure 5.32: Top Bronze OA Journals along with their Citations

5.10.3. Bronze Green OA publication

5.10.3. (a) Year-wise variation of Bronze Green OA Publication

Figure 5.33 depicts the yearly share of bronze green open access methods favoured by academics by the core universities involved. Beginning with the first open access article which was published by Assam University in the journal Astronomy and Astrophysics Supplement Series in 1997, based on the Scopus database. The second earlier open access article published through this route was again from Assam University in 1998 in the Astronomy and Astrophysics Supplement Series journal. The academic community produced the most OA publications in 2021, with 33 OA articles, followed by 2020 with 24 OA papers and 2019 with 20 OA publications. From time to time, the annual growth range of OA publications has been gradually expanding.

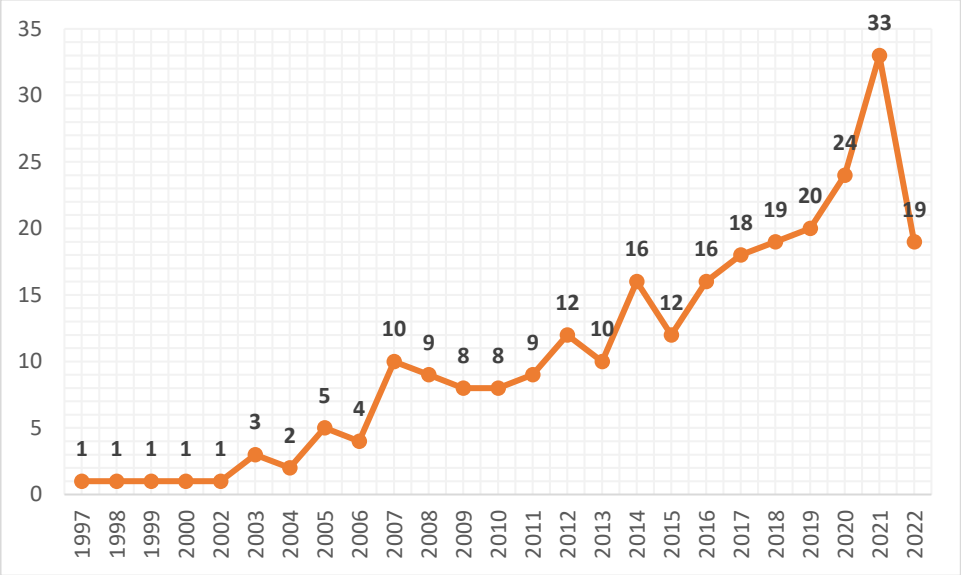

Figure 5.33: Year-wise Distribution of Bronze Green OA Publication

5.10.3. (b) Citations received by Bronze Green OA Publication

Figure 5.34 depicts the number of citations obtained by works published in the bronze green OA pathway. 'Instrumental polarization caused by telescope optics during wide field imaging' was the pioneering OA article published in 1997 in the bronze OA method, and it has gained 14 citations published in the journal Astronomy and Astrophysics Supplement Series. The OA article with the most citations in this particular field is 'Reactive oxygen species signaling in plants under abiotic stress', which obtained 402 citations in 2013 and was originally published in the journal named Plant Signaling and Behavior. The year 2020 earned the most citations, 1087 from 24 bronze green articles, surpassed by the year 2013, which obtained 628 citations from 10 OA articles. 1999 and 2000 had the minimum number of citations, with only 5 and 11 citations, accordingly.

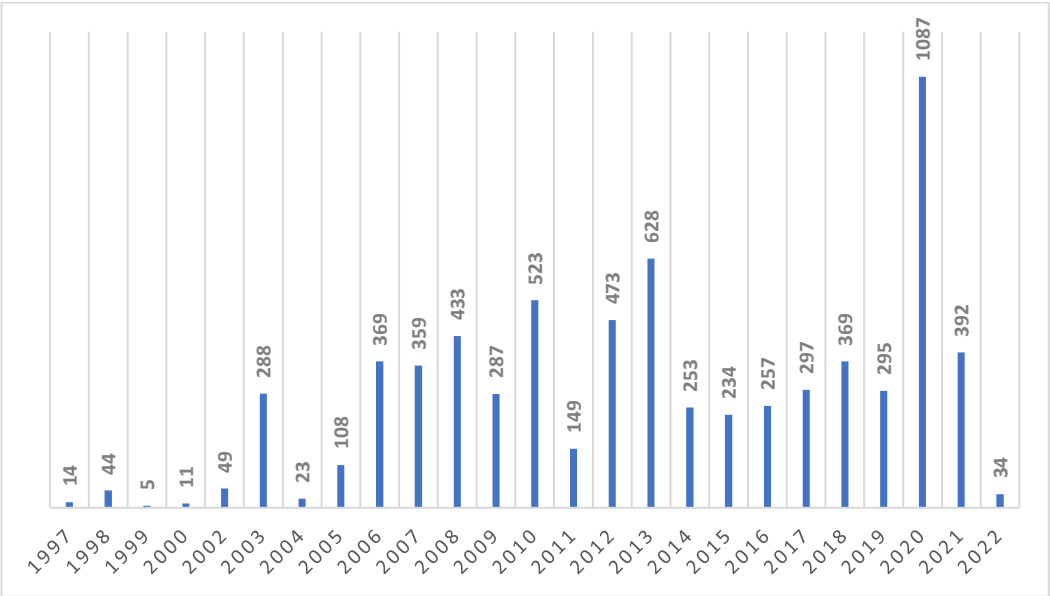

Figure 5.34: Citation gained by Bronze Green OA Publication

5.10.3. (c) Top Journals to publish in Bronze Green OA Publication

Figure 5.35 shows the top journals that issued bronze OA publications, together with their citation counts. Several periodicals have been noted regularly in various groupings of articles compiled from 262 bronze green OA articles. Correspondingly, the ACS Omega is the most often mentioned journal in the bronze green papers, occurring on 21 occasions. The ACS Omega journal is published by the reputed American Chemical Society publisher with an impact factor of 4.132 in 2023. The next highest-rated journal is Monthly Notices of the Royal Astronomical Society, which appears 16 times in a row, and Genome Announcements, which shows up 9 times consecutively. The publisher of the journal Monthly Notices of the Royal Astronomical Society is Oxford University Press which comprises an impact factor of 5.235 by 2023. With 375 citations, the ACS Omega gained the greatest quantity of citations out of all the leading five periodicals. The journal of Physics: Conference Series frequency of occurrence (5 times) in higher than many journals however, the citation count (7) for this journal is very low.

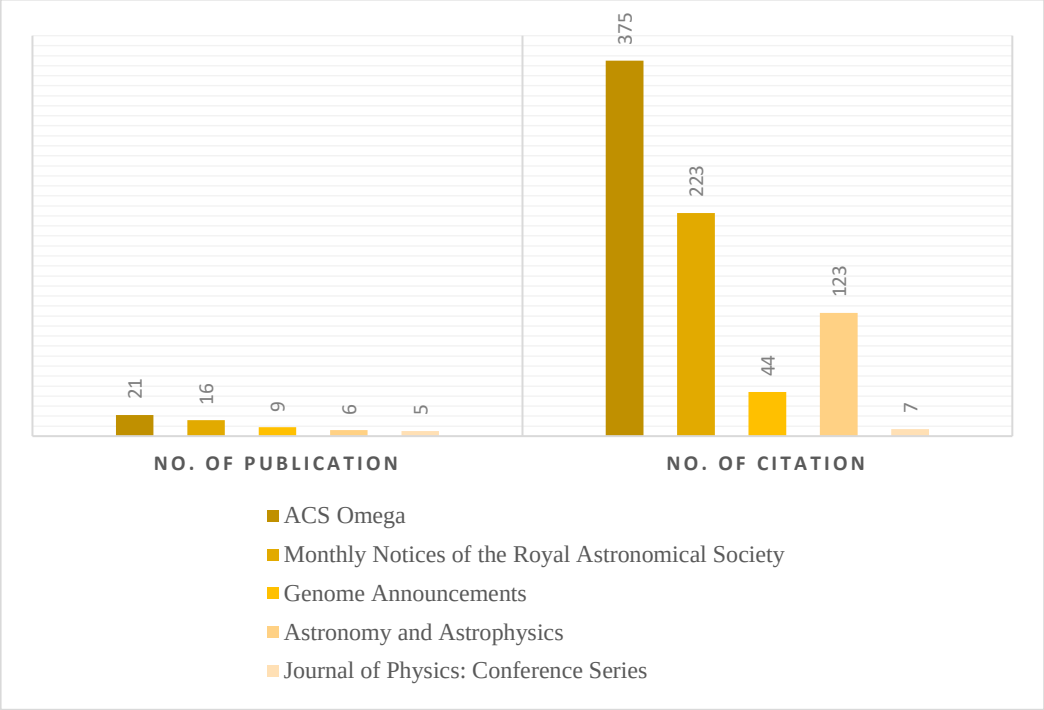

Figure 5.35: Top Bronze Green OA Journals along with their Citations

5.10.4. Gold OA publication

5.10.4. (a) Year-wise variation of Gold OA Publication

Figure 5.36 displays the average per year share of gold open access approaches preferred by academics by the significant central universities. Depending on the Scopus database, the very initial open access paper was issued by North Eastern Hill University in the journal Zeitschrift fur Kristallographie - New Crystal Structures in 1997. The next previous open access publication released using this means in 2001 in the journal Asian-Australasian Journal of Animal Sciences succeeding the year 2002 published in the journal New Journal of Physics. The academic professional published the greatest number of OA documents in 2021, with 167 OA papers, preceded by 2022 with 155 OA publications and 2020 with 108 OA publications. The graph shows that there were very few open access publications in the early years, but as time passed, the number of OA articles got ascended within the most recent time line.

Figure 5.36: Year-wise Distribution of Gold OA Publication

5.10.4. (b) Citations received by Gold OA Publication

The quantity of citations acquired by OA articles published in the gold OA route is displayed in Figure 5.37. The groundbreaking OA article, 'Crystal structure of trimethyltin 5-(2'-carboxyphenylazo) salicylaldehyde, C17H18N2O4Sn' was originally released in 1997 in the gold OA approach, and since then it has received 5 citations issued in the journal Zeitschrift fur Kristallographie - New Crystal Structures. The most widely cited OA paper in this specific category is 'A survey on Internet of Things architectures' which had 712 citations and premiered in 2018 in the Journal of King Saud University - Computer and Information Sciences. The year 2018 received the greatest number of citations, 1247 from 55 gold papers, surpassed by 2019, which acquired 963 citations against 51 OA publications. The years 1997 and 2001 had the fewest citations, registering just only 5 and 2 citations from only one gold paper each, respectively.

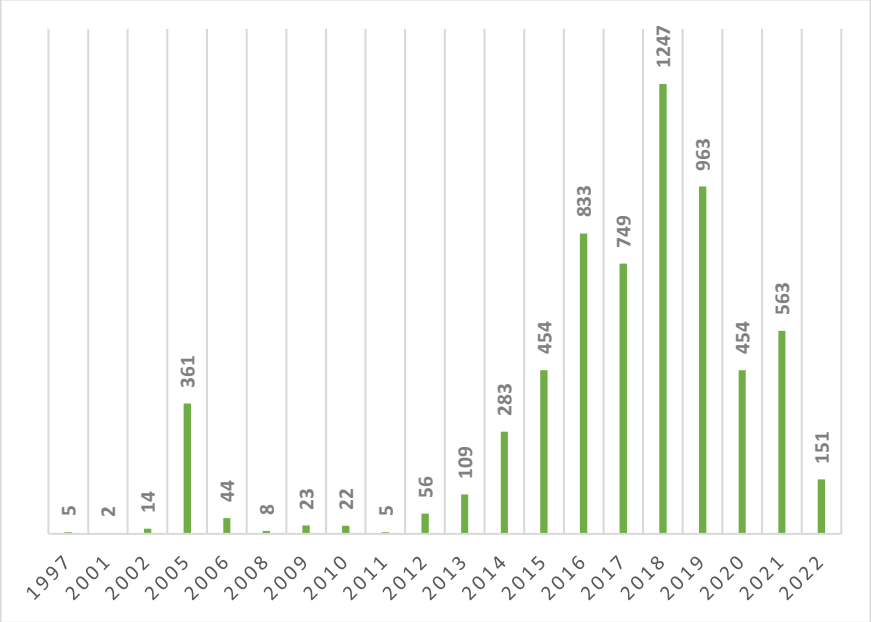

Figure 5.37: Citation gained by Gold OA Publication

5.10.4. (c) Top journals to publish in Gold OA Publication

Figure 5.38 depicts the top journals that have released gold OA publications, as well as their citation counts. Multiple sources have been consistently mentioned in the number of articles generated from 710 gold OA articles. Furthermore, the Journal of Threatened Taxa is the most significantly consistently adapted journal in the gold papers, featuring 25 times however with a low impact factor of 0.241 by 2023. Procedia Computer Science, which shows up 21 instances, and IEEE Access, which occurs 18 times, are the next highest-ranked journals. Elsevier Publication is the publisher of the periodical Procedia Computer Science, which is projected to have an impact factor of 0.883 by 2023. The IEEE Access got the maximum number of citations of among the best five periodicals, reaching up to 326 citations. The number of occasions of recurrence of the journal Trees, Forests and People (12 times) is larger than that of many other journals, nonetheless, the citation count (56) is relatively low.

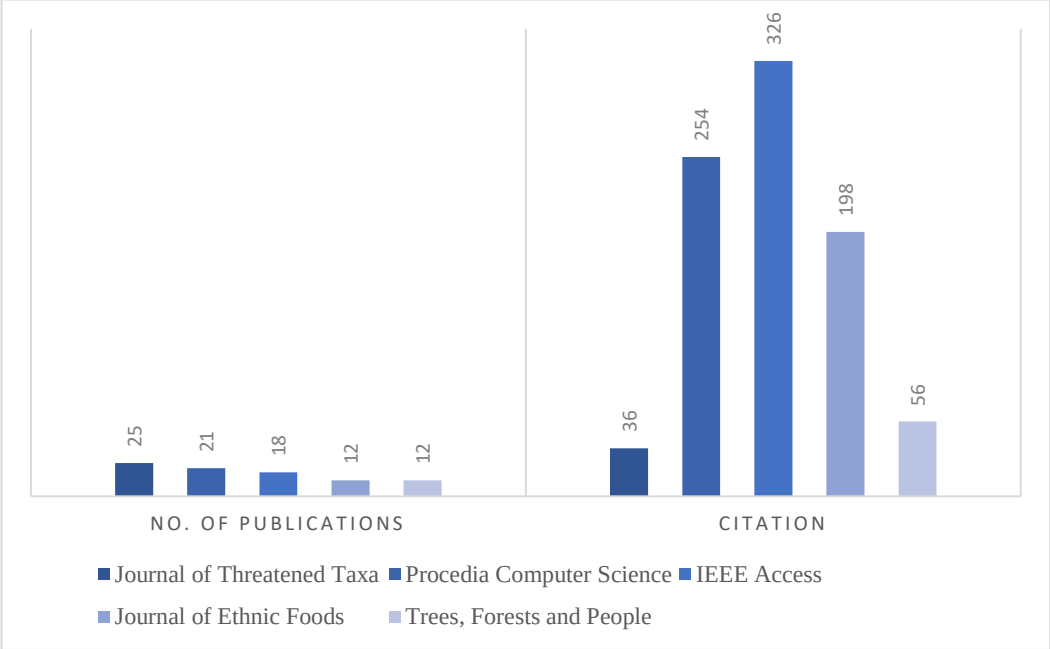

Figure 5.38: Top Gold OA Journals along with their Citations

5.10.5. Gold Green OA Publication

5.10.5. (a) Year-wise variation of Gold Green OA Publication

Figure 5.39 depicts the substantial central institutions' average annual proportion of gold green open access techniques favoured by academics. According to analysis, this gold green open access platform has produced the maximum number of open access papers compared to other OA approaches. The pattern of the graph shows that after the first open access publication in 1990 published in the International Journal of Mathematics and Mathematical Sciences by Manipur University, there was a huge gap of twelve years to reach the next open access paper published in this particular route. The succeeding open access article was in 2002 published in the Brazilian Journal of Medical and Biological Research by the faculties of North Eastern Hill University. Academic professionals generated the majority of OA articles in 2021, with 144 OA documents, subsequently followed by 2022 (125 OA articles) and 2019 (104 OA publishing) in the gold green publishing route.

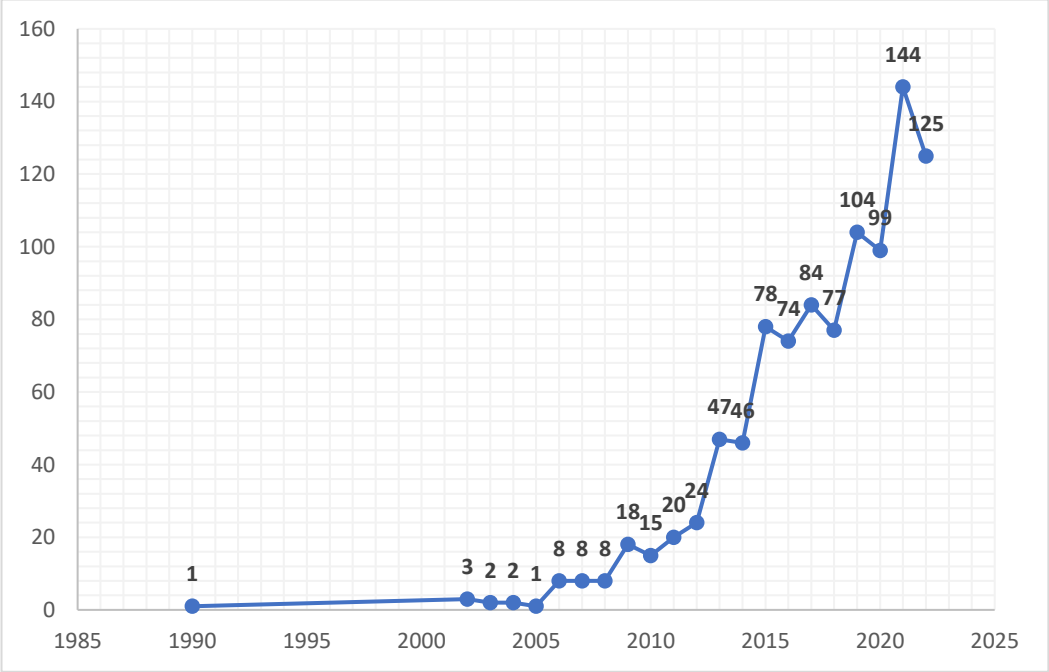

Figure 5.39: Year-wise Distribution of Gold Green OA Publication

5.10.5. (b) Citations received by Gold Green OA Publication

Figure 5.40 exhibits the number of citations collected by OA publications submitted using the gold green OA approaches. The OA article, 'Remarks on a Fixed-Point Theorem of Gerald Jungck,' was initially released in 1990 in the gold green OA technique, and it has subsequently gained no citation. However, the next foundational article is 'Sialic acid changes in Dalton's lymphoma-bearing mice after cyclophosphamide and cisplatin treatment' which was issued in the journal named Brazilian Journal of Medical and Biological Research in the year 2002 receiving 23 citations. The highest amount that referenced OA articles in this particular area is 'Online teaching-learning in higher education during lockdown period of COVID-19 pandemic,' which had 447 citations and was originally issued in the journal named International Journal of Educational Research Open in 2020. The year 2016 achieved the highest number of citations, 2384 from 74 gold articles, which were topped by 2019, which garnered 2070 citations from 104 OA articles. The years 2005 and 2004 had the lowest number of citations, with only 2 and 13 citations from a single and two gold green articles respectively.

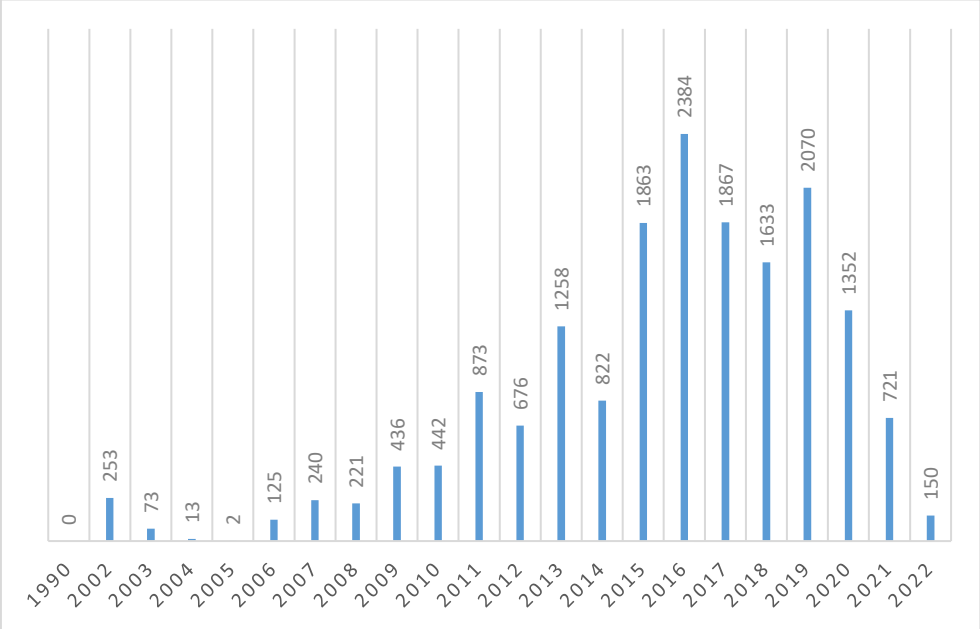

Figure 5.40: Citation gained by Gold Green OA Publication

5.10.5. (c) Top journals to publish in Gold Green OA Publication

The best-leading journals that have issued gold green OA articles, in addition to their citation counts, are illustrated in Figure 5.41. Many different periodicals were constantly acknowledged in the number of articles put together from 988 gold green OA publications. In addition, PLoS ONE is the most regularly adapted journal in the gold green documents, occurring on 77 occasions but with an impact factor of 3.752 by 2021. The subsequent highest-ranked journals are Scientific Reports (73 occurrences) and Frontiers in Microbiology (27 occurrences). Scientific Reports is published by Nature, has an impact factor of 4.6 by 2022 and has earned 1359 citations all total. Frontiers Media publishes Frontiers in Microbiology, which attained an impact factor of 6.064 by 2023 also gaining 1321 citations. The journal PLoS ONE has received the maximum number of citations indifferent to other leading journals with 2160 numbers, however, ACS Omega is the one to attain both minimum numbers of recurrences (18) and citations (90).

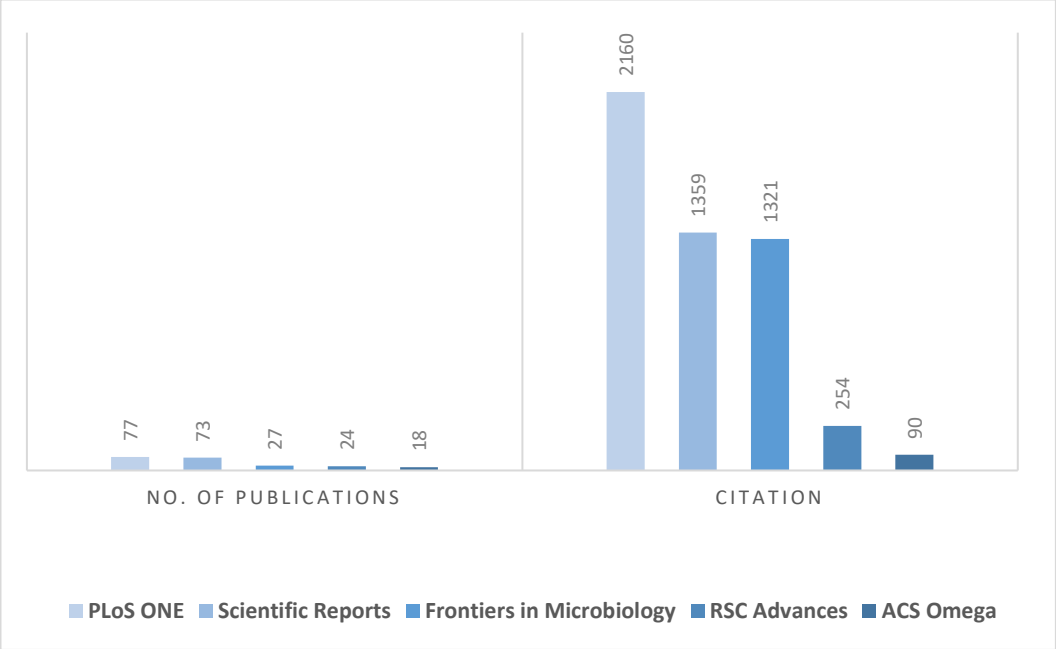

Figure 5.41: Top Gold Green OA Journals along with their Citations

5.10.6. Green OA Publication

5.10.6. (a) Year-wise variation of Green OA Publication

Figure 5.42 indicates the average yearly proportion of green open access strategies preferred by academics' faculties at the selected central universities for the study. In comparison to other OA techniques, this green open access platform has produced the second greatest amount of open access publications, based on the investigations. In 1988, the Physical Review A released the first open access article in this category. However, in 1989, the next green OA publication year has earmarked four OA papers were published in Nuclear Physics, Section A and Physics Letters B journals. With 83 OA documents, academic professionals created the bulk of OA articles in 2021, subsequently being followed by both years 2020 and 2017 (65 OA papers) in the green publishing pathway. The pattern presentation of the graph shows the zigzag movement of the publication generation per year and its collections.

Figure 5.42: Year-wise Distribution of Green OA Publication

5.10.6. (b) Citations received by Green OA Publication

The amount of citations attained by OA papers published utilizing the green OA techniques is portrayed in Figure 5.43. The fundamental work of green OA is titled 'Liquid-mesophase-solid transitions: Systematics of a density-wave theory' and it originally appeared in the Physical Review A in 1988, getting 11 citations. The total amount that cited OA research paper in this field is 'Arbuscular mycorrhizal fungi in alleviation of salt stress: A review' which achieved 678 citations and was first released in the journal of Annals of Botany in 2009. The year 2011 possessed the greatest amount of citations, 1890 from 35 green publications, which were surpassed in 2009 with 1629 citations from 32 OA articles. The years 1988 and 1990 featured the smallest number of citations, with only 11 and 29 references from a single and two green publications, respectively.

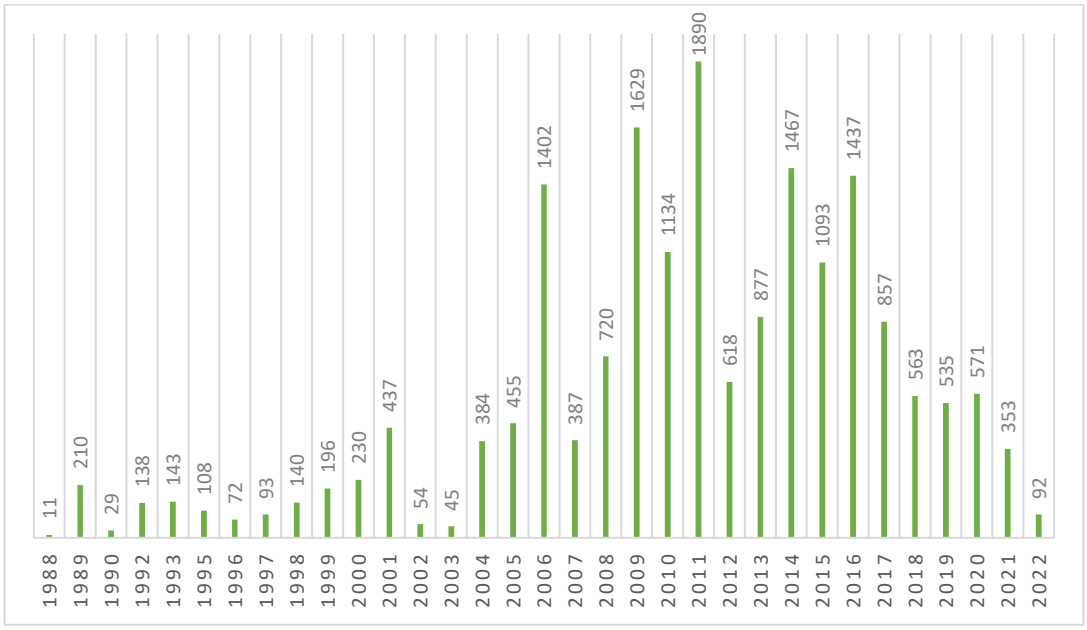

Figure 5.43: Citation gained by Green OA Publication

5.10.6. (c) Top Journals to publish in Green OA Publication

Figure 5.44 exhibits the finest leading journals that have generated green OA publications, and it also shows their citation counts. Numerous journals were repeatedly identified in the sheer number of articles assembled from 917 green OA papers. Journal of Food Science and Technology likewise happens to be the most often accommodated journal in the green papers, presenting 46 times but having an impact factor of 3.117 by 2023. Journal of Parasitic Diseases (37 instances) and Physical Review A - Atomic, Molecular, and Optical Physics (26 instances) are the following highest-ranking periodicals. Journal of Parasitic Diseases, which is issued by Springer, possesses 267 citations altogether. Physical Review A - Atomic, Molecular, and Optical Physics, produced by the American Physical Society, achieves an impact factor of 2.971 by 2023 having 480 citations. With 721 citations, the journal Journal of Food Science and Technology has the highest amount of citations in comparison to other prominent periodicals; nevertheless, the International Journal of Modern Physics A has a low number of occurrences (16) and gained citations (63).

