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Integrating Bibliometric and Altmetric Analysis for Institutional Research Impact: A Comprehensive Review

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ABSTRACT

This paper aims to review and explore institutional studies from 2020 to 2025 on Bibliometric and Altmetrics. According to the existing literature, bibliometrics and altmetrics cannot provide a thorough assessment of research impact when applied in isolation; however, when integrated, they can yield a more comprehensive view of the impact. The current study provides significant insights into research impact, publishing patterns, and institutional performance across various disciplines, particularly in the context of Indian Institutes of Technology (IITs) and higher education institutions (HEIs).

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KEYWORDS: Altmetric, Bibliometric, Citation, Higher Educational Institutions (HEIs), Research Impact, Research Output, Societal Impact, Social Media.

1. INTRODUCTION

In the rapidly expanding fields of scientific research, information and communication technology, and other related domains, a vast amount of data is generated in various formats. Researchers and academics worldwide contribute to this ever-growing body of knowledge through a substantial number of scholarly publications. An essential component of the academic research lifecycle is the dissemination of these research outputs (Bankar & Lihitkar, 2019). With the rise of digital communication channels, tracking how research is shared and consumed has become increasingly important. The evolution of scholarly communication has prompted the need for advanced methods to effectively monitor and evaluate research impact. Bibliometrics, the statistical analysis of books, journals, and scholarly articles, has traditionally been used to assess the influence and productivity of research. Early bibliometric approaches focused on basic metrics such as the number of articles published, citation counts, and word frequency analysis (Karanatsiou et al., 2017). Indicators such as citation counts, journal impact factors, and author-level metrics, including the h-index, g-index, and i10-index, are commonly used to measure scholarly productivity and impact. While these metrics remain relevant, they do not capture the full spectrum of research dissemination,

particularly online interactions and social media engagement, which are increasingly important in understanding research visibility and reach (Dhiman, 2015).

To bridge these gaps, altmetrics have emerged as a complementary approach to traditional bibliometrics. Altmetrics refer to online metrics that measure the attention and influence of scholarly outputs across various platforms, including Twitter, Facebook, blogs, news articles, and bookmarking sites. Tools like Altmetric Explorer have pioneered the aggregation of these data points, providing a more holistic view of how research resonates both within and beyond academia. By incorporating real-time data and societal engagement indicators, altmetrics help paint a fuller picture of a publication's broader impact (Erdt et al., 2018). In today's digital era, social media and technology have a significant influence on the dissemination of research and public engagement. However, as these platforms become central to academic visibility, they also bring challenges regarding authenticity, ethical communication, and self-awareness (Bajwa & Mehdiratta, 2021). This paper aims to provide a systematic review of both bibliometric and altmetric analyses, focusing on their combined role in assessing institutional research impact and offering insights into how research influence can be more comprehensively measured.

2. CORE CONCEPTS IN RESEARCH IMPACT ASSESSMENT

Understanding key terminologies is essential for evaluating institutional research performance. Bibliometrics, as defined by Fairthorne (1969), refers to the "quantitative treatment of properties of recorded discourse and behaviour appearing to it." It is broadly recognized as the quantitative analysis of the bibliographic features of a body of literature. The term itself is derived from the Greek words "biblion" (meaning "book" or "scroll") and "metron" (meaning "measurement"), reflecting its foundational purpose. Complementing bibliometrics, altmetrics, short for "alternative metrics", are defined by Priem et al. (2012) as "the study and use of scholarly measures based on activity in online tools and environments." These metrics address the limitations of traditional indicators, such as citation counts, impact factors, and the h-index (Jenkins, 2024), by incorporating data from social media platforms, blogs, and online reference managers.

Research metrics, as described by Research England, are "quantitative measurements designed to evaluate research outputs and their impacts," encompassing indicators such as publication counts, citations, social media engagement, and mentions in policy documents (DORA - Declaration on Research Assessment | Sage, 2024). Research productivity refers to the measurable output of researchers, typically within a specific time frame or relative to research inputs (Lee, 2007). Research outputs encompass all work produced during a research project, spanning a diverse range from journal articles and books to datasets, software, and creative works (Kendal, 2025). Research impact, according to the Economic and Social Research Council (ESRC), is "the demonstrable contribution that excellent research makes to society and the economy." Finally, citations are formal acknowledgements of previously published work. They give credit to original authors and provide readers with the means to locate the source, serving as a crucial tool for validating academic arguments (Vos, 2023). Together, these concepts form the foundation for assessing the reach, quality, and significance of research in both academic and societal contexts.

3. OBJECTIVES

a) Synthesize definitions, data sources, and normalization methods for bibliometric and altmetric indicators.
b) Quantify relationships between citations and altmetrics across disciplines and time windows.

c) Assess the validity, reliability, and biases of key indicators and data platforms.

d) To gain insights from the literature regarding the implications of bibliometrics and altmetrics in evaluating research impact.

e) Identify methodological gaps and prioritize future research, datasets, and reporting standards to enhance the quality of research.

4. METHODOLOGY

4.1 RESEARCH DESIGN

This research employed a systematic review of the literature, guided by the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) framework, a standardized and widely recognized method for conducting systematic reviews and meta-analyses (Page et al., 2021). The study specifically focused on identifying and evaluating scholarly publications related to bibliometric and altmetric analyses of institutional research impact published over the past six years.

4.2 DATA SOURCES AND SEARCH STRATEGY

To gather relevant literature, the researchers accessed multiple academic databases, including Scopus, Web of Science, LISTA, and Google Scholar. A structured search strategy was employed, utilising Boolean logic and incorporating the operators AND, OR, and NOT to refine the results. The specific search query used was: (Keywords: Bibliometrics AND Academic AND Institutions), with filters applied for publication years 2020-2025, the language set to English, and the document type restricted to journal articles. The search was conducted during August 2025. Only English-language articles that directly addressed the use of bibliometric and altmetric analyses in academic institutional settings were included in the final analysis.

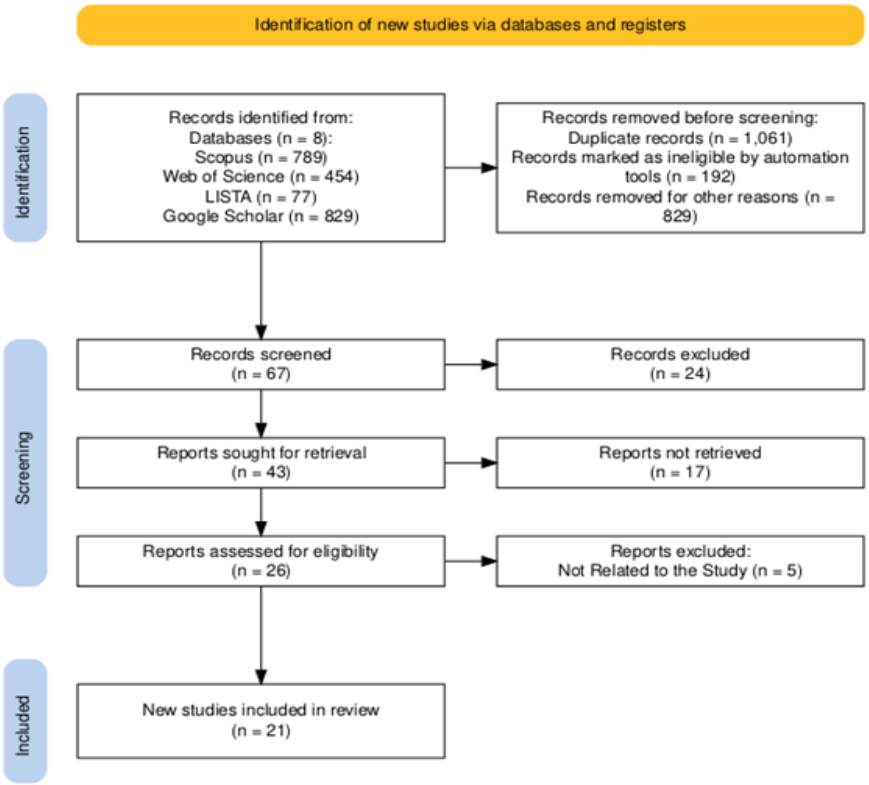

Figure 1. PRISMA Flow Diagram (Haddaway et al., 2022)