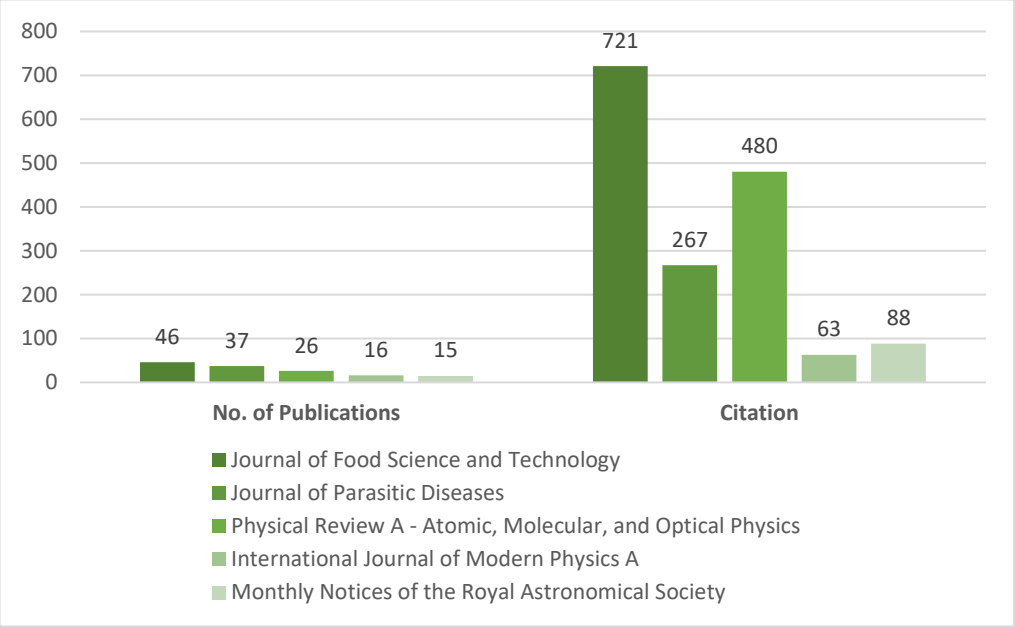

Figure 5.44: Top Green OA Journals along with their Citations

5.10.7. Hybrid Gold OA Publication

5.10.7. (a) Year-wise variation of Hybrid Gold OA Publication

Figure 5.45 illustrates the average annual ratio of hybrid gold open access methods encouraged by academics of the undertaken universities. According to the findings, this hybrid gold open access platform produced the second fewest number of open access papers when compared to other OA approaches. The first open access paper in this particular field was published in the year 1998 in Radiochimica Acta by the Korean Society of Environmental Engineers. Despite this, two OA publications were published in the subsequent year in the Journal of Biological Chemistry in 2004. Academic personnel generated the majority of OA publications in 2021, with 19 OA documents, followed by 2017 (16 OA papers) in the hybrid gold publishing pathway. The graph's layout depicts the twisted behaviour of the publishing output every single year and the collections it holds.

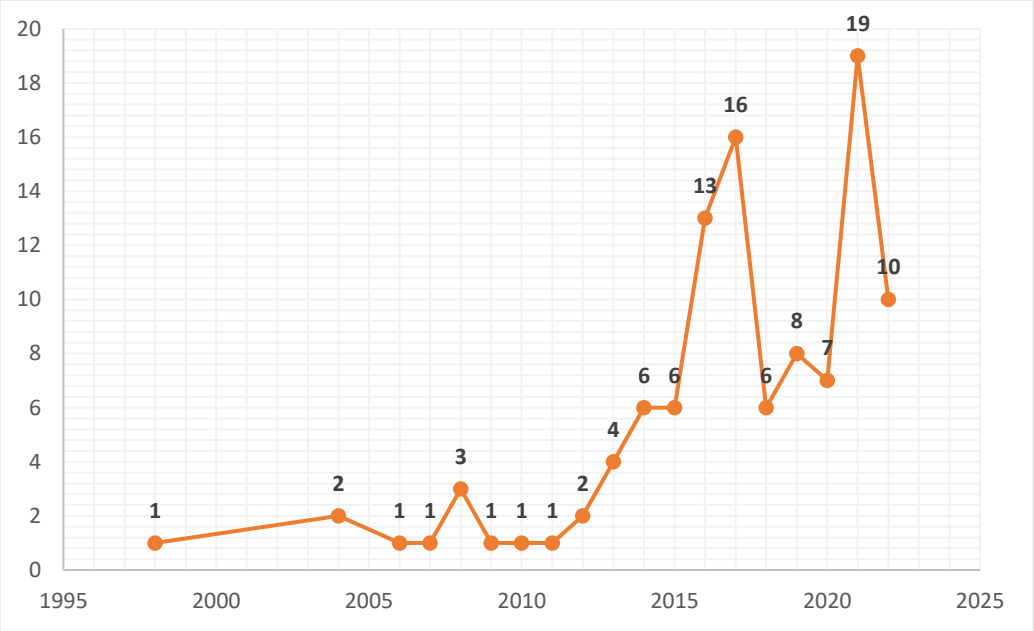

Figure 5.45: Year-wise Distribution of Hybrid Gold OA Publication

5.10.7. (b) Citations received by Hybrid Gold OA Publication

Figure 5.46 highlights the total number of citations generated by papers issued in the hybrid gold OA route. The cornerstone study of hybrid gold OA is entitled 'Removal Behaviour of Rice (Oryza sativa L) Hulls for Submicro Concentrations of Hg2+ and Cr3+ from Aqueous Solutions: A Radiotracer Study,' and first appeared in Radiochimica Acta in 1998, with 7 citations. The most referenced OA investigation in this domain is 'Climate change and challenges of water and food security,' which has 258 citations and was issued in the International Journal of Sustainable Built Environment in 2014. The year 2014 had the most citations (444 from 6 hybrid gold papers), which was eclipsed in 2008 with 283 citations from 3 OA articles. 2011 and 2007 had the minimum number of citations, comprising only 3 and 3 citations from a single hybrid gold document, consequently.

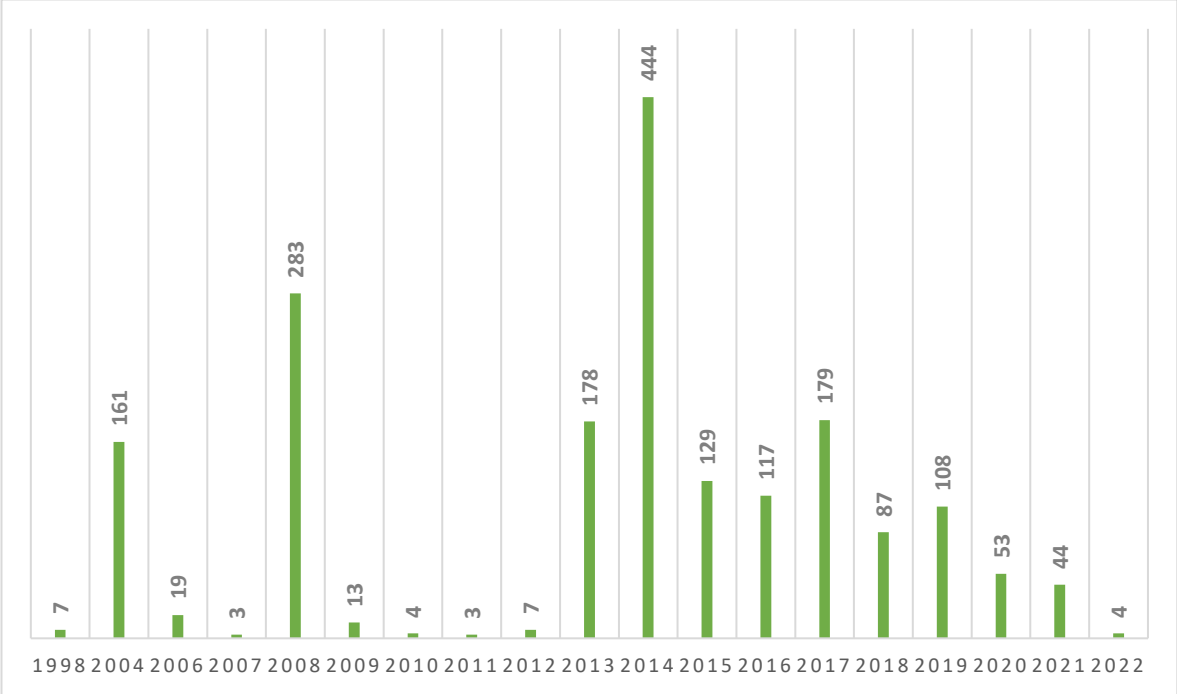

Figure 5.46: Citation gained by Hybrid Gold OA Publication

5.10.7. (c) Top journals to publish in Hybrid Gold OA Publication

Figure 5.47 highlights the most outstanding major journals that have produced hybrid gold OA papers, alongside their citation levels. The vast amount of articles compiled from 108 hybrid gold OA papers revealed several journals that have been seen on multiple occasions. South African Journal of Botany is a frequently embraced journal in hybrid gold articles, exhibiting on 8 occasions but possessing an impact factor of 3.111 by 2023. The top-ranking journals are the Asian Journal of Chemistry and the Asian Journal of Pharmaceutical and Clinical Research (5 occasions respectively). Asian Journal of Chemistry has only 11 citations in total with an Impact factor of 0.158 by 2023. Asian Journal of Pharmaceutical and Clinical Research, published by the Innovare Academic Sciences has gained only 15 citations. The International Journal of Sustainable Built Environment journal by occurring only 5 times has been able to achieve 353 citations whereas the Journal of Applied and Natural Science after having the same five times of frequency, has only got 4 citations.

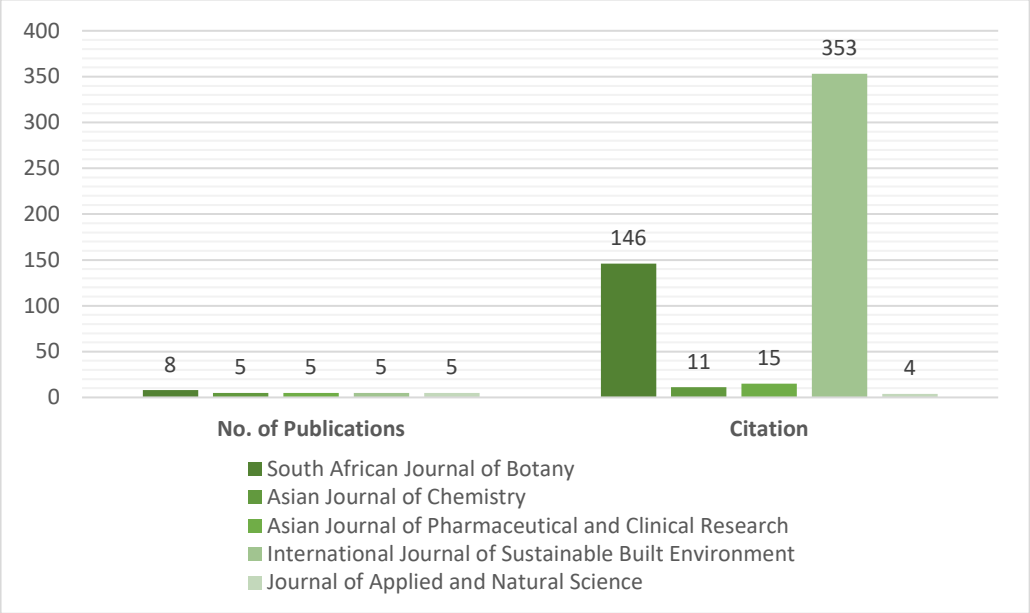

Figure 5.47: Top Hybrid Gold OA Journals along with their Citations

5.10.8. Hybrid Gold Green OA Publication

5.10.8. (a) Year-wise variation of Hybrid Gold Green OA Publication

The yearly rate of Hybrid gold green open access techniques favoured by the faculty of the selected institutions is shown in Figure 5.48. When correlated to other OA techniques, this hybrid gold green open access structure generated the fewest amount of open access publications with 87 OA papers in total. In 2003, three papers were published for the very first time in journals such as the Electronic Journal of Biotechnology, Physics Letters, Section B: Nuclear, Elementary Particle and High-Energy Physics, Journal of Biological Chemistry published by the publishers like Electronic Journal of Biotechnology and Elsevier. The subsequent year to produce the very time open access publication in this category was 2004, generated in the journal of Biological Chemistry. In the hybrid gold green publishing route, academic employees created the bulk of OA publications in 2021, with 12 OA documents, prior to 2022 (9 OA articles). The style of the graph displays the swirled patterns of the publishing output and acquisitions every year.

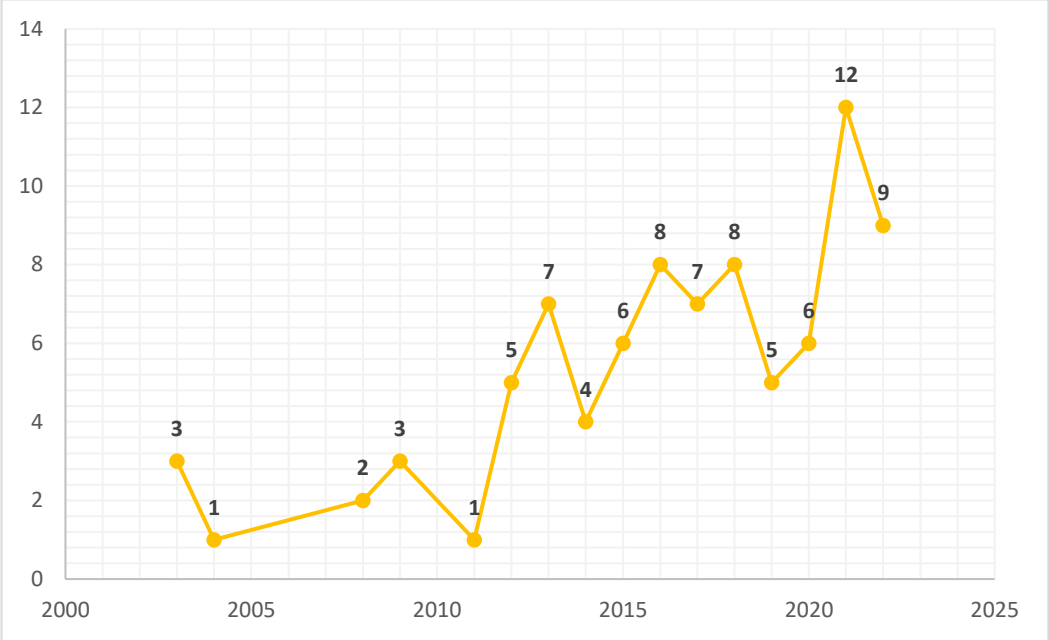

Figure 5.48: Year-wise distribution of Hybrid Gold Green OA Publication

5.10.8. (b) Citations received by Hybrid Gold Green OA Publication

The aggregate number of citations obtained from works published using the hybrid gold green OA approach is represented in Figure 5.49. The primary investigation regarding hybrid gold OA is named 'Enzymological characterization of pineapple extract for potential application in oak tasar (Antheraea proylei J.) silk cocoon cooking and reeling,' and it was initially published in the Electronic Journal of Biotechnology in 2003, with 16 citations. The most heavily cited OA study in the hybrid gold green is 'Transcriptome responses to combinations of stresses in Arabidopsis' which has 335 citations and was originally printed in the Plant Physiology journal in 2013. The year 2013 had the highest citations (393 from 7 hybrid gold green publications), followed by 2021, which possessed 190 citations from 12 OA publications. 2022 and 2004 had the lowest overall number of citations, with only 8 and 39 references from 9 and 1 hybrid gold green documents, respectively.

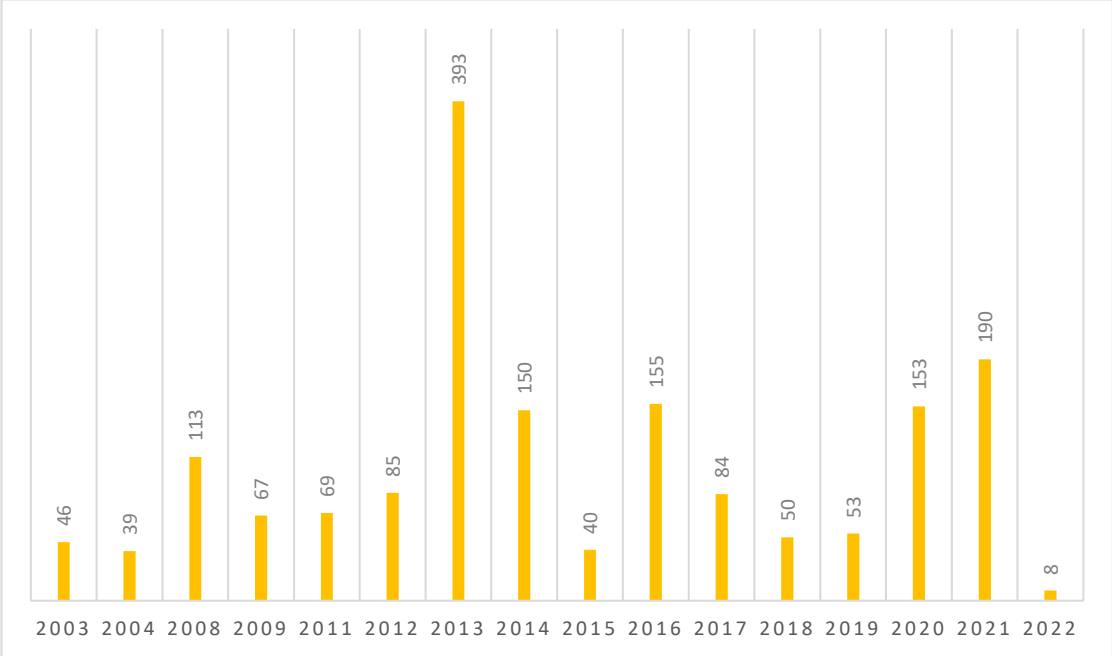

Figure 5.49: Citation gained by Hybrid Gold Green OA Publication

5.10.8. (c) Top Journals to publish in Hybrid Gold Green OA Publication

Figure 5.50 demonstrates the most notable major journals that have published hybrid gold green OA papers, alongside their citation numbers. A substantial number of publications aggregated from 87 hybrid gold green OA publications exposed various journals on various occasions. Journal of biological chemistry is considered a popular journal for hybrid gold green papers, popping up on 6 occurrences published by the publisher American Society for Biochemistry and Molecular Biology. Physical Review D and Physics Letters, Section B: Nuclear, Elementary Particle and High-Energy Physics have been designated as the next top-ranked periodicals (4 times each). Physical review D earned only 24 citations with an Impact factor of 5.407 by 2023 issued by the American Physical Society. Elseviers' Physics Letters, Section B: Nuclear, Elementary Particle and High-Energy Physics has received just 46 citations and its impact factor 4.95. The Journal of Biological Chemistry has earned the maximum number of citations (273 citations) and the Meta Gene has gained 126 citations despite appearing on three occasions.

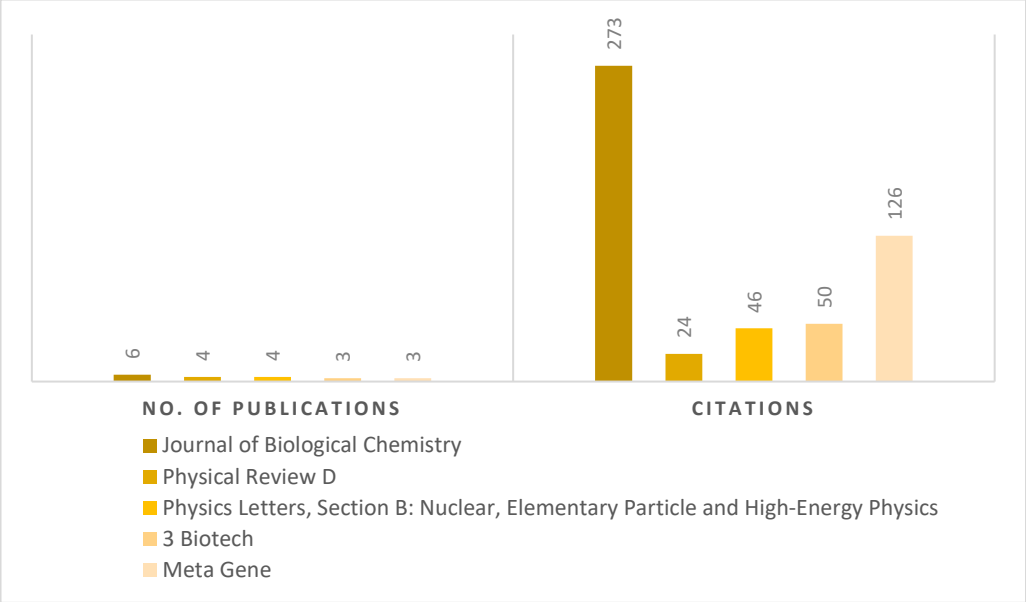

Figure 5.50: Top Hybrid Gold Green OA Journals along with their Citations

5.11. Distribution of Top Journals based on the Number of Publications for each University

Table 5.11 depicts the ranking of top journals based on the maximum number of publications for each of the selected central universities. Journals are an academic periodical that publishes papers or final version of research documents authored by academics, researchers, and other specialists. RSC Advances is a globally popular hybrid journal specialising in Chemistry with an impact factor of 4.036. RSC Advances has achieved the highest ranking in both Tezpur University and Assam University with 81 and 45 publications in terms of total publications. The Indian Journal of Physics is a hybrid journal which has managed to attain the top rank in Manipur University in both overall (32) and open access (28) publications. The top journals of Mizoram University are Library Philosophy and Practice (43) in the total category, although, the journal of Library Philosophy and Practice provides all its research articles in free accessible mode and Scientific Reports (17) in open access category. In the category of total publications, all the top journals of the selected universities have a distinct differentiation but in the top journals in the category of open access publications, there is one fine similarity i.e., most of the top journals are based on biology.

Table 5.11: University-wise Distribution of Top Journals

University	Total publications		OA publications	
	Journal	**NP**	**Journal**	**NP**
AU	RSC Advances	45	PloS One	37
MU	Indian Journal of Physics	32	Indian Journal of Physics	28
MZU	Library Philosophy and Practice	43	Scientific Reports	17
NU	ACTA Horticulturae	17	BMB Reports	3
NEHU	Lecture Notes in Networks and Systems	81	Journal of Parasitic Diseases	25
RGU	Current Science	19	Notulae Scientia Biologicae	8
SKU	Indian Journal of Traditional Knowledge	26	Frontiers in Microbiology	18
TZU	RSC Advances	81	Journal Of Food Science and Technology	49
TRU	Materials Today: Proceedings	57	Cytologia	10

5.11.1. Distribution of Top Journals based on the Number of Publications for Assam University

Table 5.12 represents the distribution of top-ranked journals based on the number of total publications and open access publications for Assam University. In case of total publication, the top journal is RSC Advances with 45 publications which is published by the Royal Society of Chemistry with an impact factor of 3.9. Liquid Crystals is the next top journal with 43 total publications which has a 2.676 impact factor that is being published from Taylor and Francis Limited. Regarding open access publications, PloS One is highest ranked journal with 37 OA publications which has gained an impact factor of 3.752 by 2022. The Indian Journal of Medical Microbiology and Journal of Physics: Conference Series are the next top OA journals with 29 and 18 articles respectively.

Table 5.12: Distribution of Top Ten Journals of Assam University

Total publications		OA publications	
Journal	**NP**	**Journal**	**NP**
RSC Advances	45	PloS One	37
Liquid Crystals	43	Indian Journal of Medical Microbiology	29
PloS One	37	Journal of Physics: Conference Series	18
Communications in Computer and Information Science	36	Monthly Notices of the Royal Astronomical Society	18
Advances in Intelligent Systems and Computing	34	Journal of Threatened Taxa	12
Current Science	32	Scientific Reports	11
Indian Journal of Medical Microbiology	29	Physical Review A - Atomic, Molecular, and Optical Physics	10
International Journal of Pharmacy and Pharmaceutical Sciences	26	Asian Journal of Pharmaceutical and Clinical Research	9
AIP Conference Proceedings	25	RSC Advances	9
Asian Journal of Pharmaceutical and Clinical Research	25	Antioxidants	8

NP=Number of Publications

5.11.2. Distribution of top journals based on number of publications for Manipur University

Table 5.13 displays the rankings of the finest periodicals for Manipur University, based on the proportion of total publications, and open access papers articles. In terms of overall publishing, the most prominent journal is the Indian Journal of Physics with 32 articles, which is produced by the Indian Association for the Cultivation of Science (IACS) and possesses an impact factor of 1.778 by 2023. Asian Journal of Chemistry, issued by Asian Publication Corporation, is the following leading journal, with 29 total papers and a 0.158 impact factor. The Indian Journal of Physics is also the most prominent concerning OA publications with 28 articles. The Indian Journal of Chemistry - Section B Organic and Medicinal Chemistry; and Current Science are succeeding top journals in the OA platform with 26 and 24 OA papers respectively.

Table 5.13: Distribution of Top Ten Journals of Manipur University

Total Publications		OA Publications	
Journal	**NP**	**Journal**	**NP**
Indian Journal of Physics	32	Indian Journal of Physics	28
Asian Journal of Chemistry	29	Indian Journal of Chemistry - Section B Organic and Medicinal Chemistry	26
Current Science	26	Current Science	24
Indian Journal of Chemistry - Section B Organic and Medicinal Chemistry	26	Journal of Molecular Structure	24
Journal of Molecular Structure	25	Spectrochimica Acta - Part A: Molecular and Biomolecular Spectroscopy	24
Spectrochimica Acta - Part A: Molecular and Biomolecular Spectroscopy	24	Asian Journal of Chemistry	21
Physical Review A - Atomic, Molecular, and Optical Physics	19	Journal of Luminescence	15
Journal of Parasitic Diseases	16	Materials Today: Proceedings	15
Materials Today: Proceedings	16	AIP Conference Proceedings	12
Journal of Luminescence	15	Journal of Alloys and Compounds	12

NP=Number of Publications

5.11.3. Distribution of Top Journals based on the Number of Publications for Mizoram University

Table 5.14 shows the most notable journals for Mizoram University according to the ratio of overall publications and open access works. The most significant journal in terms of overall publication is the Library Philosophy and Practice, which has 43 articles and is released by the University of Science and Technology Beijing. The next prominent journal is Current Science, released by the Indian Academy of Science, featuring 36 total documents having a 1.169 impact factor. Having 17 articles, Scientific Reports happens to be the most notable journal in terms of open access publishing having a 4.6 impact factor by 2022. Environmental Engineering Research and IEEE Access are the next prominent journals adopted by the faculties of Mizoram University with 12 OA articles each. The journal Library Philosophy and Practices provides all its published research articles freely available to all its stakeholders, however, it has not been deposited in Scopus Database as an open access journal.

Table 5.14: Distribution of Top Ten Journals of Mizoram University

Total Publication		OA Publication	
Journal	**NP**	**Journal**	**NP**
Library Philosophy and Practice	43	Scientific Reports	17
Current Science	36	Environmental Engineering Research	12
Environmental Science and Pollution Research	36	IEEE Access	12
Environmental Science and Engineering	33	Journal of Environmental Biology	11
Lecture Notes in Electrical Engineering	27	PloS One	11
Microsystem Technologies	24	Genomics Data	9
Transactions on Electrical and Electronic Materials	23	Journal of Threatened Taxa	9
IEEE Antennas and Wireless Propagation Letters	19	AMB Express	8
Environmental Monitoring and Assessment	18	Asian Journal of Chemistry	7
Indian Journal of Ecology	18	Desidoc Journal of Library and Information Technology	7

NP=Number of Publications

5.11.4. Distribution of Top Journals based on Number of Publications for Nagaland University

Table 5.15 represents the publications proportions indulged in the raking of journals with respect to overall publications and open access publications. The overall articles produced by the faculties of Nagaland University are subsequently lower than the other selected central universities of North East India. Consequently, the number of open access publication ratio is also low, therefore the top journals to have more numbers OA publications are BMB Reports and PloS One which have three and two open access papers respectively. However, the topmost journals with more numbers of publications in terms of total are ACTA Horticulturae, Indian Veterinary Journal, and Indian Journal of Animal Sciences simultaneously having 17, 15 and 6 articles respectively for each category.

Table 5.15: Distribution of Top Ten Journals of Nagaland University

Total Publication		OA Publication	
Journal	**NP**	**Journal**	**NP**
ACTA Horticulturae	17	BMB Reports	3
Indian Veterinary Journal	15	PloS One	2
Indian Journal of Animal Sciences	6	Asian-Australasian Journal of Animal Sciences	1
Indian Journal of Agricultural Research	5	BMC Public Health	1
Journal of Rural Development	5	Egyptian Journal of Medical Human Genetics	1
Indian Journal of Horticulture	4	Electronic Journal of Plant Breeding	1
Biochemistry	3	Global Nest Journal	1
BMB Reports	3	Indian Journal of Agricultural Research	1
Indian Journal of Agricultural Sciences	3	Journal of Basic Microbiology	1
Indian Journal of Entomology	3	Journal of International Business Studies	1

NP=Number of Publications

5.11.5. Distribution of Top Journals based on Number of publications for North Eastern Hill University (NEHU)

Table 5.16 displays the publishing proportions used in journal raking in terms of the entire documents and open access papers. The Lecture Notes in Networks and Systems, published by Springer International Publishing, is the most pertinent periodical with regard to overall publishing, with 81 publications followed by Lecture Notes in Electrical Engineering issued by Springer Verlag with 48 articles. However, in case of open access publications, the journal to hold the top position is the Journal of Parasitic Diseases with 25 articles which is followed by the Journal of Chemical Sciences and PloS One having 13 and 12 papers respectively.

Table 5.16: Distribution of Top Ten Journals of NEHU

Total Publications		OA Publications	
Journal	**NP**	**Journal**	**NP**
Lecture Notes in Networks and Systems	81	Journal of Parasitic Diseases	25
Lecture Notes in Electrical Engineering	48	Journal of Chemical Sciences	13
Journal of Organometallic Chemistry	42	PloS One	12
Journal of Physical Chemistry A	42	Sensors International	11
Advances in Intelligent Systems and Computing	28	ACS Omega	10
Journal of Molecular Structure	27	Journal of Nano- and Electronic Physics	10
New Journal of Chemistry	27	Scientific Reports	10
Chemical Physics Letters	25	IEEE Access	8
Journal of Parasitic Diseases	25	Procedia Computer Science	8
Journal of Biomolecular Structure and Dynamics	24	Electronics (Switzerland)	7

NP=Number of Publications

5.11.6. Distribution of Top Journals based on Number of Publications for Rajiv Gandhi University

Table 5.17 demonstrates the collection of instances utilized in journal raking with regard to the whole documents and open access research papers. The top-ranked journal within the context of entire publishing is Current Science, which contains 19 articles and has been issued by the Indian Academy of Sciences. Physics Letters B, published by Elsevier, is the next highest-profile journal, with 12 total publications particularly with a 4.95 impact factor by 2023. The following journal is AIP Conference Proceedings (10) published by the American Institute of Physics. This journal along with current science (17) and ChemistrySelect (9) are the topmost journals to have the maximum number of publications in the total category. In contrast, when it comes to open access publishing, the Notulae Scientia Biologicae ranks first with 8 articles, trailed by the Journal of Ethnobiology and Ethnomedicine and Ethnobotany Research and Applications, which have 5 and 4 pieces, accordingly.