The inclusion criteria comprised studies that focused specifically on bibliometric and altmetric analyses in relation to institutional research impact. Studies that were not directly related to the target focus or lacked empirical data were excluded. As illustrated in Figure 1, a total of 2,149 records were initially identified across multiple sources: Scopus (789), Web of Science (454), LISTA (77), and Google Scholar (829). Prior to screening, 2,082 records were removed: 1,061 due to duplication, 192 deemed ineligible by automation tools, and 829 excluded for other reasons. This left 67 records for the screening phase, during which 24 were excluded based on the relevance of their titles and abstracts. From the remaining 43 records, 17 full-text reports could not be retrieved. A total of 26 full-text articles were then assessed for eligibility, of which 5 were excluded for being unrelated to the study's focus. Ultimately, 21 studies met the inclusion criteria and were included in the final systematic review (Haddaway et al., 2022).

5. STUDIES ON BIBLIOMETRICS

A review of recent studies highlights significant developments in bibliometric and altmetric analyses of institutional research impact. Vkkm & Kimidi (2024) examined publication trends in second-generation IITs from 2010 to 2019, identifying 20,039 publications with an average of 9.72 citations per paper. They emphasized key disciplines such as Materials Science and Engineering and noted a total of 194,821 citations, with 67,659 from open-access sources. Similarly, Solanki et al. (2024) analyzed Scopus data from 2010 to 2021, reporting 31,393 publications and 526,671 citations, and assessed growth metrics, including the relative growth rate and collaboration index. Sharma et al. (2024) explored the exponential growth of IIT research output aligned with SDGs 3, 7, and 11, highlighting India's global collaborations and identifying IIT Kanpur as the leading institution in terms of per-paper impact, despite high productivity at IIT Bombay and IIT Madras. A bibliometric analysis by Osman et al. (2025) used VOSviewer to study 1,122 publications on sustainable development in HEIs (2015–2023), noting a rise from 105 publications in 2019 to 263 in 2023, with the UK emerging as a leading contributor with 5,450 citations. Oliveira et al. (2022) conducted a bibliometric review that established the intellectual structure of institutional performance research, focusing on themes such as sustainability, entrepreneurship, and political connections. Li & Yin (2023) examined the influence of publication metrics on university rankings, analyzing the 2020 US News & World Report Best Global Universities Ranking. They noted that top institutions with broad discipline coverage and international collaborations perform better, with multidisciplinary research enhancing their impact. Pradhan et al. (2020) extracted Scopus data from 1990 to 2019, analyzed 1527 publications with 15,440 citations, and assessed various metrics, including the average citation per paper, which was 9.88%. The results indicate that the research activities are not quite up to par when compared to those of similar universities. Lastly, Mohsen (2021) investigated applied linguistics research in Saudi universities (2011–2020), revealing increased output and strong citation rates driven by international collaboration, particularly in language instruction and learning. Collectively, these studies reflect growing global interest in institutional research evaluation, collaboration, and alignment with societal priorities.

Recent bibliometric studies have explored institutional research performance across various contexts. Forliano et al. (2021) analyzed 511 publications from the Web of Science on entrepreneurial universities in business and management, using Biblioshiny for performance analysis and science mapping. The study revealed a significant rise in publications over the last decade, with the U.S. and Europe leading in productivity. It emphasized the need for future research to focus on contributions to socioeconomic development, particularly in developing nations. Doulani (2021) examined Alzahra University's scientific output between 1986 and 2019, using data from Scopus and tools

such as MS Excel, VOSviewer, and CRExplorer. The findings revealed a steady increase in publications and citations, as well as strong collaborations with both national and international institutions, with a research focus on biology, chemistry, physics, psychology, and educational sciences. A small group of authors accounted for the majority of outputs. Singh et al. (2023) conducted a bibliometric analysis of Indian Institutes of Management (IIMs) from 2010 to 2019, assessing publication volume, citations, gender distribution, and international collaboration. While IIM Udaipur showed high international collaboration and citations per paper, IIM Ahmedabad and IIM Bangalore led in total output. The study recommended improvements in quality, gender diversity, and open access to align with global standards.

6. ALTMETRICS RELATED WORK

Several recent studies have examined the role of altmetrics in evaluating the research impact of academic institutions, particularly in the context of open access (OA) and social media engagement. Lamba et al. (2021) analyzed 669 publications from Indian central universities using Altmetric attention scores and Dimension citations, identifying Jawaharlal Nehru University, Banaras Hindu University, and the University of Hyderabad as leading institutions in different metrics, with X (formerly Twitter) providing the most altmetric attention. Gupta et al. (2024) examined 135 Indian institutions (2011–2020) using data from Altmetric.com and Web of Science, finding Mendeley readership to be the most promising altmetric indicator and proposing new derived metrics, such as ‘x’ and ‘xd’. Aguillo (2020) employed a webometric approach to investigate the limited visibility of institutional repositories across 28 social tools, attributing this to the limited promotional efforts of repository managers. Valles et al. (2020) proposed an alternative altmetric methodology by optimizing institutional repository infrastructure and developing a dashboard to track the influence of grey literature. Nath (2023) assessed 27 private Indian HEIs and found that 18.51% of publications were covered by Altmetric, 95.77% by Mendeley, and that open-access publications attracted greater altmetric attention. Holmberg et al. (2020) investigated the OA altmetrics advantage across Finnish universities, revealing complex field and platform-specific differences. OA showed benefits in 13 combinations and disadvantages in 26, highlighting the heterogeneous nature of altmetric impact. Similarly, Torres (2022) conducted a case study at Rutgers Business School, comparing OA and non-OA publications between 2014 and 2020. Findings suggest that Altmetric and CiteScore data can support strategic library initiatives and that OA publishing is gaining gradual acceptance among faculty. Collectively, these studies emphasize the growing significance of altmetrics in evaluating research visibility, the nuanced influence of OA, and the need for institution-level strategies to enhance digital engagement and impact.

Several recent studies have examined faculty engagement and institutional visibility through altmetric indicators and social media platforms. Kumar & Buragohain (2024) analyzed the ResearchGate activity of science faculty at central institutions in North-East India, focusing on publications, citations, followers, and research interests. While most faculty members demonstrated average publication counts and solid citation metrics, the study highlighted a general lack of awareness and commitment to advancing disciplinary knowledge, suggesting a need for enhanced engagement and goal-setting. Ramezani et al. (2023) assessed the altmetric performance of 50 Iranian medical universities on ResearchGate and Academia.edu, revealing a strong correlation between online engagement and institutional rankings. The study highlighted the importance of social media participation, noting that a university’s ResearchGate presence had a significant impact on its h-index, thereby reinforcing the role of digital platforms in

enhancing academic visibility and knowledge dissemination. In another study, De Melo Maricato & De Castro Manso (2022) examined science-related Twitter communities by analyzing 3,653 tweets that referenced 877 papers from the University of Brasília. Altmetric data showed that individual user profiles, rather than organizational accounts, drove the majority of engagement. The findings underscored the central role of individuals in amplifying research impact through social platforms, with institutions serving as secondary contributors.