Table 5.17: Distribution of Top Ten Journals of Rajiv Gandhi University

Total Publication		OA Publication	
Sources	**NP**	**Sources**	**NP**
Current Science	19	Notulae Scientia Biologicae	8
Physics Letters B	12	Journal Of Ethnobiology and Ethnomedicine	5
AIP Conference Proceedings	10	Ethnobotany Research and Applications	4
ChemistrySelect	9	International Journal of Mathematics and Mathematical Sciences	4
Materials Today: Proceedings	9	Middle East Fertility Society Journal	4
Oriental Anthropologist	9	Physics Letters B	4
Indian Journal of Traditional Knowledge	8	Acta Ecologica Sinica	3
Notulae Scientia Biologicae	8	Ain Shams Engineering Journal	3
European Physical Journal A	7	Arab Journal of Mathematical Sciences	3
Indian Journal of Physics	7	Bulletin Of Materials Science	3

NP=Number of Publications

5.11.7. Distribution of top journals based on number of publications for Sikkim University

Table 5.18 reveals an array of depictions used in journal rankings for total documents and open access segments. Indian Journal of Traditional Knowledge, comprising 26 articles and distributed by the National Institute of Science Communication and Information Resources (NISCAIR), is the top-ranked journal according to the criteria of total publication. Economic and Political Weekly published by Sameeksha Trust is the following topmost journal in overall publications with 25 publications. However, the third-ranked journal for total is Frontiers in Microbiology with 18 articles. The third-ranked journal in total publication is the top-ranked journal in open access publication criteria i.e., Frontiers in Microbiology with 18 articles itself distributed by Frontiers Media. The Journal of High Energy Physics and the Journal of Ethnic Foods are the next prominent journals with 12 and 8 publications respectively. The impact factor distribution of both journals is 6.376 and 0.46 respectively.

Table 5.18: Distribution of Top Ten Journals of Sikkim University

Total Publication		OA Publication	
Sources	**NP**	**Sources**	**NP**
Indian Journal of Traditional Knowledge	26	Frontiers in Microbiology	18
Economic and Political Weekly	25	Journal of High Energy Physics	12
Frontiers in Microbiology	18	Journal of Ethnic Foods	8
Current Science	14	Anthropological Review	7
Journal of High Energy Physics	12	Current Research in Microbial Sciences	7
Journal of Threatened Taxa	12	Journal of Nepal Paediatric Society	7
Lecture Notes in Networks and Systems	11	ACS Omega	6
International Journal of Food Microbiology	10	Journal of Threatened Taxa	6
Journal of Chemical Physics	10	International Journal of Sustainable Built Environment	5
The Routledge Handbook of Post-Reform Indian Economy	10	Journal of King Saud University - Computer and Information Sciences	5

NP=Number of Publications

5.11.8. Distribution of Top Journals based on the Number of Publications for Tezpur University

The data in Table 5.19 illustrates the compilation of cases used in the journal raking process, taking into account whole documents, and OA articles. The journal RSC Advances is the one in the top position with regards to total publication having 81 papers. Lecture Notes in Computer Science is the journal to grab the second position by producing the maximum number of publications in both categories with 76 and 68 articles respectively. The Lecture Notes in Computer Science is published by Springer with an impact factor of 1.27. In terms of open access publication, the Journal of Food Science and Technology is the topmost journal having 49 papers, which is published by Springer with an impact factor of 3.117. The next subsequent open access top journals are Scientific Reports, ACS Omega, and Linear Algebra and Its Applications having 25, 23 and 17 documents respectively.

Table 5.19: Distribution of Top Ten Journals of Tezpur University

Total Publication		OA Publication	
Journal	**NP**	**Journal**	**NP**
RSc Advances	81	Journal Of Food Science and Technology	49
Lecture Notes in Computer Science	76	Scientific Reports	25
Journal of Food Science and Technology	62	ACS Omega	23
Lecture Notes in Electrical Engineering	60	Linear Algebra and Its Applications	17
Advances in Intelligent Systems and Computing	50	Monthly Notices of The Royal Astronomical Society	17
Current Science	46	PloS One	17
Journal of Applied Polymer Science	46	Nuclear Physics B	14
Journal of Food Processing and Preservation	46	Journal of Chemical Sciences	13
ChemistrySelect	45	Biointerface Research in Applied Chemistry	12
Lecture Notes in Mechanical Engineering	45	Journal of Physics: Conference Series	12

NP=Number of Publications

5.11.9. Distribution of Top Journals based on the Number of Publications for Tripura University

Table 5.20 displays the publication proportion accustomed to the ranking of top journals with respect to total and open access publications adopted by the academicians of Tripura University. Cytologia and Scientific Reports rank in the top position with 10 articles each with regard to open access publication. The impact factor for both the journals i.e., Cytologia and Scientific Reports are 1.027 and 4.6 and the publishers are Japan Mendel Society and Nature respectively. Materials Today: Proceedings has the highest number of articles in terms of total publications having 57 articles. The publisher of this journal is Elsevier and its impact factor is 2.59. In case of total publication, the next top journal is Spectrochimica Acta - Part A: Molecular and Biomolecular Spectroscopy with 33 articles followed by Lecture Notes in Networks and Systems and Vegetos with 27 papers each.

Table 5.20: Distribution of Top Ten Journals of Tripura University

Total Publication		OA Publication	
Journal	**NP**	**Journal**	**NP**
Materials Today: Proceedings	57	Cytologia	10
Spectrochimica Acta - Part A: Molecular and Biomolecular Spectroscopy	33	Scientific Reports	10
Lecture Notes in Networks and Systems	27	Journal Of Earth System Science	8
Vegetos	27	Plant Science Today	8
Journal Of Luminescence	21	Procedia Computer Science	8
Journal Of Physics and Chemistry of Solids	20	Proyecciones	8
Advances In Intelligent Systems and Computing	19	Spectrochimica Acta - Part A: Molecular and Biomolecular Spectroscopy	8
Chemical Physics Letters	19	Current Science	7
Indian Journal of Physics	19	Journal Of Physics: Conference Series	6
Current Science	16	RSc Advances	6
RSc Advances	16	Sensors And Actuators, B: Chemical	6
Indian Journal of Radio and Space Physics	15	Surface Review and Letters	6
Molecular Crystals and Liquid Crystals	14	Annals Of Geophysics	5
Advances In Space Research	12	Journal Of Colloid and Interface Science	5
ChemistrySelect	12	PloS One	5

NP=Number of Publications

5.12. Distribution of Prolific Authors based on Number of Publications (NP) for each University

Table 5.21 states the most prolific authors based on the collection of research publications from all the selected universities. In terms of overall publications, the top producer for the selected universities is mainly the professors and assistant professors of the university which is based under the specialization of natural science and biological sciences. Professor Niranjan Karak from the department of Chemical Sciences of Tezpur University has the greater number of publications indexed in the Scopus database. However, Professor Sentil Kumar Nachimuthu from the Biotechnology Department of Mizoram University is the most prolific author in terms

of open access publications. Professor Sentil Kumar Nachimuthu has also achieved the second most productive authors in overall publications compared to other selected central universities.

Table 5.21: Prolific Authors based on Number of Publications for selected Universities

University	Total publications		OA publications	
	Author	**NP**	**Author**	**NP**
AU	Sarkar, Utpal	121	Bhattacharjee, Amitabha	58
MU	Rajmuhon Singh, Nongmaithem	88	Angom, Dilip	59
MZU	Nachimuthu, Senthil Kumar	179	Nachimuthu, Senthil Kumar	72
NU	Sinha, Dipak	58	Mondal, Rajkrishna	5
NEHU	Chandra, Asit Kumar	170	Tripathi, Timir	41
RGU	Kumar, Vinod V.	86	Saikia, Nipen	19
SKU	Tamang, Jyoti Prakash	103	Tamang, Jyoti Prakash	30
TZU	Karak, Niranjan	275	Das, Mrinal Kumar	37
TRU	Hussain, Syed Arshad	130	Hussain, Syed Arshad	34

NP=Number of Publications

5.12.1. Prolific Authors based on Number of Publications for Assam University

Table 5.22 shows the ranking of the prolific authors based on the accomplishments in the categories of total and open access publication of Assam University. Based on the number of publications in the category of total publications, Utpal Sarkar produced the maximum number of publications with 121 publications who is an Assistant Professor from the department of physics. The ranking is then followed by Shubhadeep Roychoudhury, an assistant professor from the life science and bioinformatics department with 120 total publications; and Sujit Kumar Ghosh with 116 publications being and assistant professor and belonging to the department of chemistry. Whereas, for the category of open access publications, the faculty to generate the highest number of OA articles is Amitabha Bhattacharjee, an assistant professor in the department of microbiology with 58 OA papers out of 103 total papers. The next top open access article producer is Shubhadeep Roychoudhury with 56 OA articles and Asoke Kumar Sen with 42 OA articles out of 65 total articles who is a professor from the department

of Physics. The table gives out the fact that the top generator in the open access platform has produced only half of the articles in OA from their entire publications.

Table 5.22: Prolific Authors of Assam University

Total publications		OA publications	
Author	**NP**	**Author**	**NP**
Sarkar, Utpal	121	Bhattacharjee, Amitabha	58
Roychoudhury, Shubhadeep	120	Roychoudhury, Shubhadeep	56
Ghosh, Sujit Kumar	116	Sen, Asoke Kumar	42
Choudhury, Manabendra Dutta	107	Pandey, Piyush	34
Bhattacharjee, Amitabha	103	das Talukdar, Anupam	32
Chakraborty, Supriyo	101	Choudhury, Manabendra Dutta	30
Roy, Sudipta	93	Singh, Manjari	27
Pandey, Piyush	84	Ghosh, Sankar Kumar	25
Jyoti Nath, Arun	84	Das, Himadri Sekhar	25
Borah, Anupom	82	Kumar, Sanjeev	23

NP=Number of Publications

5.12.2. Prolific Authors based on Number of Publications for Manipur University

Table 5.23 lists the top authors according to their contributions to the total and open access publications of Manipur University. In accordance with the overall amount of articles in the context of total publications, Nongmaithem Rajmuhon Singh, a Professor from the Chemistry department, produced the greatest quantity of papers (88 articles). Shougajam Dorendrajit Singh, a professor in the physics department, and Sumitra Phanjoubam, also a female professor in the department of physics, are the next two on the list, each with 78 and 71 publications respectively. With 59 OA articles out of 70 total papers, Dilip Angom, a professor in the Department of Physics, released the most amount of open access publications in the open access sector. Ngangkham Nimai Singh, a professor in the faculty of physics, comes in second place with 27 open access documents, subsequent by Nilkamal Singh, Assistant Professor from the Yoga

department having 20 open access papers out of 29 total articles. The table illustrates that the top open access article generators have generated more than 50% of their total publications as OA papers.

Table 5.23: Prolific Authors of Manipur University

Total Publications		**OA Publications**	
Author	**NP**	**Author**	**NP**
Rajmuhon Singh, Nongmaithem	88	Angom, Dilip	59
Dorendrajit Singh, Shougaijam	78	Nimai Singh, Ngangkham	27
Phanjoubam, Sumitra	71	Singh, Nilkamal	20
Angom, Dilip	70	Singh, Thiyam Ramsing	20
Mukherjee Singh, Okram	65	Chandrachani Devi, N.	19
Singh, Laitonjam Warjeet	57	Mukherjee Singh, Okram	15
Nimai Singh, Ngangkham	46	Singh, Lisam Shanjukumar	14
Devi, Th Gomti	44	Singh, Kangujam Priyokumar	12
Singh, Kangujam Priyokumar	35	Rahaman, Md Hamidur	11
Singh, Ravindra Kumar Hemakumar	35	Meitei, N. Mohilal	11

NP=Number of Publications

5.12.3. Prolific authors based on number of publications for Mizoram University

Table 5.24 displays the top faculty depending on the contributions of Mizoram University's overall publications as well as open access publications. Senthil Kumar Nachimuthu, a professor in the Biotechnology department, generated the most papers overall (179 papers) in terms of the number of articles in relation to the total number of publications. The following two on the list of contributors are Diwakar Tiwari, a professor in the Chemistry department, and Viswambhar Prasad Sati, another professor in the faculty of Geography and Resource Management, with 127 and 86 documents, correspondingly. Senthil Kumar Nachimuthu, a professor in the department of biotechnology, published the highest number of open access papers in the open access domain with 72 OA papers. Assistant Professor of the Biotechnology Department, Bhim Pratap Singh is in the next spot with 40 open access publications,

right behind is the Professor of Zoology, Hmar Tlawmte Lalrensanga with 29 open access papers out of 45 total papers. The data shows that the top authors of open access articles have produced less than half of all of their publications as OA papers.

Table 5.24: Prolific Authors of Mizoram University

Total Publications		**OA Publications**	
Author	**NP**	**Author**	**NP**
Nachimuthu, Senthil Kumar	179	Nachimuthu, Senthil Kumar	72
Tiwari, Diwakar	127	Singh, Bhim Pratap	40
Sati, Vishwambhar Prasad	86	Lalremsanga, Hmar Tlawmte	29
Maity, Niladri Pratap	79	Das, Joydeep	22
Das, Joydeep	78	Singh, Rambir	17
Gurusubramanian, Guruswami	75	Tiwari, Diwakar	16
Maity, Reshmi	73	Tripathi, Shri Kant	15
Singh, Bhim Pratap	73	Sahoo, Uttam Kumar	15
Tripathi, Shri Kant	69	Tripathi, Om Prakash	15
Rai, Prabhat Kumar	54	Gurusubramanian, Guruswami	12

NP=Number of Publications

5.12.4. Prolific Authors based on Number of Publications for Nagaland University

Table 5.25 presents the most notable academics based on their publications in terms of the total number of publications and open access publications at Nagaland University. With respect to the ratio of total papers, Professor Dipak Sinha produced the maximum number of articles i.e., 58 papers belonging to the department of chemistry. The next two lineup of authors are Chitta Ranjan S. Deb, a professor in the faculty of Botany having 50 papers, and Upasana Bora Sinha, a female professor belonging to the department of chemistry with 26 papers. However, the assistant professor of biotechnology, Rajkrishna Mondal authored five open access publications, which is the greatest number of publications in the open access field in the particular university. The Nagaland University is one to have the least number of open access publications from the undertaken sample size. Yet, Imlitoshi Jamir from the faculty of Biotechnology and Loli Daiho from the Plant Pathology department have

produced only two papers each adopting the open access platform. The rest nine numbers of academics from different departments have released one each number of open access articles in this university.

Table 5.25: Prolific Authors of Nagaland University

Total Publications		OA publications	
Author	**NP**	**Author**	**NP**
Sinha, Dipak	58	Mondal, Rajkrishna	5
Deb, Chitta Ranjan S.	50	Jamir, Imlitoshi	2
Sinha, Upasana Bora	26	Daiho, Loli	2
Indira Devi, M.	22	Vidyarthi, V. K.	1
Yenisetti, Sarat Chandra	21	Maiti, Chandan Suravi	1
Bharali, Pranjal	19	Rathore, Hanumant Singh	1
Jamir, Latonglila	19	Sharma, Amod	1
Vidyarthi, V. K.	19	Banik, Susanta	1
Sundarayya, Y.	17	Dzuvichu, Rosemary R.	1
Phukan, Mayur Mausoom	16	Kigwie, S.	1

NP=Number of Publications

5.12.5. Prolific Authors based on Number of Publications for NEHU

Table 5.26 highlights the most prominent academics at North Eastern Hill University in accordance with the total number of publications and open access papers that have been produced. NEHU is the second-largest producer of articles with regard to both total and open access publications. The analysis states that in terms of overall publications, Professor Asit Kumar Chandra from the chemistry department has authored the greatest quantity of publications i.e., 170 articles. The subsequent two academic contributors are Tushar S. Basu Baul, a professor in the faculty of chemistry, who has 166 publications, and Santaram Joshi, a professor in the faculty of biotechnology and bioinformatics, who has 125 works. Timir Tripathi, an assistant professor of biochemistry, is the author having the majority of open access works (41 OA articles) in that field of open access at this specific university. The academic personality in next place is Tushar S. Basu Baul, a professor in the department of

chemistry, who has 33 open access publications. Santaram Joshi, a professor of biotechnology and bioinformatics department, is just behind him with 32 of his 125 total articles being open access.

Table 5.26: Prolific Authors of NEHU

Total Publications		**OA publications**	
Author	**NP**	**Author**	**NP**
Chandra, Asit Kumar	170	Tripathi, Timir	41
Basu Baul, Tushar S.	166	Basu Baul, Tushar S.	33
Joshi, Santaram	125	Joshi, Santaram	32
Mitra, Sivaprasad	105	Velusamy, Marappan	31
Kumaria, Suman	99	Mahato, Mangal C.	30
Tripathi, Timir	97	Paul, Sudip	25
Velusamy, Marappan	93	Kumaria, Suman	22
De, Utpal Kumar	81	Dutta, Jibitesh	22
Paul, Sudip	79	Bhattacharjee, Atanu	21
Bhatia, Dinesh	75	Bhatia, Dinesh	20

NP=Number of Publications

5.12.6. Prolific Authors based on Number of Publications for Rajiv Gandhi University

The most prolific academics at Rajiv Gandhi University are shown in Table 5.27 depending on the total number of publications and open access papers. According to the data analysis, Vinod V. Kumar, assistant professor from the commerce department has contributed to the majority of publications in general, totalling 86 papers. Md Harunar Rashid, an assistant professor in the faculty of chemistry, comes in second with 64 publications, followed by Nipen Saikia, an associate professor at the department of mathematics, with 49 publications. Nipen Saikia, an associate professor in the mathematics division, contributed the greatest quantity of research works in the open access domain with 19 OA papers in this academic institution. The second-positioned academician is an assistant professor in the commerce department named Vinod V. Kumar, who has authored 18 open access publications. Sumpam Tangjang, a

professor in the botany department, is subsequent to him, with 14 OA papers out of his 29 total papers. This table also highlights that the top academician in the total publications has moved to the second position when it came to producing open access publications.

Table 5.27: Prolific Authors of Rajiv Gandhi University

Total Publications		**OA publications**	
Author	**NP**	**Author**	**NP**
Kumar, Vinod V.	86	Saikia, Nipen	19
Rashid, Md Harunar	64	Kumar, Vinod V.	18
Saikia, Nipen	49	Tangjang, Sumpam	14
Ahmed, Sahin	41	Das, Debangshu Narayan	12
Bayan, Sayan	41	Ahmed, Sahin	11
Das, Debangshu Narayan	39	Rashid, Md Harunar	9
Kalita, Pradip Kumar R.	39	Chakravorty, Jharna	9
Tag, Hui	31	Tag, Hui	8
Tangjang, Sumpam	29	Sarma, Hirendra Nath	7
Jaiswal, Jyoti	27	Rahman, Saifur	7

NP=Number of Publications

5.12.7. Prolific Authors based on Number of Publications for Sikkim University

Table 5.28 identifies the most notable faculty members at Sikkim University based on the total number of documents published and open access articles. The data assessment shows that Jyoti Prakash Tamang, who is a professor in the domain of microbiology published 103 articles overall, which reflects the greatest number of articles. Partha Pratim Ray, an assistant professor in the department of computer application, comes in second with 75 papers, while Swarup Roy, designated as professor is also from the faculty of computer application, and stands in third with 66 publications. In case of open access publishing, the top publication producer Jyoti Prakash Tamang, a professor of microbiology at this university, also made the greatest contributions to open access research with 30 OA papers. With 25 open access publications to his credit, Subir Mukhopadhyay, a professor in the physics department, landed in second

rank. While, Nitish Mondal, an associate professor in the department of anthropology, is the next author having 20 OA papers out of his 41 total publications. The results showed that only a fraction of the overall publications produced by the top authors were OA papers.

Table 5.28: Prolific Authors of Sikkim University

Total Publication		**OA Publication**	
Author	**NP**	**Author**	**NP**
Tamang, Jyoti Prakash	103	Tamang, Jyoti Prakash	30
Ray, Partha Pratim	75	Mukhopadhyay, Subir	25
Roy, Swarup	66	Mondal, Nitish	20
Misra, Anil Kumar	52	Thakur, Nagendra	17
Rajesh Raj, Seethamma Natarajan	47	Ray, Partha Pratim	15
Mondal, Nitish	41	Misra, Anil Kumar	13
Roy, Biswajit Gopal	36	Roy, Swarup	11
Mukhopadhyay, Subir	35	Chakraborty, Amit	11
Chakraborty, Amit	32	Pariyar, Anand	9
Tripathi, Ajay	31	Chettri, Dhani Raj	9

NP=Number of Publications

5.12.8. Prolific Authors based on Number of Publications for Tezpur University

Table 5.29 outlines the highest-ranking academic members in order of their contributions made in both open access publications and overall publications at Tezpur University. Tezpur University has the highest number of publications in terms of both total and open access publications amongst the selected central universities. The evaluation of the data reveals that Niranjan Karak, a professor in the field of chemical sciences, published 275 publications, which represents the highest number of publications within the overall publication count. Professor Ramesh Chandra Deka is also a member of the faculty of chemical sciences and attained the second rank with 214 publications. With 193 articles, Professor Dhruba Kumar Bhattacharyya a member in the field of computer science and engineering has successfully acquired the third rank in terms of overall publications of the university. In the open access category,

Mrinal Kumar Das is designated as the professor of the Physics Department has made the greatest quantity of contributions in the open access platform (37 OA papers) in spite of having low publications (49 articles) when compared to the top overall publication producer. Professor Sankar Chandra Deka a member of the Department of Food Engineering and Technology has been success in acquiring the next top open access article generator with 33 OA articles followed by Professor Nayandeep Deka Baruah from the Department of Mathematical Science with 28 OA papers.

Table 5.29: Prolific Authors of Tezpur University

Total Publication		**OA Publication**	
Author	**NP**	**Author**	**NP**
Karak, Niranjan	275	Das, Mrinal Kumar	37
Deka, Ramesh Chandra	214	Deka, Sankar Chandra	33
Bhattacharyya, Dhruba Kumar	193	Baruah, Nayandeep Deka	28
Dolui, Swapan Kumar	157	Bhattacharyya, Dhruba Kumar	25
Mohanta, Dambarudhar	143	Sarma, Jayanta Kumar	24
Sahu, Partha Pratim	116	Nath, Rajat Kanti	24
Maji, Tarun Kumar	112	Karak, Niranjan	22
Bora, Utpal	111	Karmakar, Pralay Kumar	20
Deka, Sankar Chandra	99	Mandal, Manabendra	19
Thakur, Ashim Jyoti	96	Mattaparthi, Venkata Satish Kumar	19

NP=Number of Publications

5.12.9. Prolific Authors based on Number of Publications for Tripura University

Table 5.30 displays the top academicians at Tripura University with an emphasis on their number of publications regarding open access papers and total publications. The investigation of the data demonstrates that Syed Arshad Hussain, a professor in the discipline of physics, produced 130 articles, the most among all authors with articles that have been published. The academic personality in second place is Debajyoti Bhattacharjee, a professor in the department of physics, with 118 articles, surpassed by Ravindra Kumar Sinha, a professor who belongs to the faculty of botany, in the third position with 95 articles. Syed Arshad Hussain, a professor in the

department of physics, has produced the largest number of open access articles among faculty members, with 34 of his 130 total works falling under this category. Professor Anirban Guha from the department of Physics is the next-highest open access publication (27 OA articles) generator after Professor Debajyoti Bhattacharjee of the physics department, who has 23 OA articles to his credit.

Table 5.30: Prolific Authors of Tripura University

Total Publication		**OA Publication**	
Author	**NP**	**Author**	**NP**
Hussain, Syed Arshad	130	Hussain, Syed Arshad	34
Bhattacharjee, Debajyoti	118	Bhattacharjee, Debajyoti	27
Sinha, Ravindra Kumar	95	Guha, Anirban	23
De, Barin Kumar	94	Debnath, Shyamal	22
Bhowmik, Mrinal Kanti	82	Sinha, Ravindra Kumar	21
Guha, Anirban	79	Bhattacharjee, Surajit	19
Bhattacharjee, Surajit	64	De, Barin Kumar	18
Chattopadhyaya, Surya	63	Datta, Badal Kumar	13
Majumder, Swanirbhar	60	Maiti, Debasish	11
Khan, Gobinda Gopal	56	Manna, Kuntal S.	11

NP=Number of Publications

5.13. Distribution of Prolific Authors based on Total Citation (TC) for each University

Table 5.31 describes the most prolific academicians with the highest number of citations attained within the selected universities. The highest citation count reflects the impact of the study conducted by the researcher which helps in the validation of various other research ideas. The total citations of the overall publications are a bit higher in number than the specific category of open access publications. Professor N. Karak from Tezpur University gained the maximum number of citations followed by Assistant Professor SK Ghosh from Assam University in total publication range. However, Associate Professor S Kumar from Assam University attained the greatest number of citations in the open access category which is trailed by Senthil Kumar N

from Mizoram University. Based on the number of citations acquired, it is reflected that departments such as Chemistry, Physics, Mathematics, Microbiology, Biotechnology, and Life Sciences are the based departments to enhance the productivity and impact of the selected universities of North-east India.

Table 5.31: Prolific Authors based on Total Citation (TC) for selected Universities

University	Total publications		OA publications	
	Author	TC	Author	TC
AU	Ghosh SK	9581	Kumar S	1926
MU	Singh OM	1006	Angom D	676
MZU	Das J	4790	Senthil Kumar N	1683
NU	Dzuvichu RR	451	Dzuvichu RR	451
NEHU	Chandra AK	4365	Tripathi T	954
RGU	Kumar V	1355	Evelin H	860
SKU	Tamang JP	5644	Tamang JP	1298
TZU	Karak N	11033	Baruah DC	1018
TRU	Bhattacharjee S	2960	Bhattacharjee D	1035

TC=Total Citation

5.13.1. Prolific Authors based on Total Citation (TC) for Assam University

Table 5.32 summarizes and reflects the most esteemed academic professional of Assam University according to the amount of gained citations from their academic literature. In terms of the overall number of citations obtained through academic papers, Sujit Kumar Ghosh, the assistant professor in the subject area of chemistry has accumulated the maximum volume of citations (9581 citations) through 116 scholarly articles. A professor from the physics department named Utpal Sarkar, who was in the subsequent spot in the ranking has been honoured. His 121 scholarly literature have been referenced in 4149 instances. The next faculty member to top the list is Associate Professor Sanjeev Kumar of the life sciences and bioinformatics department, who currently holds 2478 citations from just 36 academic papers. Regarding the open access publication approach, Sanjeev Kumar, an associate professor in the life sciences and bioinformatics department, achieved the maximum citations. His 23 scholarly

works with open access were cited on 1926 occasions in total. With 1106 citations from 9 articles of open access research literature, the assistant professor of the life science and bioinformatics department named Shuvasish Choudhury is an academic professional is the one with the next-highest collection of citations.

Table 5.32: Prolific Authors based on Total Citation (TC) for Assam University

Total publications		**OA publications**	
Author	**TC**	**Author**	**TC**
Ghosh SK	9581	Kumar S	1926
Sarkar U	4149	Choudhury S	1106
Kumar S	2478	Ghosh SK	930
Borah A	2187	Borah A	927
Bhattacharjee CR	1932	Roychoudhury S	833
Giri A	1862	Roy A	780
Pandey P	1822	Bhattacharjee A	773
Giri S	1676	Pandey P	723
Roychoudhury S	1670	Sen AK	586
Choudhury S	1665	Choudhury MD	448

TC=Total Citation

5.13.2. Prolific Authors based on Total Citation (TC) for Manipur University

The top Manipur University academic faculty are identified and represented in Table 5.33 sorted by the number of citations they have previously acquired. In the context of the total number of citations obtained via academic publications, Okram Mukherjee Singh, a professor belonging to the discipline of chemistry who have gained the maximum amount of citations (1006 citations) through 65 research articles. Nongmaithem Rajmuhon Singh, who has been identified as a professor in the chemistry department has been in the next raking. His 88 papers have been cited 884 times. The next faculty in the row is professor Arun Kumar from the discipline of earth science by racking up 852 citations from just 13 pieces of scientific literature. Professor of the physics department Dilip Angom has received the highest proportion of citations with respect to the open access publication model. His 59 open access

scholarly papers were cited 676 times in total. The university faculty member with the second-highest number of citations i.e., 526 citations from 20 pieces of open access scholarly research is Nilkamal Singh, an assistant professor in the department of yoga. The subsequent contributor on the list of ranking is Lisam Shanjukamr Singh, an assistant professor in the field of biotechnology who has produced 14 academic works that have received 302 citations.

Table 5.33: Prolific Authors based on Total Citation (TC) for Manipur University

Total Publications		**OA Publications**	
Author	**TC**	**Author**	**TC**
Singh OM	1006	Angom D	676
Singh NR	884	Singh N	526
Kumar A	852	Singh LS	302
Singh SD	840	Kundu S	239
Angom D	741	Singh SS	225
Singh LS	732	Nimai Singh N	206
Hoque N	722	Mukherjee S	190
Phanjoubam S	689	Ningthoujam DS	169
Kundu S	672	Chandrachani Devi N	135
Singh N	599	Devi SK	124

TC=Total Citation

5.13.3. Prolific Authors based on Total Citation (TC) for Mizoram University

Table 5.34 outlines the academic staff members of Mizoram University sorted by the number of citations that have been earned. With regard to the aggregate amount of citations gathered from academic works, Joydeep Das, the assistant faculty in the field of chemistry, has accumulated the biggest number of citations altogether i.e., 4790 citations through 78 scientific papers. Diwakar Tiwari, who was designated as a professor in the department of chemistry, is the author in the row below. His 127 articles netted him 3313 citations. The next place in the rankings is held by Prabhat Kumar Rai, an assistant professor in the Environmental Science domain who has successfully assembled 2810 citations through 54 scientific articles. The academic

with the highest number of citations worldwide allied to the open access publication paradigm is Biotechnology professor Senthil Kumar Nachimuthu. He garnered 1683 citations altogether for his 72 OA research publications. Bhim Pratap Singh, an assistant professor in the department of biotechnology, is the university faculty who obtained the next-greatest amount of citations which is 1069 coming from 40 open access academic literature. The next on the list of authors is Joydeep Das, another assistant professor in the discipline of chemistry who has been cited 949 times for his 22 scientific publications.

Table 5.34: Prolific Authors based on Total Citation (TC) for Mizoram University

Total Publication		**OA Publication**	
Author	**TC**	**Author**	**TC**
Das J	4790	Senthil Kumar N	1683
Tiwari D	3313	Singh BP	1069
Rai PK	2810	Das J	949
Mehta SK	2165	Mishra L	912
Gurusubramanian G	1741	Shree A	902
Lalhmunsiama	1658	Rai PK	685
Tripathi SK	1417	Lalremruata B	487
Singh BP	1345	Singh R	424
Tripathi OP	1031	Hussain J	357
Singh R	998	Tripathi OP	324

TC=Total Citation

5.13.4. Prolific Authors based on Total Citation (TC) for Nagaland University

A ranking of the faculty members of Nagaland University is mentioned in Table 5.35 according to the number of citations they obtained. According to the total number of citations obtained as per academic literature, Rosemary R. Dzuviche, the female professor in the English branch has gathered the highest total amount of citations (451 citations) from just two scholarly articles. The contributor on the following row is Arbind Kumar Verma, a professor of the Agricultural Engineering department. From just five publications, he achieved 219 citations. The assistant

professor of the Agricultural Chemistry and soil sciences department namely Jurisandhya Bordoloi has the next position in the rankings with 111 citations also from just five publications. Rosemary R. Dzuviche, the professor of English, is the academician with the most citations globally associated with the open access publishing model. She received a total of 451 citations for her single OA research paper. The next most cited member of the university is assistant professor Susanta Banik who teaches in the department of plant pathology and has received 39 citations from a single open access paper. The one that follows the list is Buno Liegise, the female professor in the education section with sole open access publication and has undertaken 25 citations to her credit.

Table 5.35: Prolific Authors based on Total Citation (TC) for Nagaland University

Total Publication		**OA Publication**	
Author	**TC**	**Author**	**TC**
Dzuvichu RR	451	Dzuvichu RR	451
Verma AK	219	Banik S	39
Bordoloi JS	111	Liegise B	25
Rathore HS	76	Jamir I	18
Banik S	64	Daiho L	7
Maiti CS	41	Sinha D	7
Sema A	41	Lairenjam C	5
Jamir I	28	Maiti CS	3
Liegise B	25	Vidyarthi VK	2
Rao BV	18	Kigwie S	1

TC=Total Citation

5.13.5. Prolific Authors based on Total Citation (TC) for NEHU

Table 5.36 highlights the authors of the academic papers written by faculty members at North Eastern Hill University in the order of the number of citations they have received. On the basis of the total academic literature, Asit Kumar Chandra a professor in the department of chemistry has accumulated the most citations (4365 citations) from 170 articles. Marappan Velusamy who is a professor in the chemistry domain, is

the author in the next row. He has received 3414 citations from 93 papers. The professor who claims the next position in the rankings is Tushar S. Basu Baul in the field of chemistry who has accumulated 2404 citations from 166 writings. The academic member with the most citations overall in relation to open access publishing style is assistant professor of biochemistry Timir Tripathi, who has racked up 954 citations through 41 OA scholarly works. A female professor named Srimoyee Ghosh, who works in the department of zoology has attained 664 citations from 15 OA articles making her the second- most cited faculty of the university. The next name is Santaram Joshi, who holds the title of professor in the biotechnology and bioinformatics division and has received 657 citations from 32 open access publications.

Table 5.36: Prolific Authors based on Total Citation (TC) for NEHU

Total Publications		**OA Publications**	
Author	**TC**	**Author**	**TC**
Chandra AK	4365	Tripathi T	954
Velusamy M	3414	Ghosh S	664
Basu Baul TS	2404	Joshi SR	657
Mitra S	2389	Mahato MC	613
Aguan K	1994	Velusamy M	564
Kumaria S	1885	Saha N	493
Saha N	1859	Kumar A	483
Joshi SR	1701	Mitra S	411
Tripathi T	1619	Basu Baul TS	395
Khatua S	1595	Kumaria S	390

TC=Total Citation

5.13.6. Prolific Authors based on Total Citation (TC) for Rajiv Gandhi University

Table 5.37 specifies the authors of the academic works published by Sikkim University faculty members in order of earned citations. Vinod Kumar, an assistant professor at the department of commerce, has amassed the most citations (1355 citations) in terms of total scholarly literature from 86 different papers. The contributor in the subsequent

row is Heikham Evelin a female assistant professor of the faculty of botany who has garnered 1342 citations from only 7 articles. However, with 890 citations from 64 works, assistant professor Md Harunar Rashid of the university's department of chemistry is the academician who ranks next in the rankings. With reference to open access publication mode, the member of the faculty with the highest total citations is botany assistant professor Heikham Evelin, who has accumulated 860 citations from only two OA articles. The contributor with the second-highest number of citations is assistant professor Vinod Kumar who belongs to the Department of Commerce and possesses 497 citations from 18 OA contributions. The following name is Pradip Kumar Kalita who is designated as a professor in the physics department being cited 271 times from only five open access papers.

Table 5.37: Prolific Authors based on Total Citation (TC) for Rajiv Gandhi University

Total Publication		**OA Publication**	
Author	**TC**	**Author**	**TC**
Kumar V	1355	Evelin H	860
Evelin H	1342	Kumar V	497
Rashid MDH	890	Kalita PK	271
Jaiswal J	520	Chakravorty J	234
Ahmed S	462	Tangjang S	115
Chakravorty J	442	Ahmed S	102
Kalita PK	415	Saikia N	96
Jamatia R	342	Sarma HN	90
Tangjang S	279	Rashid MH	90
Sarma HN	247	Tag H	84

TC=Total Citation

5.13.7. Prolific Authors based on Total Citation (TC) for Sikkim University

A ranking of the authors based on the greatest number of citations for the publications produced by academics at Sikkim University can be found in Table 5.38. In the context of total publication, Jyoti Prakash Tamang, a professor in the university's department of microbiology, has accumulated the highest number of citations (5644 citations) from

103 distinct articles. The faculty in the second row, Professor Shanti S. Sharma from the department of botany, obtained 2572 citations from 12 articles. Professor Partha Pratim Ray, who ranks third on the list and has 2392 citations from 75 publications, is a member of the department of computer application. With a total of 30 open access papers and 1298 citations, the academic member from the microbiology department professor Jyoti Prakash Tamang has the highest number of open access publications. An assistant professor Partha Pratim Ray of the computer application department is the contributor who is ranked second acquiring 1195 citations from 25 OA works.

Table 5.38: Prolific Authors based on Total Citation (TC) for Sikkim University

Total Publication		**OA Publication**	
Author	**TC**	**Author**	**TC**
Tamang JP	5644	Tamang JP	1298
Sharma SS	2572	Ray PP	1195
Ray PP	2392	Misra AK	391
Tamang B	1366	Sharma SS	312
Tamang S	1138	Acharya BK	196
Misra AK	922	Mukhopadhyay S	183
Thapa S	874	Chettri B	181
Dewan S	855	Chakraborty SN	171
Rai AK	692	Rai D	154
Sharma L	687	Roy S	152

TC=Total Citation

5.13.8. Prolific Authors based on Total Citation (TC) for Tezpur University

Table 5.39 provides a list of the authors who have gained the highest quantify of citations for the publications generated by Tezpur University's faculty members. Niranjan Karak, a professor in the faculty of chemical sciences, has obtained the most amount of citations (11033 citations) from 275 different works in terms of overall publishing. Professor Dhruba Kumar Bhattacharjee belonging to the computer science and engineering department is the contributor who is in the second row and has received 5095 citations from 193 documents. Professor Manabendra Mandal from the

department of molecular biology and biotechnology is the faculty member who is in third place in the rankings and has received 4331 citations from 85 articles. The academician with the greatest amount of open access articles is energy department professor Debendra Chandra Baruah, who has 1018 citations from 13 separate open access papers. Professor Manabendra Mandal of the molecular biology and biotechnology department is the contributor who is ranked second acquiring 890 citations from 19 OA works. Shyamal Kumar Das, an assistant professor in the department of physics is listed next. He has received 876 citations from only five open access articles.

Table 5.39: Prolific Authors based on Total Citation (TC) for Tezpur University

Total publication		**OA Publication**	
Author	**TC**	**Author**	**TC**
Karak N	11033	Baruah DC	1018
Bhattacharyya DK	5095	Mandal M	890
Mandal M	4331	Das SK	876
Dolui SK	4126	Bhattacharyya DK	738
Bora U	3879	Barah P	725
Das SK	3793	Mukhopadhyay R	687
Thakur AJ	3786	Namsa ND	610
Konwar BK	3706	Deka SC	595
Maji TK	3506	Ramteke A	543
Deka D	3375	Bhattacharya S	511

TC=Total Citation

5.13.9. Prolific Authors based on Total Citation (TC) for Tripura University

Table 5.40 ranks the most prolific authors based on the total citations of the articles that have been published by faculties of Tripura University. In case of total publication, the assistant professor named Surajit Bhattacharjee from the department of Molecular Biology and Bioinformatics has attained the maximum number of citations of 2960 from 64 numbers of articles. The author to stand in the second place is professor Debajyoti Bhattacharjee from the faculty of physics who has gained 2730 citations

from 118 papers and the academician to hold the third position is professor Ravindra Kumar Sinha from the department of botany with 95 publications has gained 2184 citations. In terms of open access publications, the author to gained the maximum number of citations is professor Debajyoti Bhattacharjee who belongs to the physics department with 1035 citations from 27 numbers of OA papers. Professor Syed Arshad Hussain of the department of physics is the contributor who is in the second spot in the rankings. He has received 1002 citations from 34 works. The next is assistant professor Surajit Bhattacharjee a member of the molecular biology and bioinformatics department gaining 803 citations from 19 OA publications.

Table 5.40: Prolific Authors based on Total Citation (TC) for Tripura University

Total Publications		**OA Publications**	
Author	**TC**	**Author**	**TC**
Bhattacharjee S	2960	Bhattacharjee D	1035
Bhattacharjee D	2730	Hussain SA	1002
Sinha RK	2184	Bhattacharjee S	803
Hussain SA	2166	Guha A	538
Khan GG	2100	Debbarma S	464
Majumdar S	1455	Sil SK	428
Das R	1260	Sinha RK	413
Guha A	1173	Chakraborty S	386
Chakraborty S	965	Majumdar S	378
Saha M	879	Maiti D	336

TC=Total Citation

5.14. Distribution of top funding agencies based on number of publications

Table 5.41 reveals prolific funding agencies that provided ultimate support to these selected central universities in both overall publication and open access publication measures based on the total number of publications. On the basis of analysing the data, the top funding organization to support the central universities is the Department of Science and Technology (DST) under the Ministry of Science and Technology of the Government of India which aims to promote recent developments in the field of

science and technologies (DST, 2021). The department of Science and Technology is the significant organization that tops seven central universities such as Assam University, Manipur University, Mizoram University, Nagaland University, Sikkim University, Tezpur University and Tripura University amongst the nine undertaken central universities of North East India in the category of entire publication ratio. While, the top funding agency to boost and provide fund for research productivity for NEHU and Rajiv Gandhi University is the University Grants Commission, which is the only grant-giving organization that provide funds to institutions of higher education in the country (UGC, 2023). However, with regards to open access publication, the department of Biotechnology is the prolific funder for the universities viz. Assam University, Mizoram University, Nagaland University and Sikkim University. The Department of Biotechnology (DBT) is also under the Ministry of Science and Technology of the Government of India that focuses on research, and innovations and also provides extramural funds, especially in biotechnology (DBT, 2023). DST tops in three universities namely Manipur University, Tezpur University and Tripura University; and UGC tops in the following universities like NEHU and Rajiv Gandhi University in the area of open access publications.

Table 5.41: Top Funding Agencies on Total and Open Access Publications

Funding Agency				
University	**Total publication**	**NP**	**OA publication**	**NP**
Assam University	Department of Science and Technology (DST)	323	Department of Biotechnology (DBT)	71
Manipur University	Department of Science and Technology (DST)	138	Department of Science Technology (DST)	34
Mizoram University	Department of Science and Technology (DST)	224	Department of Biotechnology (DBT)	81
Nagaland University	Department of Science and Technology (DST)	8	Department of Biotechnology (DBT)	3
NEHU	University Grants Commission (UGC)	384	University Grants Commission (UGC)	75
Rajiv Gandhi University	University Grants Commission (UGC)	61	University Grants Commission (UGC)	15
Sikkim University	Department of Science and Technology (DST)	100	Department of Biotechnology (DBT)	31
Tezpur University	Department of Science and Technology (DST)	587	Department of Science and Technology (DST)	119
Tripura University	Department of Science and Technology (DST)	190	Department of Science and Technology (DST)	42

NP=Number of Publications

PART B: ANALYSIS OF DATA AND REMARKS COLLECTED FROM THE RESPONDENTS OF ONLINE QUESTIONNAIRE

5.15. Distribution of filled Questionnaire

Table 5.42 presents the distribution of the questionnaire to the academic faculty of each university to share the perspective regarding the adoption and acceptance of open access publishing mode. The questionnaire has been circulated to the top ten faculty of all the undertaken central universities of North East India on the basis of the number of open access publications through email and WhatsApp. The top ten faculty of each university have been identified through publishing scholarly literature adopting open access publishing routes. The data for identifying the top authors is extracted from the Scopus database. The below table highlights the number of filled questionnaires by faculties of the selected universities. All ten questionnaires circulated to Mizoram university (100%) have been filled with responses and suggestions. The academicians of North Eastern Hill University and Rajiv Gandhi University have responded by 90% indicating that only a single faculty did not respond to the questionnaire for both universities. The next universities are Assam University and Sikkim University with 80% share of the filled questionnaire. The universities with 70% share of the filled questionnaire are Manipur University, Tezpur University and Tripura University. However, there was no response from Nagaland University towards the open access mode of publishing.

Table 5.42: Distribution of Filled Questionnaire per University

Sl. No.	University	Total Questionnaire Sent	Filled Questionnaire (share %)
1	Assam University	10	8(80)
2	Manipur University	10	7(70)
3	Mizoram University	10	10(100)
4	Nagaland University	10	0(0)
5	North Eastern Hill University	10	9(90)
6	Rajiv Gandhi University	10	9(90)
7	Sikkim University	10	8(80)
8	Tezpur University	10	7(70)
9	Tripura University	10	7(70)
Total		90	65(72.22)

5.16. Age Group of the Respondent

Figure 5.51 highlights the age group of the respondents among the selected universities. the age group for the respondent have been classified into five categories such as below 25 years, 26-35 years, 36-45 years, 46-55 years and above 55 years. The general classification of the age group has been signified with a ten-year age interval. The maximum number of respondents belongs to the age group of 36-45 years which is inclusive of 25 (38.46 %) from the undertaken sample for the questionnaire. The next highest number of respondents fall under the age category of 46-55 years having 21 (32.31%) which is followed by the group of the faculties above the age of 55 years with 15 quantity (23.08%). The category with the least numbers from the population for questionnaire distribution is the age group of 26-35 years having only 4 numbers (6.15%) of faculties members. None of the respondents from the sample fall under the first category of the age group which is below 25 years.

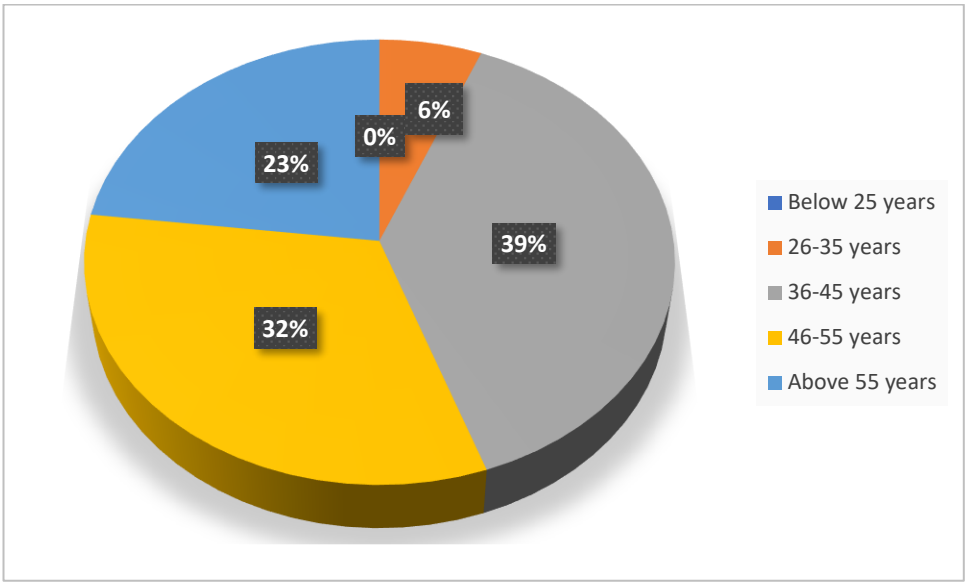

Figure 5.51: Age Group of the Respondent

5.17. Gender of the Respondent

Figure 5.52 indicates an overview of the gender category of the respondent. The gender category has been categorised into three sections viz. female, male and prefer not to respond. According to the recipient of the questionnaire, it can be highlighted that faculties from the questionnaire were male rather than female. The male gender population from the respondent is much higher than the female respondent. The number of male respondents was (62 male) 95.38% however, the female respondents were only three i.e., 4.62 % of the respondent sample. It is also to be highlighted that all the respondents have identified their own gender rather than filling the category of prefer not to say/respond. This highlights the fact that male faculties are the ones to adopt open access publishing methods compared to female academicians.

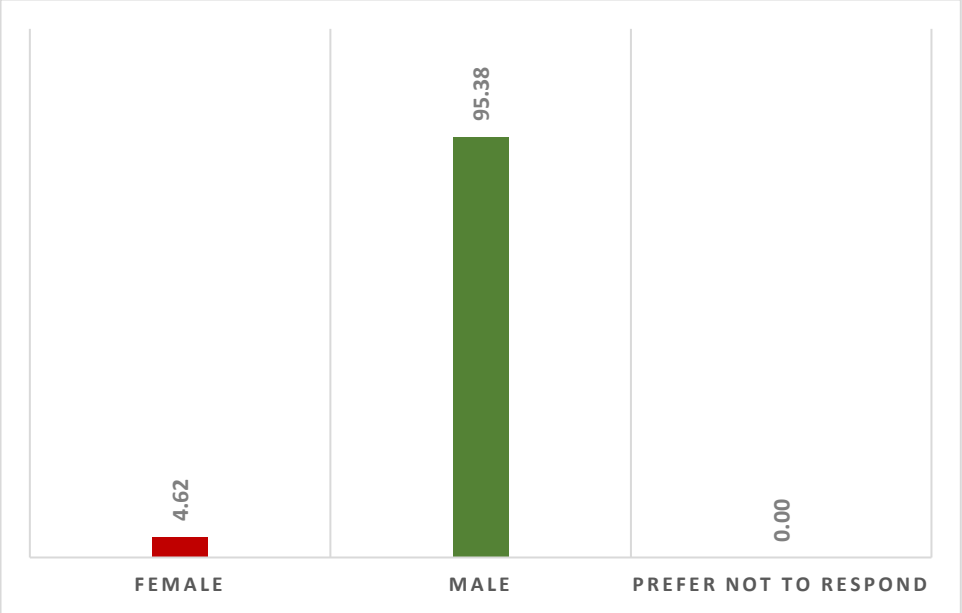

Figure 5.52: Gender of the Respondent

5.18. Distribution of Department of the Respondent

Table 5.43 displays the overall department distribution of the respondents to the questionnaire from the sample of the selected universities. A sum of twenty-nine different departments have been identified from the responds of the respondents. The below table demonstrates that the faculty of physics discipline (15.38%) has majorly responded to the questionnaire. Another explanation is that most of the faculty who fall under the top ten ranking based on open access publishing are from the Department of Physics but affiliated with different universities of the undertaken sample. The next discipline with the maximum responds is gained from chemistry department with 12.31% that is after the department of mathematics having 10.77%. The department of Botany and Zoology with 6.15% each has the per cent of the respondents to the questionnaire on the concept of open access publications. When observed, it is seen that the faculty falls under the top ten rank and the respondents are mainly from physical sciences, biological sciences, and computer sciences. Therefore, it indicates that the field of these physical, biological and computer sciences are ruling over other fields such as arts, humanities, and social sciences; as they produce scholarly articles adopting open access publishing platforms.

Table 5.43: Distribution of Department of the Respondents

Sl. No.	Department	Number of Respondent	Percentage (%)
1	Agriculture and Environmental Sciences	1	1.54
2	Anthropology	1	1.54
3	Biochemistry	1	1.54
4	Biomedical Engineering	2	3.08
5	Biotechnology	3	4.62
6	Biotechnology & Bioinformatics	1	1.54
7	Botany	4	6.15
8	Chemistry	8	12.31
9	Computer Science	1	1.54
10	Computer science and engineering	2	3.08
11	Computer Applications	1	1.54
12	Forestry	2	3.08
13	Environmental Science	1	1.54
14	Food Engineering and Technology	1	1.54
15	Geography	1	1.54
16	Geology	1	1.54
17	Horticulture, Aromatic and Medicinal Plants	1	1.54
18	Human Physiology	1	1.54
19	Life Science	1	1.54
20	Life Science & Bioinformatics	2	3.08
21	Mathematics	7	10.77
22	Microbiology	3	4.62
23	Molecular Biology and Biotechnology	1	1.54
24	Molecular Biology and Bioinformatics	1	1.54
25	Pharmaceutical Sciences	1	1.54
26	Pharmacy	1	1.54
27	Physics	10	15.38
28	Yoga	1	1.54
29	Zoology	4	6.15
Total		**65**	**100.00**

5.19. Designation of the Respondent

Figure 5.53 denotes the designation of the respondents to fill up the questionnaire regarding open access publishing. In the designation category, designations were distributed into four key forms namely Assistant professor, Associate professor, Professor and Senior professor. Out of 65 numbers of respondents, 47.69% of the respondent were designated as professors which means the highest rank in academics at the university which has been represented according to hierarchy. Assistant professor claims to have the next highest designations among the respondents with 23.08 per cent which is followed by the associate professors with 21.54 per cent. There were very few senior professors among the respondents which hold only 7.69 percent of respondents of the sample.

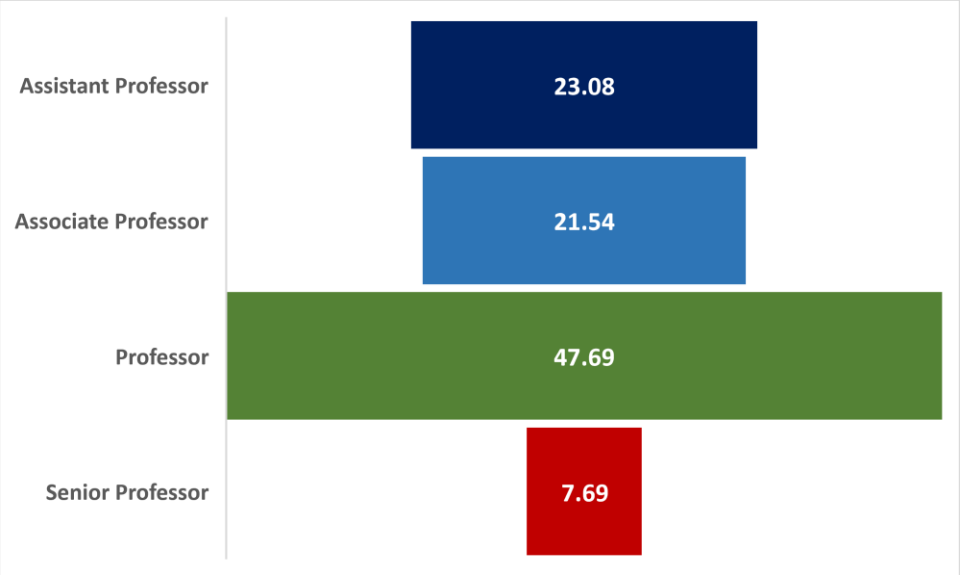

Figure 5.53: Designation of the Respondent

5.20. Distribution of Working Experience of the Respondent

Figure 5.54 displays the years of working experience gained in the field of the respondents. The categories are distributed according to year interval and the categories are zero to five years, six to ten years, eleven to twenty years, twenty-one to thirty years, and more than thirty years. The categories with maximum years of working experience indirectly do not apply to freshly appointed assistant professors. From the figure, it can be assumed that most respondents have gained working

experience from eleven to twenty years resembling 56.92 per cent; which is then followed by 21-30 years of working experience where 21.54 per cent of respondents acquired it. There are certain faculties among the respondents who attained working experience of more than 30 years. And the quantifying percent is 9.23%. The zero to five years of working experience accomplished amongst the respondents is only 3.08 percent which is the lowest among all. Therefore, it implies that the respondents of the questionnaire are highly experienced and knowledgeable personalities.

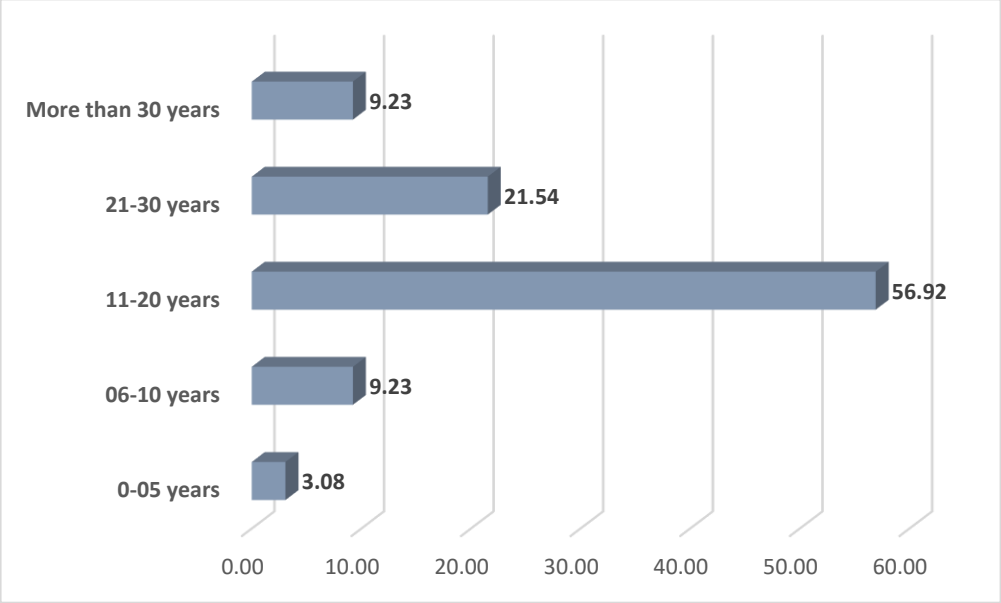

Figure 5.54: Distribution of Working Experience of the Respondents

5.21. Respondent's Compatibility with Online Access and Dissemination of Scholarly Information

Figure 5.55 demonstrates the compatibility of the respondents to access and disseminate online scholarly information and also their total years of experience they have been dealing with online access and dissemination of resources. The categories provided to the respondents through questionnaires are not experienced, 1-5 years of experience, 6-10 years of experience and more than 11 years of experience. Most of the respondents have signified that they are familiar with and have been accessing online information for more than 11 years now which is a total of 89.23 per cent. And, some of the respondents have become comfortable with online retrieval and distribution of scholarly resources from six to ten years which denotes 9.23 per cent.

None of the respondents have chosen the category of one to five years of online experience which can be said that they have been compatible with online activities for more than five years. However, one of the respondents denoted that he/she has not been accessing and disseminating online scholarly information and is not signified as not experienced at all.

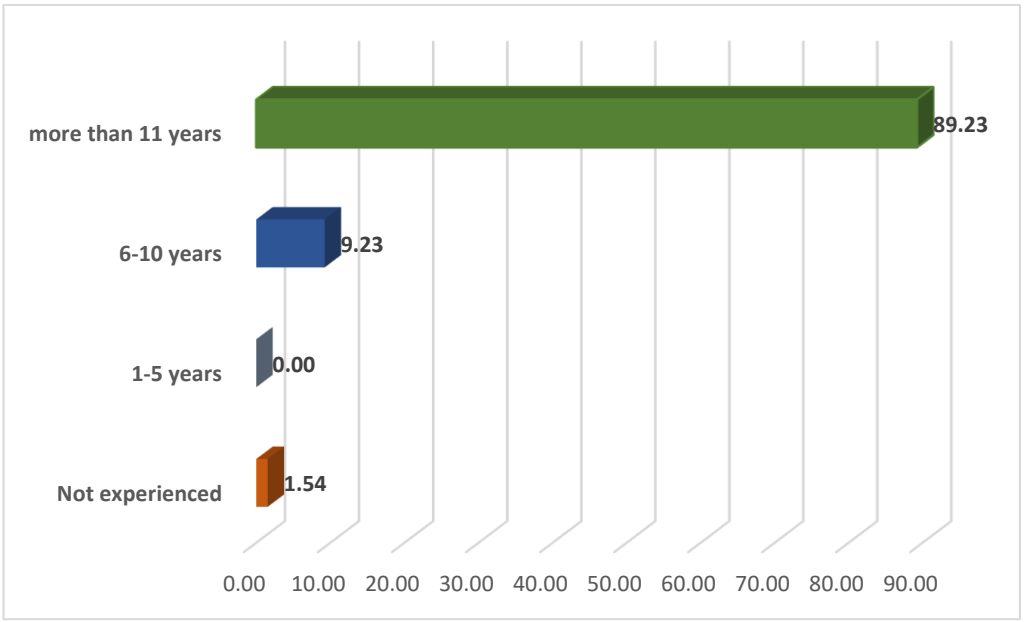

Figure 5.55: Respondent's Compatibility with Online Access and Dissemination of Scholarly Information

5.22. Respondent's Ability to Access and Disseminate Scholarly Content on Internet

Figure 5.56 displays the ability of the respondents to access and transfer scholarly information through the internet. The categories given in the questionnaire are the rating scale i.e., excellent, good fair and poor. This is a possibility provided to the respondents to rate themselves on the basis of their ability to operate the internet for academic content. When rating, out of 65 numbers of respondents, the majority of the respondents consider themselves as excellent user of the internet for accessing and distribution academic information having a percentage of 44.62. Contradictorily, it is seen the other half of the respondents rate themselves as poor in utilizing the internet for online retrieval and distribution of scholarly documents. However, certain members of the respondents have rated themselves in the fair category as they assume

to have a moderate ability to modulate the internet facilities for academic purposes. While there is no respondent in the category for good.