7. INFERENCE FROM REVIEWED LITERATURE

The literature review revealed that bibliometric approaches are a conventional way of measuring performance in the field of research, owing to their ability to demonstrate an impact within the academic/research communities, whereas altmetrics are a simple and effective technique to understand who is doing research online and what they are saying (What Are Altmetrics? - Altmetric, 2025). The altmetric data acquired enables tracking everything from articles to software products by employing a diverse set of scholarly identifiers that eliminates the noise inherent in typical measurement techniques. In order to balance traditional academic credibility with contemporary measures of online visibility and societal engagement. The literature suggests neither bibliometrics nor altmetrics can comprehensively measure research impact when employed in isolation. However, combining the two approaches can provide a more comprehensive understanding of research impact. The study of existing literature reveals important insights into publication trends, research impact, and institutional performance across a range of subjects, particularly in the context of Indian Institutes of Technology (IITs) and higher education institutions (HEIs).

Research production has significantly increased across several studies, particularly at IITs and HEIs that focus on sustainable development. For example, from 2010 to 2021, the IITs published 31,393 papers, whereas HEIs increased from 105 publications in 2019 to 263 in 2023. Research and development are becoming increasingly important due to increased funding and collaborations. International collaborations are recognized as a crucial aspect in enhancing research productivity and impact. IITs collaborate with countries such as the United States, Germany, and the United Kingdom, whereas UK higher education institutions lead in citation contributions. However, research indicates that certain institutions continue to struggle with collaboration. Research suggests that cooperation remains a challenge for many organizations, identifying areas for potential improvement.

Some institutes, such as IIT Bombay and IIT Madras, exhibit lower per-paper impact than IIT Kanpur, despite having significantly higher publication numbers. Such studies draw attention to inconsistencies in both the quality and significance of research, raising questions about the variables affecting citation rates and the overall efficacy of research (Sharma et al., 2024). Citation metrics reveal a complex terrain. Although there are many citations at IITs (526,671), the citation trends at HEIs fluctuate, rising in 2019 and then declining. This disparity may indicate that different institutions or fields have varying degrees of research impact or visibility (Solanki et al., 2024). Bibliometrics and altmetrics collectively provide a more comprehensive assessment of research impact by integrating traditional citation-based metrics, which require longer periods to accumulate, with altmetrics that deliver expedited, real-time indicators of academic and public engagement. In addition to conventional citations, altmetrics are increasingly being used to evaluate the overall impact of research. The most significant altmetric source is X (formerly Twitter), followed by Mendeley, Facebook, and other sites. Research demonstrates a strong relationship between citation counts and altmetric mentions, particularly Mendeley. Poor promotion has left many IRs largely unnoticed, particularly on scholarly websites such as ResearchGate and Academia (Aguillo, 2020).

Open-access papers tend to receive more altmetric attention, although this varies by platform and subject area. Institutions need to devise strategic approaches to enhance research visibility, engagement, and impact measurement using bibliometrics and altmetrics.

8. RESEARCH GAP AND FUTURE DIRECTION

Research papers at institutions such as IITs and HEIs are on the rise, although quality and impact vary. The factors influencing research impact and visibility are not well understood or thoroughly investigated, as some institutions publish numerous articles yet receive fewer citations. Research productivity and effect are known to be enhanced by international collaboration. However, many HEIs find it difficult to form or maintain these alliances. Interest in sustainability, entrepreneurship, and political connections is growing, but little is known about how these new subjects affect institutional rankings, reputation, and long-term research impact. To help other institutions increase their effect, future research should examine the factors contributing to some institutions receiving more citations, such as the quality of their research, their collaborators, and where they publish.

CONCLUSION

Bibliometrics and altmetrics both offer perspectives for analyzing research impact. Bibliometrics ensures credibility through established citation patterns, whereas altmetrics measure immediate involvement and broader societal impact. Since both strategies have drawbacks, such as disciplinary biases and data reliability issues, their combination enhances the evaluation of research. This study also identifies a crucial gap in understanding the factors that influence research visibility and influence in Indian HEIs, including the IITs. Future research should focus on developing uniform methods for measuring scholarly impact that strike a balance between inclusivity and rigor.

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