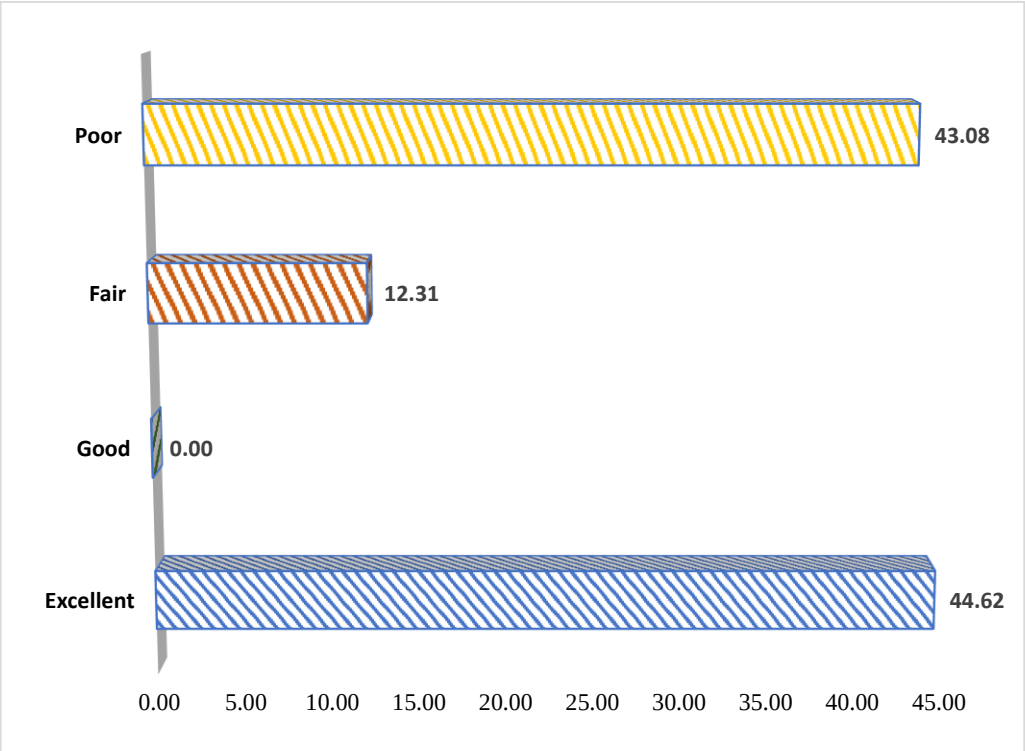

Figure 5.56: Respondent's Ability to Access and Disseminate Scholarly Content on the Internet

5.23. Respondent's Confidence Metric on Accessing Scholarly Content on the Internet

Figure 5.57 describes the confidence of the respondents for the retrieval of academic information via the Internet based on their self-efficacy. The respondents are provided with the 5-point Likert scale options such as Strongly Disagree, Disagree, Neutral, Agree and Strongly Agree. Most of the respondents (41.54%) strongly agree with having confidence in accessing scholarly information through the Internet. And, the rest of the respondents have agreed to the assertion by 33.85%; some of the respondents are neutral regarding the assertion by 16.92%. While, others strongly disagree with the assertion which is based on the usability of the internet for sharing academic information.

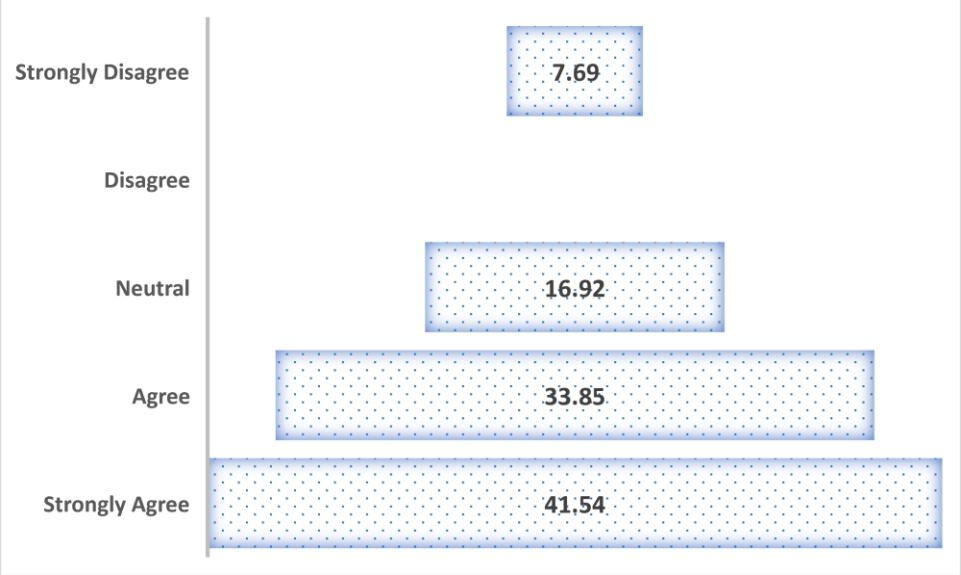

Figure 5.57: Respondent's Confidence Metric on Accessing Scholarly Content on the Internet

5.24. Respondent's confidence Metric in Publishing their Research Output on the Internet

Figure 5.58 displays the rating of the respondents towards the assertion of self-efficacy through the internet provided to them through the questionnaire. The assertion was based on the confidence level of the respondents towards publishing and sharing their research publications via internet for the global audiences. A greater number of respondents (52.31%) strongly agreed with the assertion meaning that these respondents have the confidence to share their scholarly articles on the internet. 23.08% of the respondents simply agree with the assertion and 9.23% of the respondents are neutral with the assertion. The respondents also strongly disagree and disagree with the assertion, which signifies that those faculty members of the sample either do not share their research works through the Internet or their confidence is very low regarding the transfer of academic works through the Internet to acquire greater and global audiences.

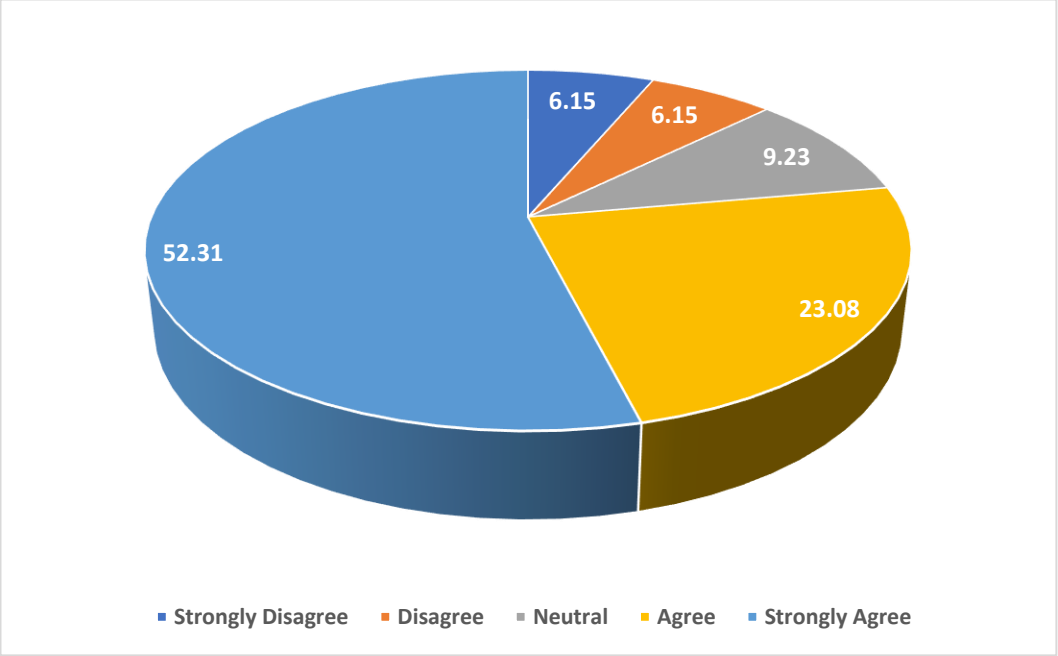

Figure 5.58: Respondent's Confidence Metric in publishing their Research Output on the Internet

5.25. Distribution of Preferable Method for Publishing and Spreading the Scholarly Work by the Respondents

Figure 5.59 visualizes the preferable mode for sharing and publishing the scholarly content adopted by the respondents. The option provided in the questionnaire was the traditional mode or subscription mode, which is generally understood as the printed version or accessing research articles by paying a certain amount for it. Another mode of access and transfer is open access publishing where the scholarly works are generally open and free with no or fewer copyright restrictions. The other one is both i.e., publishing and sharing is undertaken by the respondents via subscription-based as well as open access publishing mode. Through the analysis, it is found that the majority of the respondents (63.08%) have opted for both (subscription-based and open access based). However, certain respondents (26.15%) have chosen the traditional or subscription-based process. The other respondents have preferred mainly open access publishing mode so that they can retrieve and spread their research work freely for greater visibility.

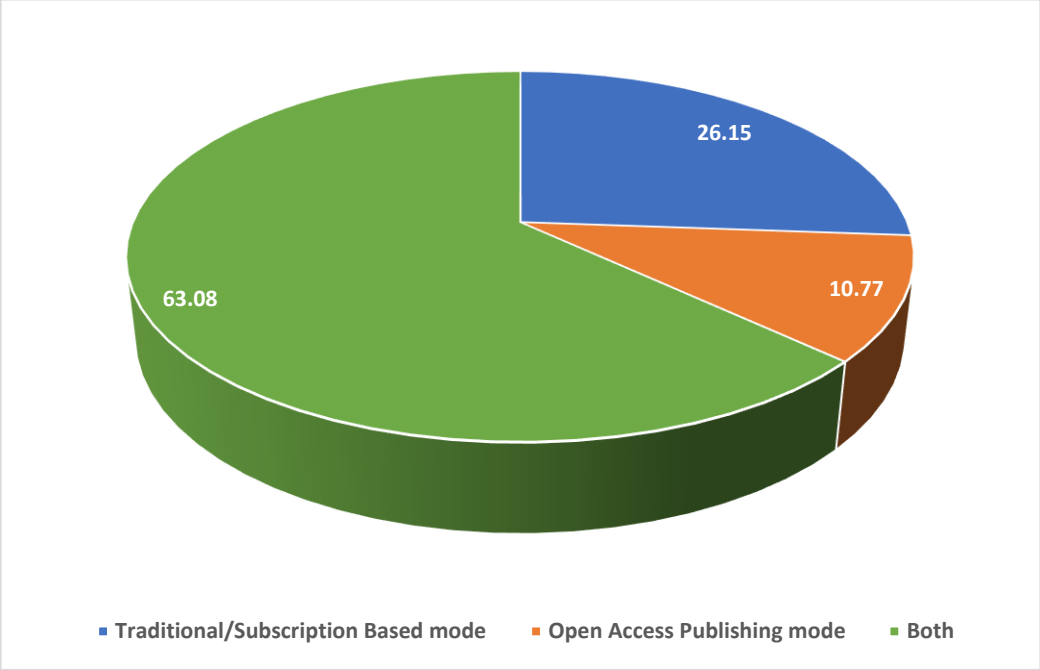

Figure 5.59: Distribution of Preferable Method for Publishing and Spreading your Scholarly Work by the Respondent

5.26. Awareness of Respondent about the term Open Access Publication and its Periodicity

Figure 5.60 presents the awareness of the respondents about the term open access publication. It shows that all the respondents are aware of the terminology. Figure 5.61 depicts the time frame for the respondents being aware of the term open access publishing. The category has been listed in the following options viz. 1-5 years, 6-10 years, 11-15 years, and 16-20 years. Most of the respondents (40%) are aware of the term open access publishing for 11-15 years. The respondents who are aware of the term for 6-10 years are the 36.92 per cent respondents. However, a few of the respondents who have been aware of this terminology for 1-5 years are 10.77 per cent of respondents and for 16-20 years are 12.31 per cent of respondents/academic faculty.

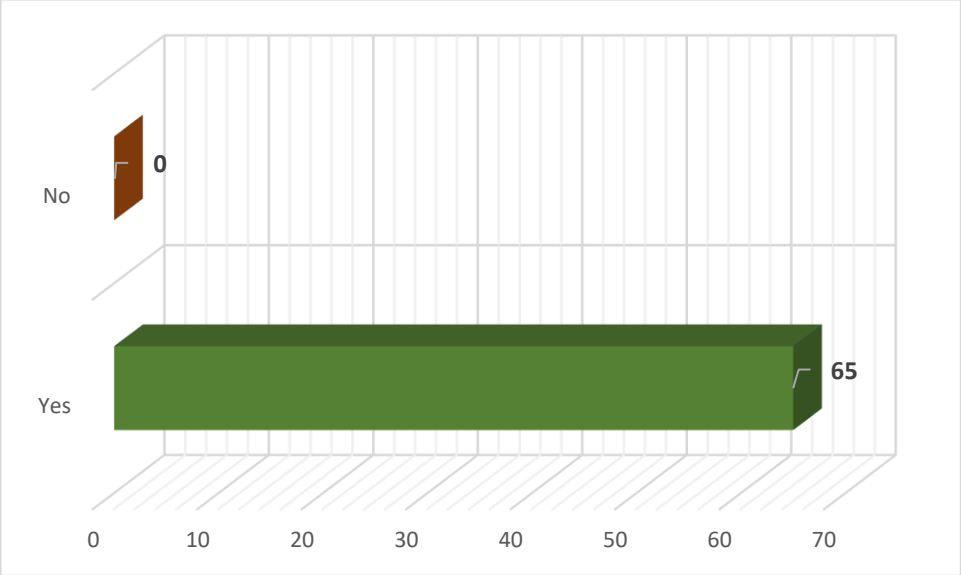

Figure 5.60: Awareness of Respondent about the Term Open Access Publication

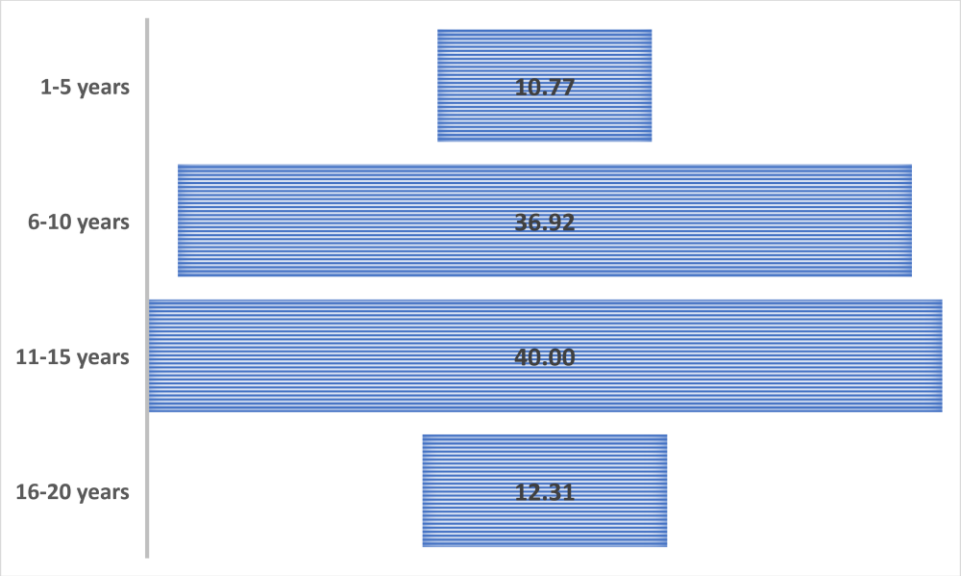

Figure 5.61: Time Period of Awareness of the Term Open Access Publication by the Respondent

5.27. Designated Ways to Learned about Open Access by the Respondent

Figure 5.62 shows the designated mode of information gained by the respondents about the concept of open access publishing. A possibility of eight options was provided in the questionnaire within which the respondents mostly selected the option of browsing the Internet i.e., 27.92 per cent. While certain others have become familiar with the term through the option- received an email from open access journal editor

for article submission by 18.83 per cent. It signifies that the marketing levels of the journal editors are making and significant influence on the academic profession. However, a minor proportion of the respondents 13.64 per cent selected the option of reading and viewing an open access scholarly article. And rest either learned about the term from colleagues/friends (9.74%) or; participated in various conferences and seminars (5.19%). A very low number of respondents have been aware of the term open access publication from their individual university library (3.25%).

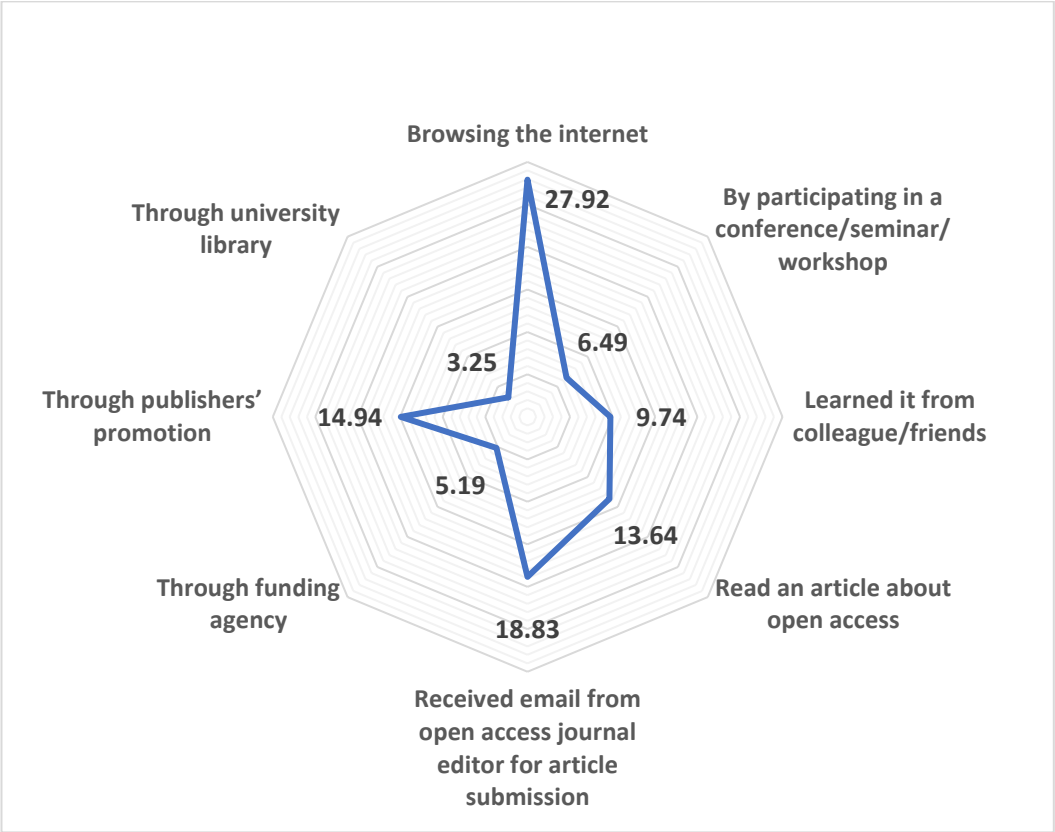

Figure 5.62: Information Learned About Open Access by the Respondent

5.28. Awareness of the Respondent of Resources, Terms and Initiatives about Open Access

Figure 5.63 displays the awareness of the faculty towards the terms, resources and initiatives related to open access publishing. The respondents are very much informed about the resource open access journals (21.96%) followed by the Directory of Open Access Journals (DOAJ, 18.82%). They are also well-versed in the Directory of Open Access Repositories (DOAR, 10.98%) and the Gold open access model (9.02%). The

respondents are least familiar with the Registry of Open Access Repositories (ROAR, 5.10%) and Budapest Open Access Initiative (BOAI, 1.18%). One of the respondents also highlighted about the term ArXiv which is a facility for the free distribution of open access resources or scholarly articles archived in different fields and subjects.

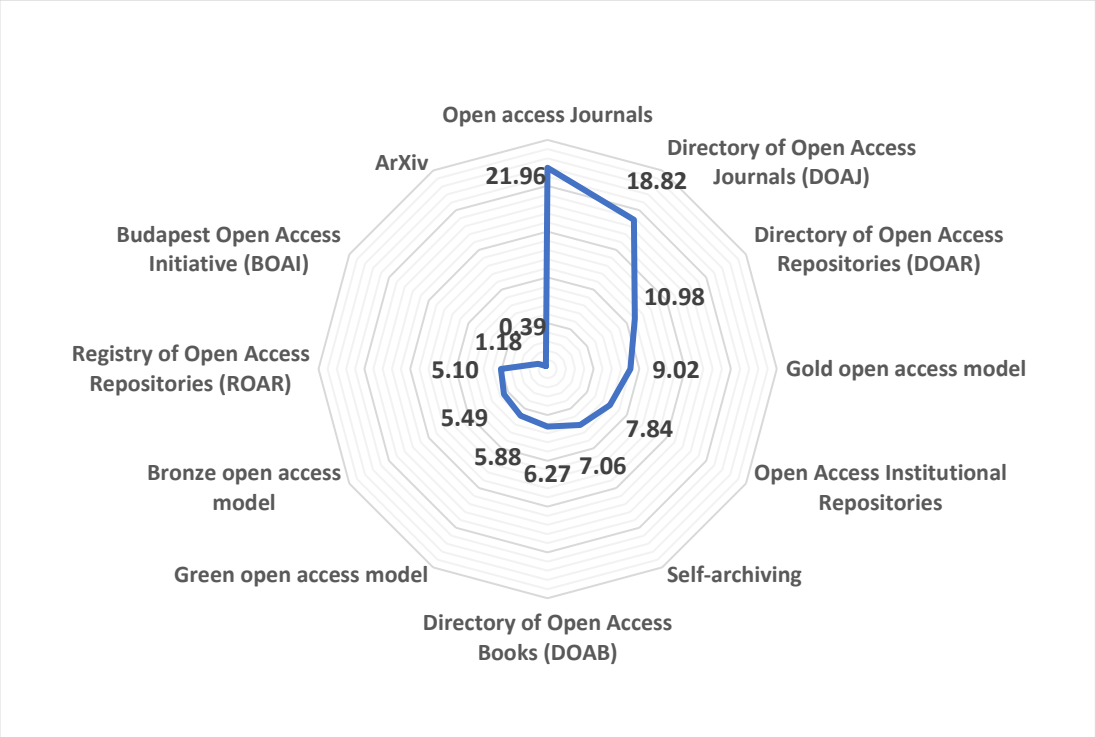

Figure 5.63: Awareness of the Respondent of Resources, Terms and Initiatives about Open Access

5.29. Respondent's Use of Open Access Platform

Figure 5.64 demonstrates the well-versed use of open access platforms by the respondents. The categories presented in the questionnaire were primarily for access or retrieval of scholarly resources and secondarily for distribution and dissemination of research results at the global level, and tertiary and involved both options. The majority of the respondents i.e., 60% have pitched on to both options which means the respondents would like to use open access platforms for both such as accessing scholarly content as well as transferring the research outcomes. Yet, the other 40% of the respondents opt for only access to scientific literature for the study. However, none of the respondents has chosen the option for transfer of research results individually

directing that respondents do not use open access solely for dissemination of research findings.

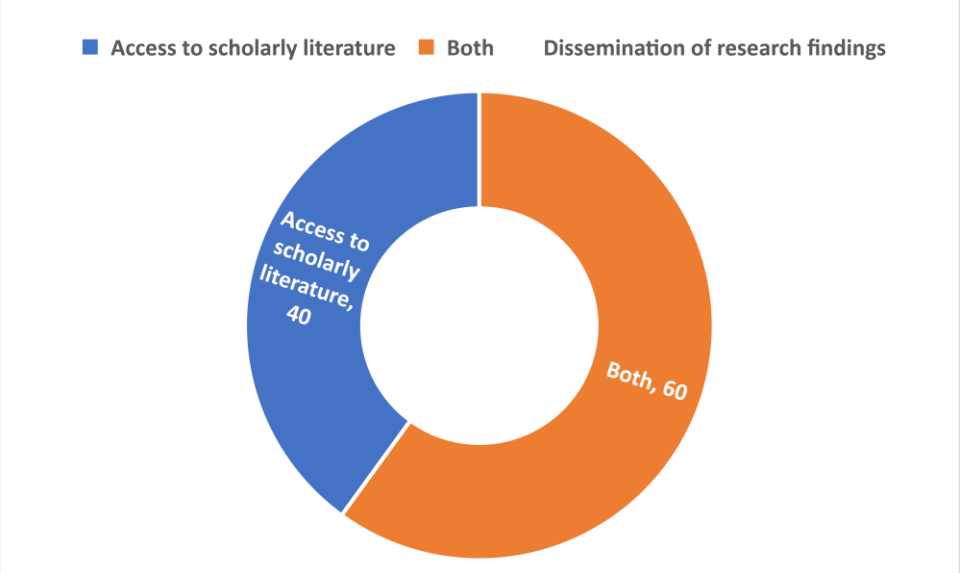

Figure 5.64: Respondent's Use of Open Access Platform

5.30. Journal Publications Published by the Respondent

Figure 5.65 indicates the number of open access publication that has been initiated by the respondents. The categories provided to the respondents in the questionnaire are 1-10; 11-20; 21-30; 31-40; 41-50; and more than 50 journal publications. The respondents stated the quantity of journal publications which was quantified in the provided category. The category 11-20 journal scholarly articles are the ones which received a majority of article numbers by 38.46 per cent by the respondents. The next following category is having publications between 21-30 journals acquiring 24.62 percent of the number of publications. Moreover, within the category of 1-10 and 31-40 journal articles, the number of articles given by the respondents are same which is 13.85 per cent. However, the category of 41-50 journal articles has the least number of open access journal articles (3.08%) generated by the respondents.

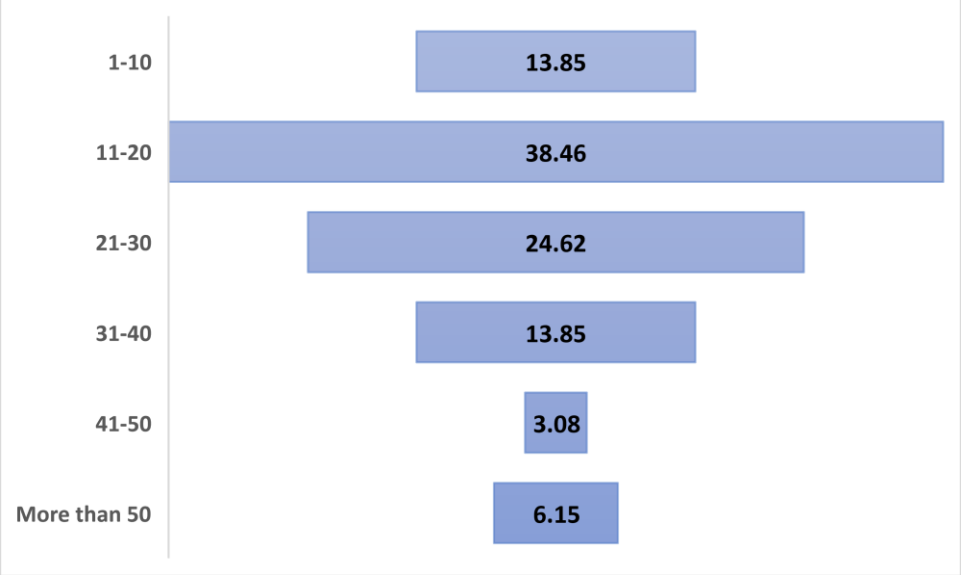

Figure 5.65: Journal Publications Published by the Respondent

5.31. Open Access Platforms where Respondents have Published Articles

Figure 5.66 illustrates the platform adopted by the respondents to publish their research findings through open access publishing or deposit their scholarly output through any repository. The options undertaken mainly provide all the possible modes to publish or disseminate research output through various mediums such as institutional or subject repository; Google scholar or ResearchGate; personal webpage or website; open access journals or hybrid journals and other databases. The respondents of the sample have majorly published their research findings on open access journals adopting gold open access routes with 50.96 per cent and it is followed by adopting hybrid journals which provide the facility to adopt open access publishing by paying a certain amount for article processing called Article Processing charge (APC) by 28.85 per cent. Certain respondents also deposited their research results in a subject repository (5.77 %) and also uploaded the final version or published article on their personal webpage of the institution.

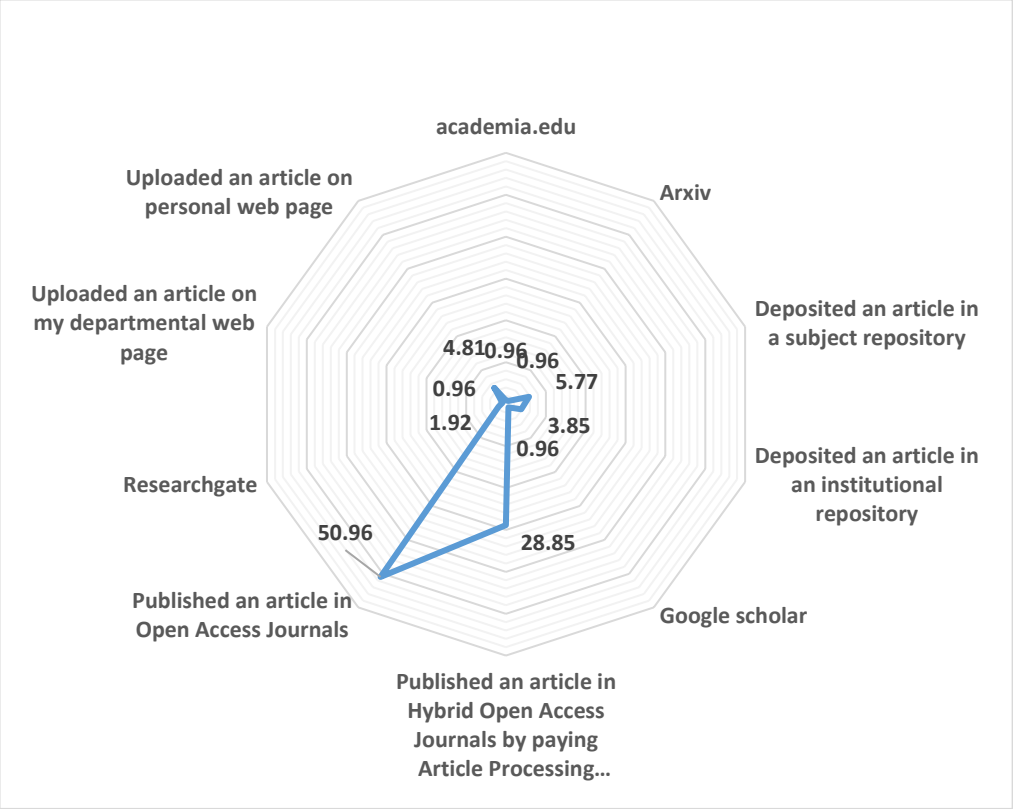

Figure 5.66: Open Access Platforms where Respondents have Published Articles

5.32. Reason of the Respondent to Publish Articles in Open Access Platforms

Figure 5.67 depicts the purpose for accepting and adopting open access publishing to publish or share their research outputs. The choices assembled in the questionnaire are the advantages of adopting open access publishing mainly stating the wide range accessibility of the research works for the audiences; the possibility of gaining more citations; elevation of visibility; supporting and contributing in the open access publication and also approving and promoting plan S. The respondents truly opt for the benefits of an open access platform for increasing visibility of the research work (37.41%) and broader accessibility of the scholarly items (32.37%). Subsequently, most of the respondents also adopt open access publishing to acquire more citations of their scientific findings. However, none of the respondents have chosen the option of supporting plan S which indicates that the respondents are quite unsure about promoting plan S and its concept. Certain respondents also stated that accepting the open access platform is quite expensive for the Indian scholarly producers and it is not

a feasible and sustainable publication mode for the researchers particularly from the academic field since there is no fund specially designed for article processing charge (APC).

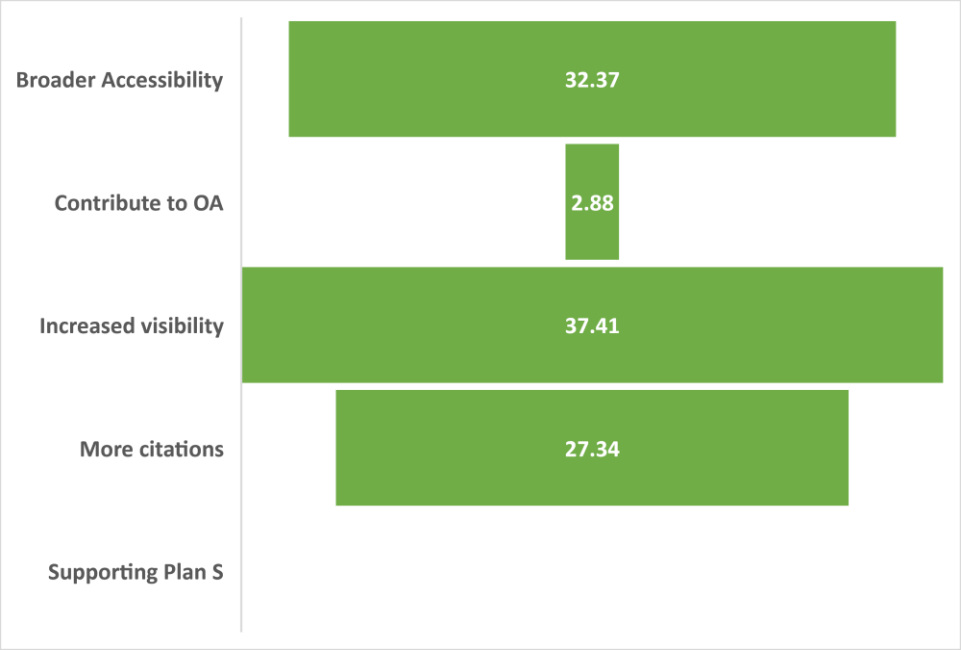

Figure 5.67: Reason of the Respondent to Publish Articles in Open Access Platforms

5.33. Satisfaction Level of the Respondent in Open Access Platform

Figure 5.68 displays the level of satisfaction as well as dissatisfaction of the respondents towards open access publishing. The remark of the respondents highlights that certain sections of the sample are satisfied with the privileges associated with open access to only some extent (40%); however, another segment of the respondents (35.38%) are tremendously complacent with the benefits of open access publishing. Yet, some other per cent of respondents are extremely discontented with it, and certain others are unsure about the level of satisfaction towards open access platform (9.23%). Only, 4.62 per cent of the sample are truly satisfied and content about the facilities and privileges enhanced by adopting open access publishing.

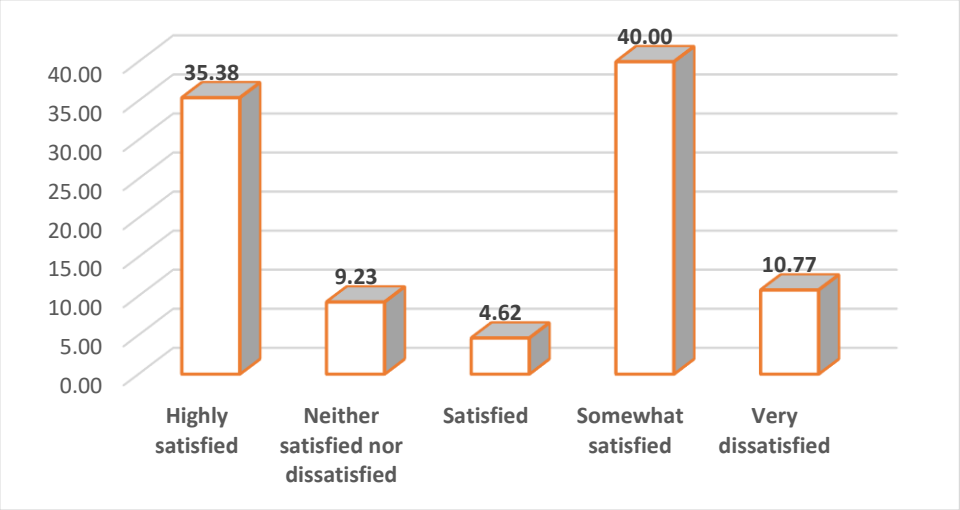

Figure 5.68: Satisfaction Level of the Respondent in Open Access Platform

5.34. Troubles Encountered in Publishing Articles in Open Access Platforms by the Respondents

Figure 5.69 states that only 18.46% of the respondents have encountered certain inconveniences while publishing research articles on open access platforms. The rest of the respondents (81.54%) have clarified of not encountered any issues regarding open access publishing. Figure 5.69 exhibits the several technical difficulties bumped into while publishing any research articles through open access platforms by the respondents. The list of responses prearranged in the questionnaire are complications in the understanding of intellectual property rights and various terms related to copyright problems; certain licensing limitations; the emergence of several open access approaches like gold, green, bronze, hybrid, diamond, etc.; expansion of different technical standards such as creative commons, Sherpa Romeo, metadata, etc. For about 47.37% of the twelve respondents have endured the trouble of not being aware of the technical standards of open access publishing. While 31.58% of the respondents have difficulty in dealing with various developing concepts of open access models; and 15.79 per cent of respondents have problems with limited licensing terms. A few respondents have also added certain problems regarding publishing research articles on open access platforms. These problems mainly stated the excessive charges or publication fees associated with research publishing through this platform.

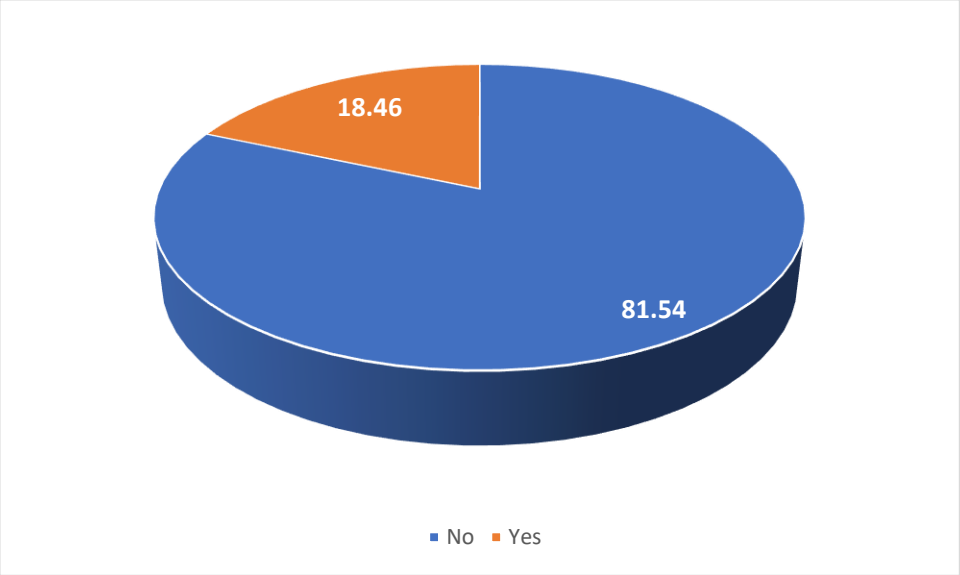

Figure 5.69: Troubles Encountered in Publishing Articles in Open Access Platforms by the Respondent

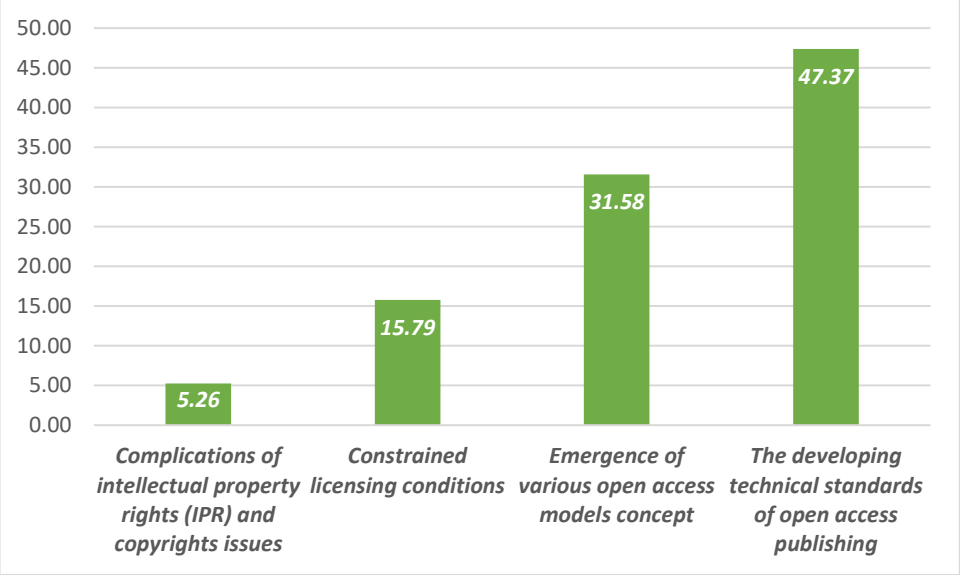

Figure 5.70: Various Troubles Encountered by the Respondents in Publishing OA Platforms

5.35. Impact of OA Journals on the Respondents' Academic Growth

Figure 5.71 indicates the presumption of the respondents about the academic growth for submitting their scientific publications in open access journals. 52.31 per cent of the respondents believe that submission of a scholarly article in an open access journal can lead to the growth of their academic profile. Since publishing an article in an open

access journal will have greater exposure and accessibility regardless of the copyright restrictions when compared to releasing an academic publication in traditional or subscription-based journals. While 30.77 per cent of the respondent are unsure about the influence of open access publishing on their academic growth. and another 3.08 per cent of the stakeholder are also hesitant to comment on the impact of open access platforms in their academic profile. Although, 13.85 per cent of respondents have strictly proclaimed that publishing in an open access journal does not provide pre-eminence in their academic growth.

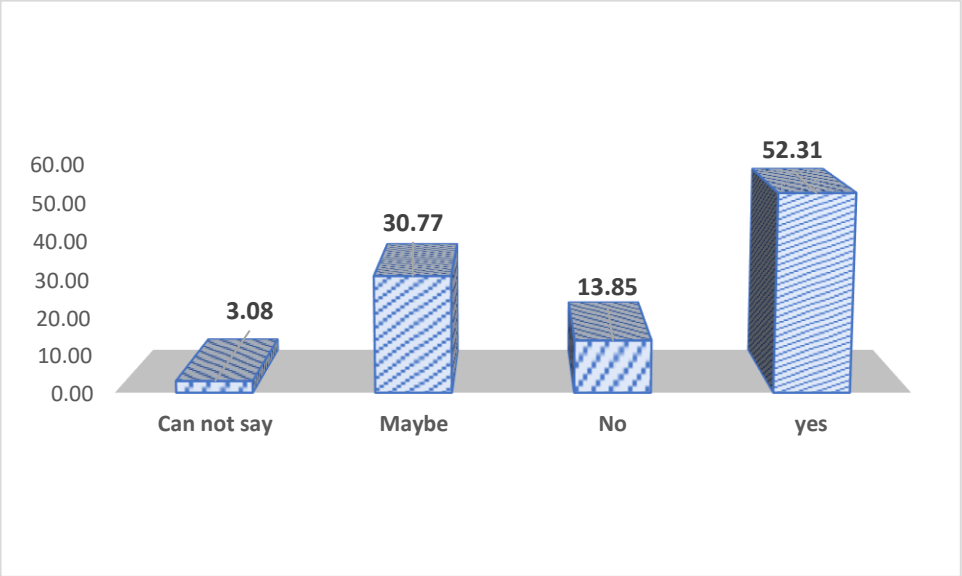

Figure 5.71: Impact of OA Journals on the Respondents' Academic Growth

5.36. Reasons for Lack of Interest in Open Access pointed out by the Respondent

Figure 5.72 denotes the probable reasons for the academics to have low interest in accepting and adopting open access publishing. The sample respondents have pinpointed the reasons for no low significance in open access from the questionnaire as well as they have specifically induced several other reasons with it. Many of the respondents (40 per cent) have picked out the reason for the low interest of academics as having no or less awareness regarding open access publishing and its benefits, whereas, 23.08 per cent have no significant trust in open access publishers. 18.46 per cent of the respondents prefers the traditional mode of publishing over open access publishing, and certain other respondents (16.92 per cent) thinks that open access

publication has low quality and standards. Also, 1.54 per cent of the respondents contemplate that the scholarly articles published in open access platforms are not peer-reviewed by any anonymous reviewers.

Other than the designated reasons, the respondents highly mentioned the cost and expensiveness involved in producing an open access article in the name of Article Processing Charges (APCs). They also stated the difficulty in identifying real open access journals instead of many predatory journals that are available in the academic market.

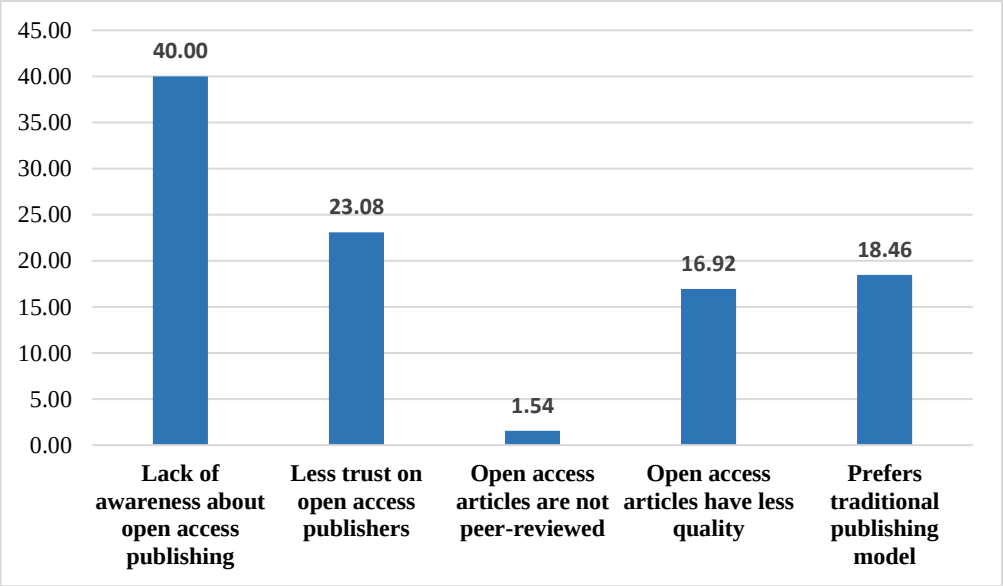

Figure 5.72: Reasons for Lack of Interest in Open Access Pointed out by the Respondents

5.37. Future Instance of the Respondents to Publish in Open Access Platform

Figure 5.73 demonstrates the anticipated expectations of the respondents of the undertaken sample to issue their scholarly research findings in any open access journals. 46.15 per cent of the respondents specified their probable possibility to produce scholarly articles in open access publishing and 12.31 per cent of the respondents are very much positive in publishing and sharing their research work in open access platform. Whereas, some of the respondents (6.15 per cent) have clearly expressed their opinion of not publishing any research article on open access platform and 10.77 per cent also have stated the view of less possibility of adopting the OA

platform. However, 24.62 per cent of the respondents are neutral regarding the future contribution of open access platforms which can either wave for both positive and negative pathways.

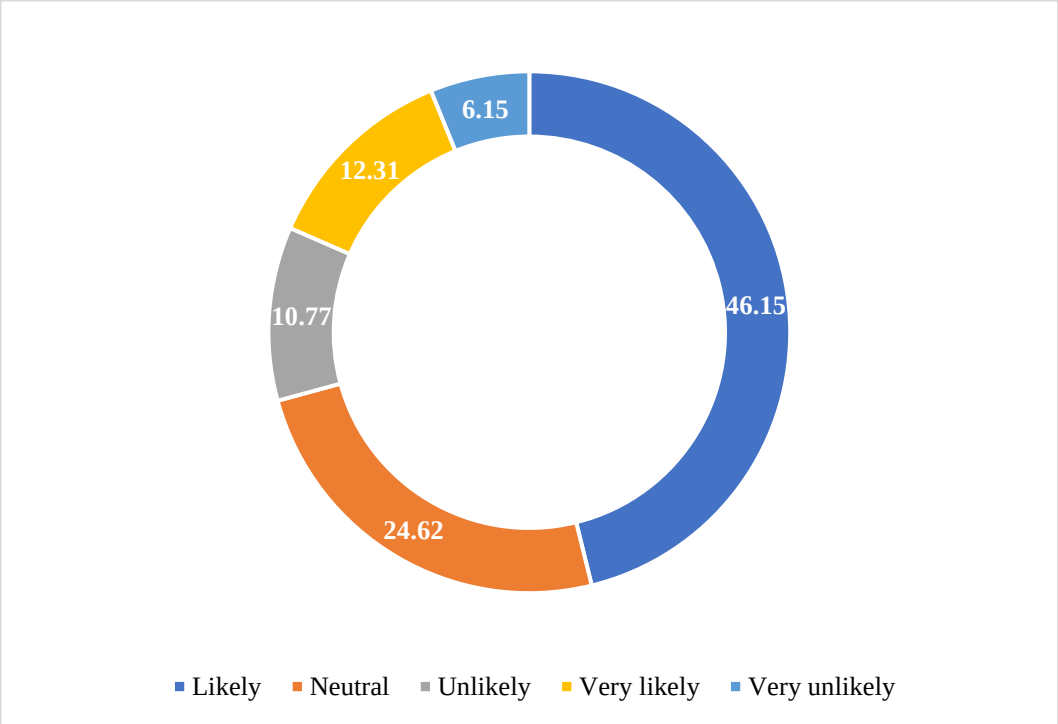

Figure 5.73: Future Instance of the Respondents to Publish in Open Access Platform

5.38. Ratio of Recommendations for the OA Platform by the Respondents and its Frequency

Figure 5.74 expresses the possibility of the respondents recommending open access platforms to other colleagues and fellow mates. According to the selected option of the respondents, 64.62 per cent are interested in recommending the open access platforms to their fellow academicians however the other 35.38 per cent have stated their unwillingness to recommend open access publishing for the issue of scholarly articles. Amongst the 64.62 per cent of the respondents, as displayed in the figure 5.75, the frequency of the recommendation is lower than expected; since only 14.29 per cent of the respondent have positively agreed to recommend the platform frequently. 30.95 per cent of the respondents want to recommend the platform very rarely. The percentage of the infrequency of recommendation by the respondents is higher than the optimistic recommendation intention towards publishing open access articles.

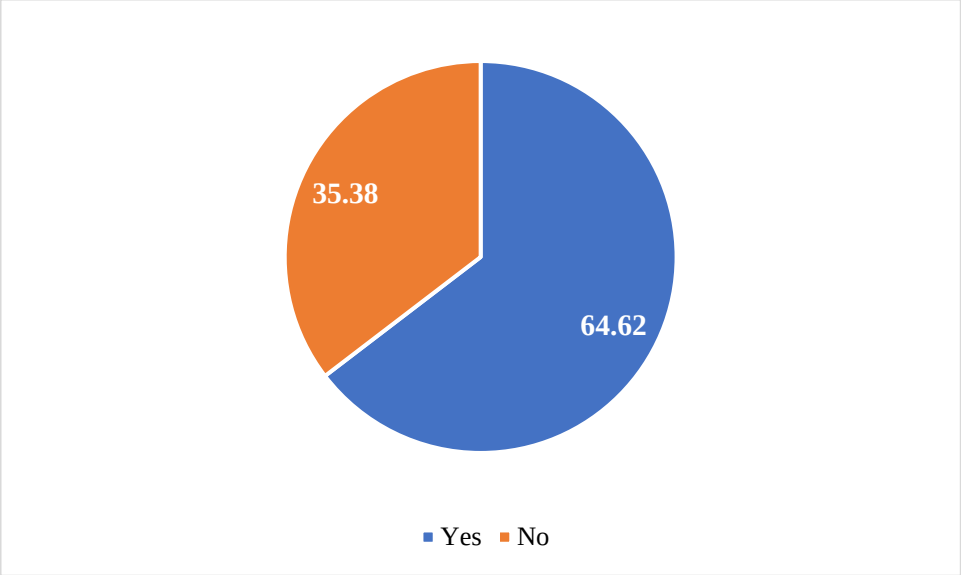

Figure 5.74: Ratio of Recommendations for OA Platform by the Respondents

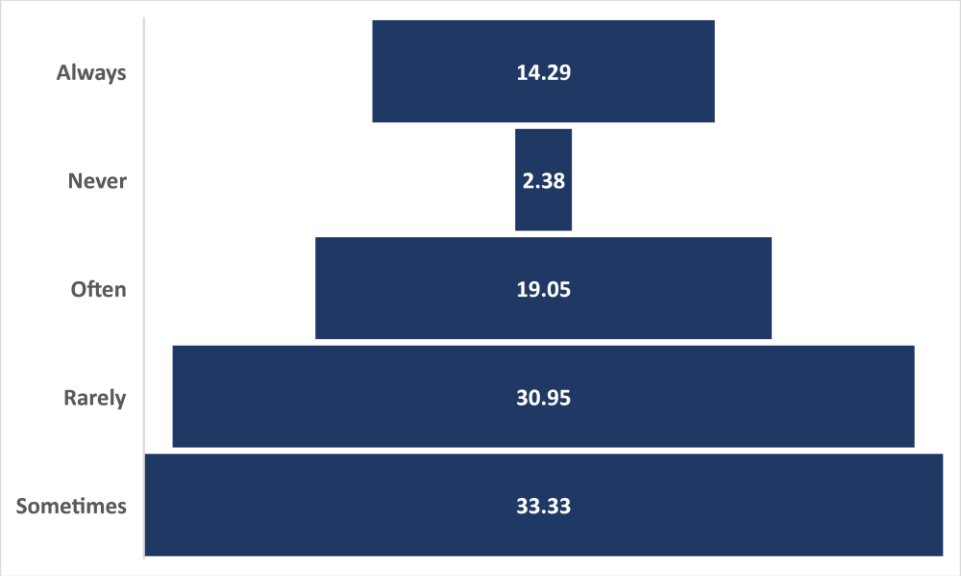

Figure 5.75: Frequent Recommendation of OA Platform by the Respondent

5.39. Awareness Mechanisms can be Adopted about OA Platforms

Figure 5.76 has shown several mediums to inform and aware the academics about open access platforms via the responses given by the participants. Amongst the opinions of the respondents, 26.32 per cent want certain workshop drives for a better understanding of open access publishing facilities, policies and benefits. 21.05 per cent of the respondents opt for several seminar or conferences that purely concentrates on

open access. 20.18 per cent of the respondents believe that the awareness about open access will be enhanced by publishing more open access articles. 8.77 per cent of them also believe that recognizing with awards and felicitation of prolific authors in open access will induce certain interest in the field. However, only 4.39 per cent of the respondents want open access publishing to be included in the curriculum of the courses that are being offered in the educational institutions.

Some of the respondents also added in the others section that recognising the true open access journals will correspondingly spread information about open access publishing. In contrast, it was also highlighted that open access publishing should not be publicised since it negotiates the quality of the scientific publication as well as the journal.

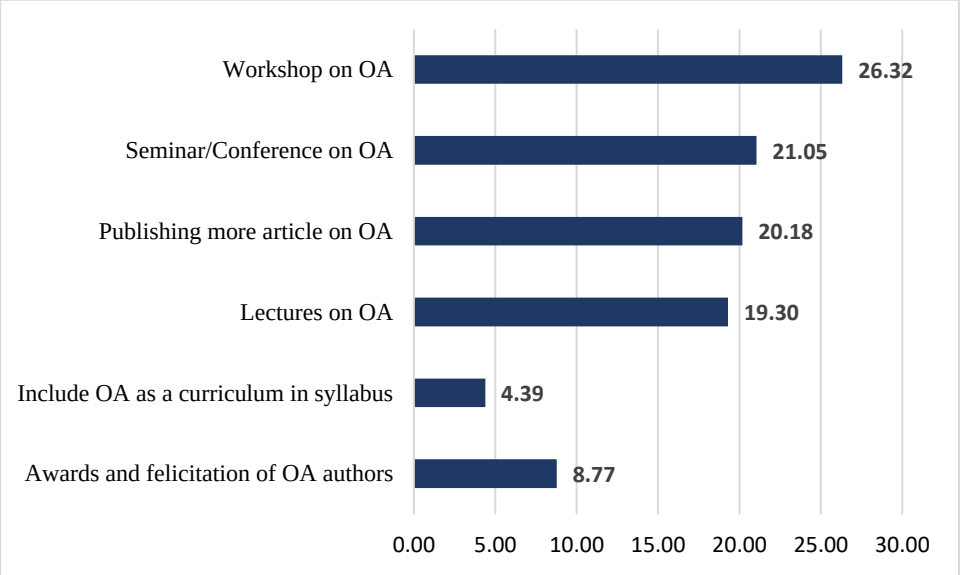

Figure 5.76: Awareness Mechanism can be Adopted about OA Platforms

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CHAPTER 6

Findings, Conclusion and Suggestions

6.1. Introduction

This chapter addresses the findings and inferences of the study that have been discussed in the preceding chapter. The primary goal of the study was to determine the attitude and perceptions towards publishing scientific productivity via open access platform. The study provides insights into the opinions and views of the faculty toward scientific communication at central universities in North East India about adopting open access publishing for the access and dissemination of academic resources. The analysis of the data was commenced in consideration of the undertaken objectives. The major findings of the study have been drawn in two comprehensive categories such as:

(a) Findings respective to the objectives of the study
(b) General inferences of the study

A. Findings respective to the objectives of the study

Objective 1: Find out the research contributions of the faculties of central universities of North East India

a) Based on the analysis of the data extracted from the Scopus database, it is clearly visible that from a total of 2321 numbers of appointed faculties in the central universities of North East India, only 1190 numbers of faculty members have been able to index or publish articles in Scopus-indexed journals which acquires a shared per cent of 51.27%.
b) As per the total Scopus indexed faculty, maximum faculty members are designated as Assistant Professor with 565 (47.48%) which is subsequent to Professor 417 (35.04%), and 160 (13.45%) of them as Associate Professor. However, the rest 48 (4.03%) faculties are guest lecturers in the central universities.
c) Amongst the Scopus-indexed faculty members of the selected central university i.e., 1190 members, an aggregate of 18610 scholarly publications have been produced by the faculty member which Tezpur University has the maximum publication of 5052 (27.15%) numbers. NEHU has the second highest number of publications with 3242 (17.42%) followed by Assam University with 3156 (16.96%).

d) Professors have been successful at the top amongst other designations with 11561 (53.71%) publications despite having fewer numbers of faculty members than Assistant Professor which has 7106 (33.01%) publications.

e) Under the category of year-wise distribution of the overall publications, the year 2021 has the greatest amount of scholarly articles with 1898 (10.20%) which is trailed by the year 2022 with 1725 (9.27%) and year 2020 with 1580 (8.49%).

f) Out of a total citation of 2,71,635 gained from the publications published by faculties indexed in the Scopus database, the faculties of Tezpur University have acquired the highest number of citations with 85,249 (31.38%) being tailed by Assam University with 46,778 (17.22%) and NEHU with 40,683 (14.98%).

g) With regards to the gender distribution, after a collective analysis of all the central universities, the maximum number of faculty members is male i.e., 926 (77.82%) while the number of female faculty is 264 (22.18%). In view of publication pattern, the publication quantity of the male faculty which is 18961 (88.08%) is much higher than the female faculty with 2565 (11.92%).

h) In terms of department distribution, a cumulative amount of 121 variants of departments have been identified amidst the selected central universities. Within which the department of Physics has the greater number of faculty members and it also produced the highest publication quantity which is 2686 (12.48%) and next is the department of chemistry with 2507 (11.65%).

Objective 2: Assess the level of awareness about open access (OA) among the faculties

a) The category of the awareness of the faculty members towards open access publishing has been determined by using the online survey method via Google form questionnaire (mentioned in ANNEXURE-I). The online questionnaire was distributed among the top ten faculty members of the undertaken central universities of North East India.

Within which 65 (72.22%) of the faculty members have responded to the online questionnaire.

b) Out of the total respondents, 44.62% revealed to have an excellent ability to access and distribute scholarly materials online, however, 43.08% have rated themselves in the poor category. While in terms of self-efficacy regarding accessing online scholarly content, 41.54% of the respondents are very confident about online accessing of scientific literature; and 52.31% of the respondents are self-confident about publishing the research findings through online mediums.

c) In terms of the preferred mode of releasing and disseminating the research work, 63.08% of the respondents favour both the traditional mode of publishing as well as open access mode of publishing. Yet, 26.15% of the respondents majorly prefer only the traditional mode of publication and distribution.

d) Regarding the awareness about open access publishing, 100% of the respondents revealed having certain ideas about open access platforms and their characteristics. And 40% of them have been aware of the term for the last 11-15 years. 27.92% of the respondents were familiar with the term open access through browsing the internet and 14.94% of them through publishers' promotion through email. 21.96% of the respondents are aware of open access journals as the sources or initiatives of open access while 18.82% are aware of the Directory of Open Access Journals (DOAJ).

Objective 3: Reveal the attitude and behaviour of faculty towards their publications

a) With regards to the utilization or attitude towards open access platforms, 60% of the respondents use open access platforms for both retrieving scholarly content along exposing the research works of the individual. However, 40% of them adopt open access for only accessing scientific literature.

b) 38.46% of the respondents have published 11-20 numbers of scholarly papers and 24.62% of them have produced 21-30 numbers in open access platforms. About 50.96% of the respondents have published their open

access articles mostly in open access journals. 28.85% of them also publish their research works in open access sections of hybrid journals by paying APC. 37.41% of the respondents opted for open access platform to have greater visibility of their research findings while 32.37% of them adopted the OA platform to access scholarly articles without any restrictions.

Objective 4: Investigate the faculty's publications in OA in selected universities

a) According to the data retrieved from the Scopus database, out of 1190 faculty members, 709 (59.58%) of the faculties are associated with open access publications. Assistant Professors make up the largest proportion of the aforementioned faculty members, accounting for 334 (47.11%), followed by Professors (264, 37.24%) and Associate Professors (92, 12.98%).

b) A cumulative collection of 3868 academic OA publications was generated by the 709 academics of the nominated central institution where Tezpur University holds the greatest quantity of open access publications with 854 (22.08%) numbers. Assam University pertains in a subsequent spot having 767 (19.83%) OA documents, immediately followed by NEHU with 651 (16.83%). In case of share percentage, Sikkim University has the most quantity of OA articles having 25.95% when extracted from the total number of publications.

c) Professor has managed to outperform all other designation categories with 2143 (48.11%) OA articles while possessing fewer faculty members than Assistant Professor, who has 1639 (36.80%) OA publications.

d) In terms of the distribution of publications by year, the year of 2021 has the highest proportion of OA research articles having 525 (13.57%), thereafter the two following years are 2022 with 455 (11.76%); and 2020 releasing 397 (10.26%).

e) With regards to the acquired citations, a total of 61,614 citations have been derived from faculty-authored open access publications that were included in the Scopus database where Tezpur University's academics were cited the most with 13,534 (21.97%). And, the next most cited

central universities are Assam University acquiring 12,150 (19.72%) and NEHU gaining 9125 (14.81%) citations.

f) In the context of gender category, the overall proportion of male faculty members associated with open access platforms is 556 (78.42%), whereas the proportion of female faculty comprised 153 (21.58%) within the selected central universities. According to the pattern of open access publications, the male faculty published 3825 OA papers (86.44%) which is way more than the female faculty, who have published 600 (13.56%) OA articles.

g) Only 94 departments of the undertaken central universities are integrated with open access publishing, in which, the department of physics ranks first to generate the maximum number of OA papers having 700 (15.82%) compared to other departments. And, the subsequent departments to have more OA publications are the Department of Chemistry with 302 (6.82%) and the Biotechnology Department with 284 (6.42%).

Objective 5: Find out the preferred routes of OA publications by faculty

a) The open access publications extracted from the Scopus database are classified into primary four OA approaches such as gold, green, bronze and hybrid. However, the co-relation view among the different open access routes has been systematically categorized into seven OA routes as analytically generated by the Scopus database itself. The majority of the academicians have opted for the category of gold green OA route by releasing 988 (25.54%) OA articles and within this category, the year 2021 has initiated the most OA articles (144) whereas the year 2016 has attained the highest citations counts (2384). The next most entrusted OA route is green which has 917 (23.71%) OA publications attaining the highest number of citations (1890) in the year 2011 which is trailed by the bronze (796, 20.58%) and gold (710, 18.36%) OA routes. In the bronze OA route, the maximum number of citations was gained in the year 2016 having 1161 citations altogether and in the gold OA route, the year 2018 received the greatest quantity of citations which was 1247.

Objective 6: Identify the degree of satisfaction among the faculty's OA publications

a) Under the degree of satisfaction section, 40% of the respondents are slightly satisfied with the characteristics and facilities of open access platform and 35.38% of the respondents are extremely contented with the features and privileges provided by OA publishing. 18.46% of the respondents have stated that they have confronted certain challenges while proceeding to publish an article in open access platform mainly with the technical standards of OA publishing (47.37%) and the development of different variants of open access approaches.

Objective 7: Rank the most productive central universities and the most prolific contributions in OA

a) Based on the number of open access publications, Tezpur University is the most productive central university among the undertaken sample central universities of North East India with 854 (22.08%). Assam University is the second most prolific central university with 767 (24.30%).

b) Under the section of prolific authors of open access platform, the top faculty based the highest number of open access publication of each university states as Amitabha Bhattacharjee from Assam University (58 OA articles); Dilip Angom (59 OA papers) from Manipur University; Nachimuthu, Senthil Kumar from Mizoram University has 72 OA publications; Rajkrishna Mondal (5 OA articles) from Nagaland University; Timir Tripathi (41 OA papers) from NEHU; Nipen Saikia (19 OA papers) of Rajib Gandhi University; Jyoti Prakash Tamang (30 OA publications) of Sikkim University; Mrinal Kumar Das (37 OA papers) of Tezpur University; and Syed Arshad Hussain (34 OA publications) from Tripura University.

c) The prolific journals based on the numbers of OA publications have been published for respective selected central universities are revealed below as PLOS One (37 OA publications) for Assam University; Indian Journal

of Physics (28 OA papers) from Manipur University; Scientific Reports (17 OA publications) for Mizoram University; BMB Reports (3 OA papers) for Nagaland University; Journal of Parasitic Diseases (25 OA articles) from NEHU; Notulae Scientia Biologicae (8 OA papers) from Rajib Gandhi University; Frontiers in Microbiology (18 OA publications) for Sikkim University; Journal Of Food Science and Technology (49 OA publications) for Tezpur University; and Cytologia and Scientific Reports (10 OA papers each) from Tripura University.

d) Under the prolific cited faculty of each undertaken central university on the basis of the maximum number of citations attained from the open access publications are presented as Sanjeev Kumar from Assam University (1926 citations); Dilip Angom (676 citations) from Manipur University; Nachimuthu, Senthil Kumar from Mizoram University has gained 1683 citations; Rosemary R. Dzuviche (451 citations) of Nagaland University; Timir Tripathi (954 citations) from NEHU; Heikham Evelin (860 citations) of Rajib Gandhi University; Jyoti Prakash Tamang (1298 citations) from Sikkim University; Debendra Chandra Baruah (1018 citations) of Tezpur University; and Debajyoti Bhattacharjee (1035 citations) from Tripura University.

B. General inferences of the study

a) The analysis of the extracted data interprets that the number of overall scholarly publications produced by the faculties of the undertaken central university is 18,610 papers but the number of scholarly open access publications is just 3868 articles. From the overall publications, open access articles share is only 20.78%.

b) In terms of citations received by the publications published by the faculties shows that from the total citation (271,635) attained by the overall articles, the open access articles have acquired 61,614 citations which is just 22.68% of the total citations. The university to attain the maximum share of citations for OA articles from the total papers is Nagaland University which has 46.05% share of citations from the total citations gained by the university.

c) Under the criteria of open access models, the highest number of open access publications which have been generated in each category are represented.

Tezpur University has the highest quantity of OA publications in numerous OA models such as bronze (198 OA articles), gold (136 OA papers), green (248 OA publications), hybrid gold (20 OA documents) and hybrid gold green (20 OA papers). And, Assam University also has the most quantity of OA publications in the different OA routes like bronze gold (74 OA publications), gold green (244 OA papers) and hybrid gold (20 OA articles).

d) The number and publication gap between gender categories i.e., male and female in each undertaken university is very high. The number of OA publications produced by the female gender is drastically low primarily at Sikkim University, Mizoram University and Tripura University when compared to the OA publications of the male gender of the selected central universities.

e) In case of the open access publication distribution among the departments of the selected central universities, it is seen that most open access scholarly work has been produced by the disciplines of Science and Technology when compared to the discipline of social science and humanities. In the discipline of social science and humanities, the Department of Economics has the maximum open access collection with 40 (0.90%), Geography (39, 0.88%) and English (35, 0.79%).

f) Ranking of the department of each university based on a number of OA publications reveals that the department of physics has the most open access collection in the certain selected universities viz. Manipur University (129 OA articles), Tezpur University (109 OA papers) and Tripura University (198 OA publications). Yet, the Department of Biotechnology has the maximum number of OA articles in Mizoram University (129 OA papers) and Nagaland University (8 OA articles). Whereas in Assam University, the Life Science department (228 OA publications) has the highest number of OA papers; the Chemistry department (115 OA articles) for NEHU; the Mathematics department (37 OA articles) for Rajib Gandhi University; Microbiology department (60 OA documents).

g) Within the funding scenario, it is seen that from the entire published scholarly publications, only 2508 (13.48%) numbers of scholarly publications have been funded by various national and international organizations. Whereas from 3868 OA publications, only 693 (17.92%) OA articles have been

provided grants by the agencies. Department of Science and Technology, the Department of Biotechnology and the University Grants Commission are the funding organizations that have repeatedly provided grants to the undertaken universities and ranked top when analyzed.

h) Under the section on qualitative analysis of the attitude and perception of the designated faculty members of the selected central universities. Only 65 (72.22%) of the faculty members have responded to the online questionnaire amongst the distributed 90 faculty members. Most of the respondents belong to the age group of 36-45 years (38.46%) and the next is 46-55 years (32.31%).

i) Within the group of respondents, 62 (95.38%) are male gender while only 3 (4.62%) of the respondents belong to the female category. Meanwhile, 29 variations of the department are encompassed where most of the respondents belong to the physics department (10, 15.38%). And, most of the respondents were designated as Professors (31, 47.69%) and Assistant Professors (15, 23.08%). Majority of the respondents have 11-20 years of working experience (37, 56.92%) and 21-30 years (14, 21.54%).

j) About 52.31% of the respondent believe that adopting open access publishing to spread their research work will have a good influence on their academic career. However, 13,85% strictly denied the circumstance of having an impact on the academic profession. 40% of the respondents consider that for lack of awareness or less trust in OA publishers (23.08%) about the quality of open access publishing, the professional has less interest in open access platforms. 46.15% of the respondents stated that they are likely to publish or issue their research findings in open access platform in the future.

k) 64.62% of the respondents are pleased to recommend open access to other professionals while 35.38% of them do not wish to recommend. Amongst that 64.62% of respondents, 33.33% of responded faculty would sometimes recommend features of open access platforms and 30.95% would share about OA publishing very rarely. 26.32% of the respondents desired the workshop on open access to spread and inform about the area and 21.05% of them opted for seminars and conferences, particularly on the OA platform.

6.2. Conclusion

Open access publications, as a concept, originated in the broader movement towards democratizing knowledge and making scholarly research accessible to a wider audience. The open access movement, such as the Budapest Open Access Initiative (2002), Bethesda Statement (2003), Berlin Declaration (2003), and Delhi Declaration on Open Access (2018) are the transformative force in the development of scholarly communication and knowledge dissemination. It originated as a response to the limitations of traditional publishing models, which often restricted access to research articles behind paywalls, hindering the free flow of knowledge. Over the years, this movement has gained momentum and evolved into a global initiative to make research and academic resources freely accessible to all. This development has significantly expanded the reach and impact of research, enabling researchers, educators, policymakers, and the general public to benefit from and contribute to global knowledge. Moreover, the open access movement has encouraged transparency, collaboration, and the adoption of open science practices, ultimately enhancing the quality and rigour of research.

Open access has become a powerful tool for advancing academic communication and bridging the gap between research and the general public. Open access empowers scholars to disseminate their work widely, fostering collaboration and innovation, and accelerating scientific progress. This comprehensive study investigated various aspects of research contributions, awareness of open-access publishing, attitudes and behaviours of faculty members, and the state of open-access publications in the nine central universities of North-East India. The findings from each objective of the study shed light on essential facets of the academic landscape in this region. Many faculty members have engaged in Scopus-indexed journal publications, with 51.27% of the appointed faculties contributing to scholarly output. Among the faculty, Assistant Professors constitute the largest group, followed by Professors and Associate Professors, with a small percentage of guest lecturers. The study also highlights the disparities among universities in the Northeast region regarding scholarly output, with Tezpur University leading the way, followed by Assam University and NEHU. These universities are leading the scientific

publications as per the Scopus record as they have maximum research publications. Notably, Professors have emerged as the most prolific contributors to scholarly publications despite their smaller numbers than Assistant Professors. The reason may be their extensive experience and expertise in their respective fields. The year-wise distribution of open-access publications shows a trend towards increased scholarly output, with 2021 being the most prolific year, closely followed by 2022 and 2020. Additionally, Tezpur University has garnered the highest number of citations, indicating the impact of its faculty's research on the academic community. Gender disparities in faculty composition and publishing patterns are apparent, with a significantly higher number of male faculty members and a substantial gap in publication quantity between male and female faculty. The departmental distribution of scholarly output also reveals a preference for Science and Technology disciplines. The study's survey results demonstrate a strong awareness of open-access publishing among faculty members, with a notable percentage confident in accessing and distributing scholarly materials online. Moreover, the majority of respondents express a preference for both traditional and open-access modes of publication. Departmental rankings reveal the prominence of Physics in open-access publications across several universities. Funding for scholarly publications, both overall and within the open-access domain, is attributed to various national and international organizations, with the Department of Science and Technology, the Department of Biotechnology, and the University Grants Commission playing crucial roles.

The feedback received from the questionnaire on faculty attitudes towards open-access publication in Central Universities of North East India reflects a diverse range of opinions and concerns. While some respondents expressed positive views about open access and its potential for greater visibility and recognition in research, others raised significant challenges associated with its implementation. One prominent issue highlighted is the financial constraint researchers face, particularly those from universities with limited research funding. The high cost of Article Processing Charges (APCs) in many open-access journals is seen as a barrier, making it difficult for researchers and those from less resource-rich institutions to publish their work in the open access route. This situation perpetuates an inequitable distribution of resources and hampers the visibility of valuable research. Additionally, the presence of predatory journals charging APCs without providing proper peer review or

editorial services is a concern. This phenomenon underscores the importance of discerning between legitimate open-access journals and predatory ones.

While the concept of open access is appreciated for its potential to democratize knowledge, the practical challenges raised by faculty members in the North East Indian context need to be carefully prioritized. The feedback suggests that addressing funding, predatory journals, and awareness issues will be crucial in promoting open-access publication in the region. It is evident that for open access to fulfil its potential, there is a need for supportive policies, funding mechanisms, and increased awareness among researchers. The study concludes that there is a need for increased awareness among researchers in the North Eastern region of India regarding various aspects of open-access publishing, such as journal selection, publishing route, licensing, funding, and mandates, in order to enhance the visibility and impact of North-East Indian researchers. This will aid in career advancement and the identification of potential research collaborators.

At last, this research highlights the growing significance of open-access publishing in the scholarly landscape of North-East India's central universities. It emphasizes the need for addressing gender disparities and promoting open access awareness and participation among faculty members. Additionally, it provides valuable information for stakeholders to make informed decisions regarding scholarly communication and open access initiatives in the region and globally.

6.3. Suggestions

The present study comprehensively analyzed the faculty attitudes and perception of scholarly communication on open-access publications in the selected central universities of North-East India. The following suggestions and feedback were given in light of analyzing the carefully gathered data from Scopus and online surveys for potential future advancement in open access:

1. It is seen from the study that the field of science and technology has a greater impact on open access platforms as their number of OA publications is higher than the disciplines of social science and humanities. Therefore, it suggested to the faculty and research professionals in the field of social science and humanities to publish their research articles in open access journals to cater more visibility and accessibility of their research works.

2. It is observed from the survey that many of the faculty members among and within the top ten producers of open access publications are not well aware of the different versions and routes of open access. So, it is recommended to the library and information science professional to spread and disseminate the idea of open access platform as it is an emerging platform for publication through certain workshops, seminars/conferences, symposiums, webinars and other means.
3. There has been an existing mandate policy or initiative i.e., ROARMAP for funded research to publish their research findings in open access journals. Many funding organizations from India such as DST, DBT, ICAR, etc. are indexed in ROARMAP, which has a definite policy to publish the research articles funded by these organizations in open access journals. However, the charges required in the open access journals as Article Processing Charges (APC) are not provided within the grants that have been commissioned. Therefore, it is requested that the government and funding organization provide a section of grants specially designed to publish the research works in open access journals for APC as the charges of APC are too high.
4. To increase the dissemination and accessibility of the scholarly findings, it is recommended that the universities/institutions create an open access repository (or institutional repository) which will hold all the pre-print versions of the published article in any journal of all the faculty members. This will help to promote the accessibility of the research works by the authors.
5. It can also be recommended to the universities/institutions to award or felicitate the top producer of scholarly articles published in open access platforms to promote the productivity and citations of their research works, which will definitely enhance the quality of the institution or university.
6. It is also recommended to the universities and institutions that hold research programs to include open access publishing in the curriculum of the syllabi of Research Methodology and Ethics. The inclusion of the open access concept in the syllabi of Research Methodology will help the young researchers to know about the possible OA journals and directories that help in the accession of numerous research works for reference and also will help to understand various policies related to open access.

7. Based on the findings of the study, which indicate that male authors have a greater number of research publications in open access mode, it is advisable to encourage and support female authors in taking proactive steps to publish their research findings in open access journals. This recommendation aims to promote gender equity in academia and ensure that the valuable contributions of female researchers receive the same visibility and accessibility as those of their male counterparts. Institutions and funding agencies can play a crucial role by providing resources, training, and awareness campaigns to empower female researchers to embrace open access publishing, thereby fostering a more inclusive and equitable scholarly landscape.

6.4. Scope for Further Research

Since the concept of open access publishing is relatively new, so, many research fields are unexplored and accessible for further investigation by any interested individual or organization. Based on the results of this study, the following scope for research have been suggested as potential research fields for the research professionals in the field of library and information science and other disciplines:

1. Presently, the study is only confined to the data from the Scopus database, however, the attitude and adoption of open access publishing can also be determined by using the data from various databases such as Web of Science (WoS), Google Scholar, Dimensions, IEEE Explore, PubMed, etc. The study can also be fortified by using the database of Altmetrics.com.
2. For scholarly production, the young scientists and researchers have also been very enthusiastic, so discovering the perception of open access among the young researchers or research scholars of an institution or collection of institutions will provide a clear view of the future of scholarly production.
3. The present study identified the perception of open access platforms only within the central universities of North-East India. This study can also be initiated by the researchers by undertaking the scholarly publications of a country, association of countries or particular geographical regions like BRICS, SAARC, South Asian countries, East Asian Countries, Middle East, European countries, and many more. The study can also be accomplished in different universities or technical institutions.

4. The co-relational analysis of open access publications and their gained citations can also be encouraged. In addition, societal attention on open access research publications can be conducted.
5. The study area of open access publishing can also be linked with the mandate policies of funded project work and produce the acceptance ratio of the mandate policies by various national and international funding organizations.

Faculty Attitudes toward Open Access Publications for Scholarly Communication in Central Universities of North East India: An Evaluation

Dear Author

I am a Ph.D. student in the Department of Library and Information Science at Mizoram University, Aizawl. My research entitled as “Faculty Attitudes toward Open Access Publications for Scholarly Communication in Central Universities of North East India: An Evaluation”. The main motive of my study is to assess whether the researchers opt for open access publishing or not and to determine their attitude in terms of open access publications. The terminology “open access” refers to research articles that are publicly available without payment, since respective authors give their authorization for this to occur via open access journals or a digital repository.

You were chosen to take part in this survey since you match the group of top researchers with recent publications in open access platform in journals of Scopus indexed database. We really appreciate you taking the time to participate in this online survey. The questionnaire will ask you about your opinions or perspectives on open access publishing, which will take approximately around five minutes to finish.

Your response will be kept confidential and all the data will be used for research purpose only. If you have any query or suggestions, please find me at **Email:** mayadeori94@gmail.com or **contact: 91 7002810284**.

Sincerely yours
Maya Deori
Research Scholar
Department of Library and Information Science
Mizoram University, Aizawl-796004

* Indicates required question

1. Email *

2. Name (Optional)

3. Age *

Mark only one oval.

- ◯ Below 25 years
- ◯ 26-35 years
- ◯ 36-45 years
- ◯ 46-55 years
- ◯ Above 55 years

4. Gender *

Mark only one oval.

- ◯ Male
- ◯ Female
- ◯ Prefer not to respond

5. Name of the Department *

_____

6. Name of the Institution *

_____

7. Academic Position/Designation *

Mark only one oval.

- ◯ Senior Professor
- ◯ Professor
- ◯ Associate Professor
- ◯ Assistant Professor

8. Years of working experience(s) *

Mark only one oval.

- 0-5 years
- 6-10 years
- 11-20 years
- 21-30 years
- More than 30 years

9. How long have you been accessing or disseminating scholarly information online? *

Mark only one oval.

- Not experienced
- 1-5 years
- 6-10 years
- more than 11 years

10. How would you appraise your own ability to access and disseminate scholarly content on the internet? *

Mark only one oval.

- Excellent
- Good
- Fair
- Poor

11. Please rate how strongly you agree or disagree with each of the following assertions about your self-efficacy in using the Internet.

Mark only one oval per row.

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
I am confident in accessing scholarly content on the internet	◯	◯	◯	◯	◯
I am confident in publishing my research output on the internet	◯	◯	◯	◯	◯

12. What is your preferable method for publishing and spreading your scholarly work? *

Mark only one oval.

- ◯ Traditional/Subscription Based mode
- ◯ Open Access Publishing mode
- ◯ Both

13. Are you aware of the term open access publication? *

Mark only one oval.

- ◯ Yes
- ◯ No

14. If yes, for how long have you been aware of the term open access publication?

Mark only one oval.

- 1-5 years
- 6-10 years
- 11-15 years
- 16-20 years

15. From where did you learn about open access? (Tick one or more) *

Tick all that apply.

- Browsing the internet
- Learned it from colleague/friends
- Through university library
- Read an article about open access
- Through publishers' promotion
- Through funding agency
- By participating in a conference/seminar/workshop
- Received email from open access journal editor for article submission
- Other: _____

16. Please indicate which of the following resources, terms and initiatives that you are aware of? (Tick one or more) *

Tick all that apply.

- Directory of Open Access Journals (DOAJ)
- Directory of Open Access Repositories (DOAR)
- Registry of Open Access Repositories (ROAR)
- Directory of Open Access Books (DOAB)
- Open Access Institutional Repositories
- Open access Journals
- Budapest Open Access Initiative (BOAI)
- Self-archiving
- Green open access model
- Gold open access model
- Bronze open access model
- Other: _____

17. You used open access platform majorly for- *

Mark only one oval.

- ◯ Access to scholarly literature
- ◯ Dissemination of research findings
- ◯ Both

18. Please indicate the number of publications you publish or made available through open access platform

Mark only one oval per row.

	1-10	11-20	21-30	31-40	41-50	More than 50
Journal Articles	◯	◯	◯	◯	◯	◯

19. Which among the following open access platforms you have published your research articles? (Tick one or more) *

Tick all that apply.

- ☐ Published an article in Open Access Journals
- ☐ Published an article in Hybrid Open Access Journals by paying Article Processing Charges (APC)
- ☐ Deposited an article in an institutional repository
- ☐ Deposited an article in a subject repository
- ☐ Uploaded an article on personal web page
- ☐ Uploaded an article on my departmental web page
- ☐ Other: _____

20. Why do you prefer to publish your work in the open access platforms? (Tick one or more) *

Tick all that apply.

- [ ] Increased visibility
- [ ] Broader Accessibility
- [ ] More citations
- [ ] Contribute to OA
- [ ] Supporting Plan S
- [ ] Other: _____

21. How satisfied are you with the open access publishing platform? *

Mark only one oval.

- ◯ Highly satisfied
- ◯ Somewhat satisfied
- ◯ Neither satisfied nor dissatisfied
- ◯ Somewhat dissatisfied
- ◯ Very dissatisfied

22. Have you ever encountered any trouble in publishing article in open access platform? *

Mark only one oval.

- ◯ Yes
- ◯ No

23. If yes, please specify- (Tick one or more)

Tick all that apply.

- [ ] The developing technical standards of open access publishing
- [ ] Complications of intellectual property rights (IPR) and copyrights issues
- [ ] Constrained licensing conditions
- [ ] Emergence of various open access models concept
- [ ] Other: _____

24. Do you believe that submitting to open access journals will have a greater impact on your research? *

Mark only one oval.

- ◯ Yes
- ◯ No
- ◯ Maybe
- ◯ Can not say

25. Why do you believe that people lack interest in open access platforms? (Tick one or more) *

Tick all that apply.

- ☐ Open access articles are not peer-reviewed
- ☐ Open access articles have less quality
- ☐ Prefers traditional publishing model
- ☐ Lack of awareness about open access publishing
- ☐ Less trust on open access publishers
- ☐ Other: _____

26. How likely are you to publish your research in open access journals in the future? *

Mark only one oval.

- ◯ Very likely
- ◯ Likely
- ◯ Neutral
- ◯ Unlikely
- ◯ Very unlikely

27. Do you recommend to other faculties to publish paper in OA? *

Mark only one oval.

- ◯ Yes
- ◯ No

28. If yes, how often do you recommend open access publication?

Mark only one oval.

- Never
- Rarely
- Sometimes
- Often
- Always

29. In your opinion, how could you aware the behavior of authors towards OA mode? (Tick one or more) *

Tick all that apply.

- [ ] Workshop on OA
- [ ] Seminar/Conference on OA
- [ ] Publishing more article on OA
- [ ] Lectures on OA
- [ ] Include OA as a curriculum in syllabus
- [ ] Awards and felicitation of OA authors
- [ ] Other: _____

30. Do you have any views or feedback regarding open access platform? *

_____

_____

_____

_____

_____

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Degree	Ph.D.
Department	Library & Information Science
Title of Thesis	Faculty Attitudes Toward Open Access Publications for Scholarly Communication in Central Universities of North East India: An Evaluation
Date of Admission	23.07.2019
Year of Completion of Coursework	2020
MZU Registration No.	1900183
Ph.D. Registration No. & Date	MZU/Ph.D./1432 of 23.07.2019
Date of Pre-Submission	04.09.2023

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1. Deori, M., Emami, M., Verma, M. & Daud, S. (2022). Global Mapping of Open Access Literature Availability in the Area of Scientometrics Research during 2012-2021. 1. 59-74.
2. Deori, M., Verma, M. K., & Basumatary, B. (2022). Life Sciences' Faculty Attitude towards Open Access Publications for Scholarly Communications: A Comparative evaluation of Three Selected Central Universities of North East India. *Resilience, Reflection, and Innovation in Library Services and Practices.* 294-308.
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Title of Thesis	Faculty Attitudes Toward Open Access Publications for Scholarly Communication in Central Universities of North East India: An Evaluation
Date of Admission	23.07.2019
Approval of Research Proposal	
1. DRC	11.05.2020
2. BOS	18.05.2020
3. School Board	23.06.2020
MZU Registration No.	1900183
Ph.D. Registration No. & Date	MZU/Ph.D./1432 of 23.07.2019
Extension (If Any)	N/A

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ABSTRACT

FACULTY ATTITUDES TOWARD OPEN ACCESS PUBLICATIONS FOR SCHOLARLY COMMUNICATION IN CENTRAL UNIVERSITIES OF NORTH EAST INDIA: AN EVALUATION

AN ABSTRACT SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF DOCTOR OF PHILOSOPHY

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SEPTEMBER, 2023

FACULTY ATTITUDES TOWARD OPEN ACCESS PUBLICATIONS FOR SCHOLARLY COMMUNICATION IN CENTRAL UNIVERSITIES OF NORTH EAST INDIA: AN EVALUATION

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1. Introduction

Library and Information Science is a very broad discipline that has adopted highly specialized techniques and research strategies. The research in LIS has evolved as a professional practice by various academicians and professionals in the field. From the past to the present, various pieces of research have been carried out by professionals emerging from the category of traditional areas like classification, bibliography, user study, information literacy, etc. to communicative and computer science-related areas. Since Library and Information Science have always been confined with a clear objective to satisfy their users in case of services or information retrieval processes. Therefore, with the introduction of Information and Communication Technology (ICT), it has been combined with computer-related facilities for the users. Nowadays, in research, it has always been observed that the researchers have focused on selecting the users' affiliated research areas. With the rapid growth in ICT, electronic publishing and digital libraries have contributed to the restructuring of scholarly publishing patterns in academic institutions and it has had a lot of impact on the scholarly communication process of academics, scholars and researchers from traditional print publication to electronic publications. Open access scholarly communication is a new trend in communicating the research findings and in the last decade it has gained more and more popularity among the academic community because open access is beneficial for both- users as well as researchers.

Scholarly communication is a means through which scholars communicate with each other in a broader public population. It is the process of authoring, publishing and use of the scholarly publication. It can be defined as "*the system through which research and other scholarly writings are created, evaluated for quality, disseminated to the scholarly community, and preserve for future use*" (Association of College & Research Libraries, 2003). Scholarly Communication can be described as a process through which researchers and scholars publish and share their research articles basically in peer-reviewed journals so that it is visible to information seekers worldwide. By adopting the term scholarly communication mainly, the LIS professionals are accepting it as a new mode of delivery of information. The professionals can go beyond supporting researchers in discovering and accessing scholarly information, by getting

involved in knowledge creation and changing the way through which new research is produced and shared. It can also help in serving the economic crisis in journal publishing, by encouraging and supporting the researchers to publish in open access journals.

2. Open Access

Open access is free, immediate, online and availability of research articles with reusable rights. Open access has certain features of the availability of free online resources with no or fewer copyright/licensing restrictions which diminishes barriers to information dissemination. This is all about making the scientific research content available for anyone and anywhere in the world to read access and build upon so that people can do interesting things in new ways with the available materials. The idea of open access is to make the literature search more valuable and relevant. Open access publishing has many benefits for the researchers mainly greater visibility than subscription-based articles and due to higher visibility, the article receives more citations which eventually decides the impact of the study.

There are two degrees of open access that can be distributed as *gratis* open access and *libre* open access which means free of charge online access and free of charge online access with various additional usable rights respectively. The various additional rights can be granted by the use of Creative Commons Licenses. And there are two main different routes to open access publishing i.e., Green and Gold. The '*green*' is generally self-archiving, where the authors make their final accepted version of articles freely available to all by depositing and displaying them in central or institutional repositories. The '*gold*' means journal publishing or the publishers of the journal provide full access to the research articles either by providing full authority to the author or institution; or by charging a processing fee. Later the '*hybrid*' was added to the list which means that the traditional subscription-based journals allow to publish certain publications in open access section of the journal by receiving a modest amount or fee from the author.

3. Significance of the Study

The term open access often means the availability of free peer-reviewed literature on the web with an opportunity to be retrieved by the public community allowing them to print, copy, download, and share the full-text articles. Open Access (OA) publishing has various advantages for all academic communities, including (a) Authors: Through OA, they may reach a global audience and make their accomplishments more widely known; (b) Universities: OA improves their goal of information sharing by enhancing the profile of their scholars and their publications. It also lowers publication expenses associated with journal and database subscriptions. Nowadays, open access is believed to be an emerging research area in the field of Library and Information Science where researchers determined the attitude and behaviour of different academic communities towards open access and measured their contribution. As stated by the report of the National Science Foundation in 2020, India has surpassed to third position in terms of scientific publications with 1,49,213 papers. Since Indian academicians are already very aware of the importance of scientific publications, therefore, it is very interesting and challenging to know the Indian academicians' attitudes towards OA publications. To know the trend of the academicians regarding open access publishing, the present study helps to provide a clear view of OA awareness, attitudes towards OA publications and insight story in the adoption of OA.

In addition, the study also anticipates a clear vision regarding the adoption of open access routes or open access publication patterns such as the Gold, Green, Bronze, and Hybrid. Besides that, the study strives to rank the most productive central Universities of North-east India and the most prolific contributors among the faculties in OA publications. Moreover, the findings of the study offer acuity to the researchers at the participating academic institutions with clarity to help them decide how to optimize scholarly communication for future high-impact publications.

4. Scope of the Study

Since the region of North-east India is present in the easternmost province of India linked with central India through a thin passageway pinch between Nepal and Bangladesh. In terms of the Academic community, even after being a prominent part of India, due to its geographical locations, the academicians of the regions sometimes lapse out certain academic progress and advancements compared to other regions of India. Since the central universities play a vital role in these regions in projecting academic and research achievements, it is also necessary to review the status of the academicians regarding the latest areas of research. Since the concept of open access publishing has been building a virtuous position in sharing and dissemination information in the digital world which led to evaluating the status of the adoption of open access publishing.

Therefore, the scope of the present study is limited to analyze the faculty's attitude towards Open Access publications for their scholarly communication in central universities of North East India. Presently, there are a total of 11 central universities (as on 05.03.2020), situated in different states of North East India. Out of these central universities, two central universities i.e., Central Agricultural University, Manipur and National Sports University, Manipur are different from other central universities in terms of nature and administrative control under ICAR and Ministry of Youths and Sports respectively however all other central universities are under UGC. Thus, the scope of the present study is limited to nine central universities of North East India which are recognized under the University Grants Commission (UGC). The publications of faculty were tallied from the Scopus database and only those publications were considered which appeared in the Scopus database.

5. Research Design

A research design is a methodical approach utilized by the researcher to offer genuine, unbiased, reliable, and economically viable solutions to problems. It is an arrangement of parameters for gathering and evaluating data that attempts to strike operational effectiveness with relevance to the study objective. It emphasizes on crafting a tactical strategy to carry out numerous procedures and responsibilities essential to successfully

conclude the study. And also, validates that these methods are sufficient to generate authentic, truthful, and comprehensive responses to the research questions.

5.1. Statement of the Problem

Open access is generally the scholarly publication which is free of restrictions with immediate online access to peer-reviewed full-text research articles along with the right to read, copy, download, share and print. For any researcher, it is equally important how the research findings will be shared with the rest of the academic communities. And sharing of research work has undergone a tremendous change in the way of scientific communication in the last two decades and from the LIS perspective, it is a very interesting and challenging attempt to measure the changes in the attitude of the faculties in their scientific communication of central universities of North East India. The main aim of this study is to examine the attitude and perception towards publishing in open access platforms. The study also gives insights into the most prolific contributors, research contributions of central universities of NE India, leading universities and top faculty in OA publications in these universities, preferred route to publish OA publications, popular OA journals and platforms and purpose for publishing in open access platform.

5.2.Objectives of the study

A research objective is a simple, explicit phrase that gives out a clear direction to carry out the investigation of the study. The objective of the research provides a vibrant indication of what to achieve in the whole investigation.

The objectives of the present study are to:

1. Find out the research contributions of the faculties of central universities of North East India
2. Assess the level of awareness about open access (OA) among the faculties
3. Investigate the faculty's publications in OA in selected universities
4. Reveal the attitude and behaviour of faculty towards their OA publications
5. Find out the preferred routes of OA publications by faculty
6. Identify the degree of satisfaction among the faculty's OA publications

7. Rank the most productive central universities and the most prolific contributions in OA

6. Research Methodology

A research methodology gives the research investigation authenticity and delivers valid scientific findings. Furthermore, it provides a comprehensive technique that assists in maintaining researchers' focus and enables a basic, viable, and reasonable technique. It summarizes the steps followed and the procedures that culminated in the study findings.

6.1. Type of Research: The present study eventually examined the purpose and productivity of publication in open access platform by the faculty which described that the nature of the study was both quantitative and qualitative. The study adopted both bibliometrics and survey methods for the identification of samples and collection of data.

6.2. Sample of the Study: The faculty of the central universities of North-East India was reserved as a sample for the study by using the census sampling method. The publications or research contributions of the faculty of the central universities of North-East India on the open access platform that was indexed in the Scopus database until 2022 were considered as the sample of this study. A survey was conducted to examine the attitude and behaviour of the faculty members towards open access which was based on 90 faculty members (top ten faculties from each university based on the OA publications). However, only 65 faculty members from 9 central universities responded to the questionnaire.

6.3. Data Collection Tools: For collection of data, the following tools were used in this study**:**

- ***Scopus Database:*** The Scopus is the greatest database of literature that has undergone peer review, including scientific journals, books, and conference proceedings. It offers a comprehensive examination of the research conducted globally in various areas of science, technology, health, social and behavioural sciences, and humanities and arts fields. The Scopus database was utilized to compile the publication statistics from the undertaken central universities.

- ***Google Form for questionnaire:*** Google Form is a product or tool from Google which is online and free permitting for creation of forms for surveys and quizzes. It also elaborately provides the feature to share and edit as well as analyse the data retrieved from the responses of the respondents. This study has circulated a questionnaire to each of the sample populations using Google Forms from Google to accomplish the collection of data for the qualitative measure using the survey method.

6.4. Data Collection Procedure: By using the Scopus database, the data required for evaluation was retrieved between November 19th to December 14th 2022 using the Scopus Database up until the year 2022. The retrieved data was scrutinized and arranged according to standard interpretation using Microsoft Excel. The total contribution of the faculties and their variations was identified manually using Biblioshiny (Bibliometrix R Package). Biblioshiny is an open-source tool to perform a comprehensive scientific mapping assessing scientific publications. It was created using the R programming language to ease the interface with other statistical and graphical applications and to be adaptable (Aria and Cuccurullo, 2017). The availability of open access scholarly publications was analysed manually using MS Excel. While, to examine the attitude and behaviour of the faculty members towards open access, a survey was conducted and the top ten faculties from each university were identified as the sample size. A questionnaire was circulated from March 26th 2023 to each faculty included in the sample via email at first, later WhatsApp, which was then followed by a telephonic approach to each of the sample population.

6.5. Data Analysis and Interpretation: The collected data from the Scopus database and questionnaire was scrutinized, tabulated, and analyzed using suitable software packages such as MS Excel and Biblioshiny (Bibliometrix R Package). Later the analyzed data was displayed by using different tables and graphs for better interpretation of the result.

7. Findings of the Study

It addresses the findings and inferences of the study that have been discussed in the preceding chapter. The primary goal of the study was to determine the attitude and perceptions towards publishing scientific productivity via open access platform. The study provides insights into the opinions and views of the faculty toward scientific communication at central universities in North East India about adopting open access publishing for the access and dissemination of academic resources. The analysis of the data was commenced in consideration of the undertaken objectives. The major findings of the study have been drawn in two comprehensive categories such as:

(a) Findings respective to the objectives of the study
(b) General inferences of the study

7.1.Findings respective to the objectives of the study

Objective 1: Find out the research contributions of the faculties of central universities of North East India

a) Based on the analysis of the data extracted from the Scopus database, it is clearly visible that from a total of 2321 numbers of appointed faculties in the central universities of North East India, only 1190 numbers of faculty members have been able to index or publish articles in Scopus-indexed journals which acquires a shared per cent of 51.27%.
b) As per the total Scopus indexed faculty, maximum faculty members are designated as Assistant Professor with 565 (47.48%) which is subsequent to Professor 417 (35.04%), and 160 (13.45%) of them as Associate Professor. However, the rest 48 (4.03%) faculties are guest lecturers in the central universities.
c) Amongst the Scopus-indexed faculty members of the selected central university i.e., 1190 members, an aggregate of 18610 scholarly publications have been produced by the faculty member which Tezpur University has the maximum publication of 5052 (27.15%) numbers. NEHU has the second highest number of publications with 3242 (17.42%) followed by Assam University with 3156 (16.96%).

d) Professors have been successful at the top amongst other designations with 11561 (53.71%) publications despite having fewer numbers of faculty members than Assistant Professor which has 7106 (33.01%) publications.
e) Under the category of year-wise distribution of the overall publications, the year 2021 has the greatest amount of scholarly articles with 1898 (10.20%) which is trailed by the year 2022 with 1725 (9.27%) and year 2020 with 1580 (8.49%).
f) Out of a total citation of 2,71,635 gained from the publications published by faculties indexed in the Scopus database, the faculties of Tezpur University have acquired the highest number of citations with 85,249 (31.38%) being tailed by Assam University with 46,778 (17.22%) and NEHU with 40,683 (14.98%).
g) With regards to the gender distribution, after a collective analysis of all the central universities, the maximum number of faculty members is male i.e., 926 (77.82%) while the number of female faculty is 264 (22.18%). In view of publication pattern, the publication quantity of the male faculty which is 18961 (88.08%) is much higher than the female faculty with 2565 (11.92%).
h) In terms of department distribution, a cumulative amount of 121 variants of departments have been identified amidst the selected central universities. Within which the department of Physics has the greater number of faculty members and it also produced the highest publication quantity which is 2686 (12.48%) and next is the department of chemistry with 2507 (11.65%).

Objective 2: Assess the level of awareness about open access (OA) among the faculties

a) The category of the awareness of the faculty members towards open access publishing has been determined by using the online survey method via Google form questionnaire (mentioned in ANNEXURE-I). The online questionnaire was distributed among the top ten faculty members of the undertaken central universities of North East India. Within which 65

(72.22%) of the faculty members have responded to the online questionnaire.

b) Out of the total respondents, 44.62% revealed to have an excellent ability to access and distribute scholarly materials online, however, 43.08% have rated themselves in the poor category. While in terms of self-efficacy regarding accessing online scholarly content, 41.54% of the respondents are very confident about online accessing of scientific literature; and 52.31% of the respondents are self-confident about publishing the research findings through online mediums.

c) In terms of the preferred mode of releasing and disseminating the research work, 63.08% of the respondents favour both the traditional mode of publishing as well as open access mode of publishing. Yet, 26.15% of the respondents majorly prefer only the traditional mode of publication and distribution.

d) Regarding the awareness about open access publishing, 100% of the respondents revealed having certain ideas about open access platforms and their characteristics. And 40% of them have been aware of the term for the last 11-15 years. 27.92% of the respondents were familiar with the term open access through browsing the internet and 14.94% of them through publishers' promotion through email. 21.96% of the respondents are aware of open access journals as the sources or initiatives of open access while 18.82% are aware of the Directory of Open Access Journals (DOAJ).

Objective 3: Reveal the attitude and behaviour of faculty towards their publications

a) With regards to the utilization or attitude towards open access platforms, 60% of the respondents use open access platforms for both retrieving scholarly content along exposing the research works of the individual. However, 40% of them adopt open access for only accessing scientific literature.

b) 38.46% of the respondents have published 11-20 numbers of scholarly papers and 24.62% of them have produced 21-30 numbers in open access

platforms. About 50.96% of the respondents have published their open access articles mostly in open access journals. 28.85% of them also publish their research works in open access sections of hybrid journals by paying APC. 37.41% of the respondents opted for open access platform to have greater visibility of their research findings while 32.37% of them adopted the OA platform to access scholarly articles without any restrictions.

Objective 4: Investigate the faculty's publications in OA in selected universities

a) According to the data retrieved from the Scopus database, out of 1190 faculty members, 709 (59.58%) of the faculties are associated with open access publications. Assistant Professors make up the largest proportion of the aforementioned faculty members, accounting for 334 (47.11%), followed by Professors (264, 37.24%) and Associate Professors (92, 12.98%).

b) A cumulative collection of 3868 academic OA publications was generated by the 709 academics of the nominated central institution where Tezpur University holds the greatest quantity of open access publications with 854 (22.08%) numbers. Assam University pertains in a subsequent spot having 767 (19.83%) OA documents, immediately followed by NEHU with 651 (16.83%). In case of share percentage, Sikkim University has the most quantity of OA articles having 25.95% when extracted from the total number of publications.

c) Professor has managed to outperform all other designation categories with 2143 (48.11%) OA articles while possessing fewer faculty members than Assistant Professor, who has 1639 (36.80%) OA publications.

d) In terms of the distribution of publications by year, the year of 2021 has the highest proportion of OA research articles having 525 (13.57%), thereafter the two following years are 2022 with 455 (11.76%); and 2020 releasing 397 (10.26%).

e) With regards to the acquired citations, a total of 61,614 citations have been derived from faculty-authored open access publications that were included in the Scopus database where Tezpur University's academics

were cited the most with 13,534 (21.97%). And, the next most cited central universities are Assam University acquiring 12,150 (19.72%) and NEHU gaining 9125 (14.81%) citations.

f) In the context of gender category, the overall proportion of male faculty members associated with open access platforms is 556 (78.42%), whereas the proportion of female faculty comprised 153 (21.58%) within the selected central universities. According to the pattern of open access publications, the male faculty published 3825 OA papers (86.44%) which is way more than the female faculty, who have published 600 (13.56%) OA articles.

g) Only 94 departments of the undertaken central universities are integrated with open access publishing, in which, the department of physics ranks first to generate the maximum number of OA papers having 700 (15.82%) compared to other departments. And, the subsequent departments to have more OA publications are the Department of Chemistry with 302 (6.82%) and the Biotechnology Department with 284 (6.42%).

Objective 5: Find out the preferred routes of OA publications by faculty

a) The open access publications extracted from the Scopus database are classified into primary four OA approaches such as gold, green, bronze and hybrid. However, the co-relation view among the different open access routes has been systematically categorized into seven OA routes as analytically generated by the Scopus database itself. The majority of the academicians have opted for the category of gold green OA route by releasing 988 (25.54%) OA articles and within this category, the year 2021 has initiated the most OA articles (144) whereas the year 2016 has attained the highest citations counts (2384). The next most entrusted OA route is green which has 917 (23.71%) OA publications attaining the highest number of citations (1890) in the year 2011 which is trailed by the bronze (796, 20.58%) and gold (710, 18.36%) OA routes. In the bronze OA route, the maximum number of citations was gained in the year 2016 having 1161

citations altogether and in the gold OA route, the year 2018 received the greatest quantity of citations which was 1247.

Objective 6: Identify the degree of satisfaction among the faculty's OA publications

a) Under the degree of satisfaction section, 40% of the respondents are slightly satisfied with the characteristics and facilities of open access platform and 35.38% of the respondents are extremely contented with the features and privileges provided by OA publishing. 18.46% of the respondents have stated that they have confronted certain challenges while proceeding to publish an article in open access platform mainly with the technical standards of OA publishing (47.37%) and the development of different variants of open access approaches.

Objective 7: Rank the most productive central universities and the most prolific contributions in OA

a) Based on the number of open access publications, Tezpur University is the most productive central university among the undertaken sample central universities of North East India with 854 (22.08%). Assam University is the second most prolific central university with 767 (24.30%).
b) Under the section of prolific authors of open access platform, the top faculty based the highest number of open access publication of each university states as Amitabha Bhattacharjee from Assam University (58 OA articles); Dilip Angom (59 OA papers) from Manipur University; Nachimuthu, Senthil Kumar from Mizoram University has 72 OA publications; Rajkrishna Mondal (5 OA articles) from Nagaland University; Timir Tripathi (41 OA papers) from NEHU; Nipen Saikia (19 OA papers) of Rajib Gandhi University; Jyoti Prakash Tamang (30 OA publications) of Sikkim University; Mrinal Kumar Das (37 OA papers) of Tezpur University; and Syed Arshad Hussain (34 OA publications) from Tripura University.

c) The prolific journals based on the numbers of OA publications have been published for respective selected central universities are revealed below as PLOS One (37 OA publications) for Assam University; Indian Journal of Physics (28 OA papers) from Manipur University; Scientific Reports (17 OA publications) for Mizoram University; BMB Reports (3 OA papers) for Nagaland University; Journal of Parasitic Diseases (25 OA articles) from NEHU; Notulae Scientia Biologicae (8 OA papers) from Rajib Gandhi University; Frontiers in Microbiology (18 OA publications) for Sikkim University; Journal Of Food Science and Technology (49 OA publications) for Tezpur University; and Cytologia and Scientific Reports (10 OA papers each) from Tripura University.

d) Under the prolific cited faculty of each undertaken central university on the basis of the maximum number of citations attained from the open access publications are presented as Sanjeev Kumar from Assam University (1926 citations); Dilip Angom (676 citations) from Manipur University; Nachimuthu, Senthil Kumar from Mizoram University has gained 1683 citations; Rosemary R. Dzuviche (451 citations) of Nagaland University; Timir Tripathi (954 citations) from NEHU; Heikham Evelin (860 citations) of Rajib Gandhi University; Jyoti Prakash Tamang (1298 citations) from Sikkim University; Debendra Chandra Baruah (1018 citations) of Tezpur University; and Debajyoti Bhattacharjee (1035 citations) from Tripura University.

7.2.General inferences of the study

a) The analysis of the extracted data interprets that the number of overall scholarly publications produced by the faculties of the undertaken central university is 18,610 papers but the number of scholarly open access publications is just 3868 articles. From the overall publications, open access articles share is only 20.78%.

b) In terms of citations received by the publications published by the faculties shows that from the total citation (271,635) attained by the overall articles, the open access articles have acquired 61,614 citations which is just

22.68% of the total citations. The university to attain the maximum share of citations for OA articles from the total papers is Nagaland University which has 46.05% share of citations from the total citations gained by the university.

c) Under the criteria of open access models, the highest number of open access publications which have been generated in each category are represented. Tezpur University has the highest quantity of OA publications in numerous OA models such as bronze (198 OA articles), gold (136 OA papers), green (248 OA publications), hybrid gold (20 OA documents) and hybrid gold green (20 OA papers). And, Assam University also has the most quantity of OA publications in the different OA routes like bronze gold (74 OA publications), gold green (244 OA papers) and hybrid gold (20 OA articles).

d) The number and publication gap between gender categories i.e., male and female in each undertaken university is very high. The number of OA publications produced by the female gender is drastically low primarily at Sikkim University, Mizoram University and Tripura University when compared to the OA publications of the male gender of the selected central universities.

e) In case of the open access publication distribution among the departments of the selected central universities, it is seen that most open access scholarly work has been produced by the disciplines of Science and Technology when compared to the discipline of social science and humanities. In the discipline of social science and humanities, the Department of Economics has the maximum open access collection with 40 (0.90%), Geography (39, 0.88%) and English (35, 0.79%).

f) Ranking of the department of each university based on a number of OA publications reveals that the department of physics has the most open access collection in the certain selected universities viz. Manipur University (129 OA articles), Tezpur University (109 OA papers) and Tripura University (198 OA publications). Yet, the Department of Biotechnology has the maximum number of OA articles in Mizoram

University (129 OA papers) and Nagaland University (8 OA articles). Whereas in Assam University, the Life Science department (228 OA publications) has the highest number of OA papers; the Chemistry department (115 OA articles) for NEHU; the Mathematics department (37 OA articles) for Rajib Gandhi University; Microbiology department (60 OA documents).

g) Within the funding scenario, it is seen that from the entire published scholarly publications, only 2508 (13.48%) numbers of scholarly publications have been funded by various national and international organizations. Whereas from 3868 OA publications, only 693 (17.92%) OA articles have been provided grants by the agencies. Department of Science and Technology, the Department of Biotechnology and the University Grants Commission are the funding organizations that have repeatedly provided grants to the undertaken universities and ranked top when analyzed.

h) Under the section on qualitative analysis of the attitude and perception of the designated faculty members of the selected central universities. Only 65 (72.22%) of the faculty members have responded to the online questionnaire amongst the distributed 90 faculty members. Most of the respondents belong to the age group of 36-45 years (38.46%) and the next is 46-55 years (32.31%).

i) Within the group of respondents, 62 (95.38%) are male gender while only 3 (4.62%) of the respondents belong to the female category. Meanwhile, 29 variations of the department are encompassed where most of the respondents belong to the physics department (10, 15.38%). And, most of the respondents were designated as Professors (31, 47.69%) and Assistant Professors (15, 23.08%). Majority of the respondents have 11-20 years of working experience (37, 56.92%) and 21-30 years (14, 21.54%).

j) About 52.31% of the respondent believe that adopting open access publishing to spread their research work will have a good influence on their academic career. However, 13,85% strictly denied the circumstance of having an impact on the academic profession. 40% of the respondents

consider that for lack of awareness or less trust in OA publishers (23.08%) about the quality of open access publishing, the professional has less interest in open access platforms. 46.15% of the respondents stated that they are likely to publish or issue their research findings in open access platform in the future.

k) 64.62% of the respondents are pleased to recommend open access to other professionals while 35.38% of them do not wish to recommend. Amongst that 64.62% of respondents, 33.33% of responded faculty would sometimes recommend features of open access platforms and 30.95% would share about OA publishing very rarely. 26.32% of the respondents desired the workshop on open access to spread and inform about the area and 21.05% of them opted for seminars and conferences, particularly on the OA platform.

8. Conclusion

Open access publications, as a concept, originated in the broader movement towards democratizing knowledge and making scholarly research accessible to a wider audience. The open access movement, such as the Budapest Open Access Initiative (2002), Bethesda Statement (2003), Berlin Declaration (2003), and Delhi Declaration on Open Access (2018) are the transformative force in the development of scholarly communication and knowledge dissemination. It originated as a response to the limitations of traditional publishing models, which often restricted access to research articles behind paywalls, hindering the free flow of knowledge. Over the years, this movement has gained momentum and evolved into a global initiative to make research and academic resources freely accessible to all. This development has significantly expanded the reach and impact of research, enabling researchers, educators, policymakers, and the general public to benefit from and contribute to global knowledge. Moreover, the open access movement has encouraged transparency, collaboration, and the adoption of open science practices, ultimately enhancing the quality and rigour of research.

Open access has become a powerful tool for advancing academic communication and bridging the gap between research and the general public. Open access empowers scholars to disseminate their work widely, fostering collaboration and innovation, and accelerating scientific progress. This comprehensive study investigated various aspects of research contributions, awareness of open-access publishing, attitudes and behaviours of faculty members, and the state of open-access publications in the nine central universities of North-East India. The findings from each objective of the study shed light on essential facets of the academic landscape in this region. Many faculty members have engaged in Scopus-indexed journal publications, with 51.27% of the appointed faculties contributing to scholarly output. Among the faculty, Assistant Professors constitute the largest group, followed by Professors and Associate Professors, with a small percentage of guest lecturers. The study also highlights the disparities among universities in the Northeast region regarding scholarly output, with Tezpur University leading the way, followed by Assam University and NEHU. These universities are leading the scientific publications as per the Scopus record as they have maximum research publications. Notably, Professors have emerged as the most prolific contributors to scholarly publications despite their smaller numbers than Assistant Professors. The reason may be their extensive experience and expertise in their respective fields. The year-wise distribution of open-access publications shows a trend towards increased scholarly output, with 2021 being the most prolific year, closely followed by 2022 and 2020. Additionally, Tezpur University has garnered the highest number of citations, indicating the impact of its faculty's research on the academic community. Gender disparities in faculty composition and publishing patterns are apparent, with a significantly higher number of male faculty members and a substantial gap in publication quantity between male and female faculty. The departmental distribution of scholarly output also reveals a preference for Science and Technology disciplines. The study's survey results demonstrate a strong awareness of open-access publishing among faculty members, with a notable percentage confident in accessing and distributing scholarly materials online. Moreover, the majority of respondents express a preference for both traditional and open-access modes of publication. Departmental rankings reveal the prominence of Physics in open-access publications across several universities. Funding for scholarly publications, both

overall and within the open-access domain, is attributed to various national and international organizations, with the Department of Science and Technology, the Department of Biotechnology, and the University Grants Commission playing crucial roles.

The feedback received from the questionnaire on faculty attitudes towards open-access publication in Central Universities of North East India reflects a diverse range of opinions and concerns. While some respondents expressed positive views about open access and its potential for greater visibility and recognition in research, others raised significant challenges associated with its implementation. One prominent issue highlighted is the financial constraint researchers face, particularly those from universities with limited research funding. The high cost of Article Processing Charges (APCs) in many open-access journals is seen as a barrier, making it difficult for researchers and those from less resource-rich institutions to publish their work in the open access route. This situation perpetuates an inequitable distribution of resources and hampers the visibility of valuable research. Additionally, the presence of predatory journals charging APCs without providing proper peer review or editorial services is a concern. This phenomenon underscores the importance of discerning between legitimate open-access journals and predatory ones.

While the concept of open access is appreciated for its potential to democratize knowledge, the practical challenges raised by faculty members in the North East Indian context need to be carefully prioritized. The feedback suggests that addressing funding, predatory journals, and awareness issues will be crucial in promoting open-access publication in the region. It is evident that for open access to fulfil its potential, there is a need for supportive policies, funding mechanisms, and increased awareness among researchers. The study concludes that there is a need for increased awareness among researchers in the North Eastern region of India regarding various aspects of open-access publishing, such as journal selection, publishing route, licensing, funding, and mandates, in order to enhance the visibility and impact of North-East Indian researchers. This will aid in career advancement and the identification of potential research collaborators.

At last, this research highlights the growing significance of open-access publishing in the scholarly landscape of North-East India's central universities. It emphasizes the need for addressing gender disparities and promoting open access awareness and participation among faculty members. Additionally, it provides valuable information for stakeholders to make informed decisions regarding scholarly communication and open access initiatives in the region and globally.

9. Suggestions

The present study comprehensively analyzed the faculty attitudes and perception of scholarly communication on open-access publications in the selected central universities of North-East India. The following suggestions and feedback were given in light of analyzing the carefully gathered data from Scopus and online surveys for potential future advancement in open access:

1. It is seen from the study that the field of science and technology has a greater impact on open access platforms as their number of OA publications is higher than the disciplines of social science and humanities. Therefore, it suggested to the faculty and research professionals in the field of social science and humanities to publish their research articles in open access journals to cater more visibility and accessibility of their research works.
2. It is observed from the survey that many of the faculty members among and within the top ten producers of open access publications are not well aware of the different versions and routes of open access. So, it is recommended to the library and information science professional to spread and disseminate the idea of open access platform as it is an emerging platform for publication through certain workshops, seminars/conferences, symposiums, webinars and other means.
3. There has been an existing mandate policy or initiative i.e., ROARMAP for funded research to publish their research findings in open access journals. Many funding organizations from India such as DST, DBT, ICAR, etc. are indexed in ROARMAP, which has a definite policy to publish the research articles funded by these organizations in open access journals. However, the charges required in the open access journals as Article Processing Charges

(APC) are not provided within the grants that have been commissioned. Therefore, it is requested that the government and funding organization provide a section of grants specially designed to publish the research works in open access journals for APC as the charges of APC are too high.

4. To increase the dissemination and accessibility of the scholarly findings, it is recommended that the universities/institutions create an open access repository (or institutional repository) which will hold all the pre-print versions of the published article in any journal of all the faculty members. This will help to promote the accessibility of the research works by the authors.
5. It can also be recommended to the universities/institutions to award or felicitate the top producer of scholarly articles published in open access platforms to promote the productivity and citations of their research works, which will definitely enhance the quality of the institution or university.
6. It is also recommended to the universities and institutions that hold research programs to include open access publishing in the curriculum of the syllabi of Research Methodology and Ethics. The inclusion of the open access concept in the syllabi of Research Methodology will help the young researchers to know about the possible OA journals and directories that help in the accession of numerous research works for reference and also will help to understand various policies related to open access.
7. Based on the findings of the study, which indicate that male authors have a greater number of research publications in open access mode, it is advisable to encourage and support female authors in taking proactive steps to publish their research findings in open access journals. This recommendation aims to promote gender equity in academia and ensure that the valuable contributions of female researchers receive the same visibility and accessibility as those of their male counterparts. Institutions and funding agencies can play a crucial role by providing resources, training, and awareness campaigns to empower female researchers to embrace open access publishing, thereby fostering a more inclusive and equitable scholarly landscape.