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Assessing Research Quality through Scopus and WoS Insights: Case Study of MSIT

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ABSTRACT
Research productivity encapsulates the transformative ideas and theoretical explorations that find practical applications, culminating in research publications showcased in esteemed journals or documented through patent registrations. The importance of scientometric assessments in evaluating the research capabilities and impact of academic institutions cannot be emphasized enough. This research endeavor presents a comparative scientometric scrutiny of MSIT's research output, utilizing Clarivate's Web of Science (WoS) and Elsevier's Scopus databases. Investigation delves into the attributes, constraints and coverage of WoS and Scopus, dissecting their efficacy in assessing the scholarly contributions of MSIT. A meticulous analysis ensues, encompassing MSIT's comprehensive repository of 1179 publications across both Scopus and Web of Science Database. The exploration unfolds across various dimensions like the distribution of publications by year and citation count, ACPP & RCI, yearly publication growth, research publications by type of documents, relative growth rate and doubling time, top 10 countries in relation with number of publications, the relative distribution of journals by research area, rank authors based on number of publications, the top ten source that are preferred for publications, the Overlap in Journals in WoS and Scopus. The findings underscore merit of MSIT's faculty members channeling their efforts towards publishing research papers with heightened Impact Factors, particularly within ESCI, SCI, and journals indexed in WoS and Scopus. This study serves as a guidepost for augmenting the institution's scholarly footprint and encourages a strategic focus on high-impact research avenues.

KEYWORDS
Maharaja Surajmal Institute of Technology (MSIT);Research Productivity; "Web of Science" (WoS), "Scopus"; Scientometric analysis; Scientometric study; Research Evaluation;, Citation Indexes; Research Evaluation; Relative Growth Rate; Doubling Time.

1. Introduction

Scientometric assessments have become indispensable tools in gauging the research productivity of academic institutions. MSIT stands as a prominent field of study, driving innovation and advancing knowledge in the ever-evolving domain of information technology (G. Kumar et al., 2020; S. Kumar, 2020). Evaluating the research productivity of the MSIT program is crucial for understanding its academic prowess and its contributions to the broader scientific community.

Scientometrics was introduced by "Vasily Nalimov" under its Russian name "Naukometriya" (1969), which translates to "Scientometrics" in English. Modern scientometrics draws heavily from the contributions of "Derek J. de Solla Price" and "Eugene Garfield'.

In this research paper, we have undertaken a comparative scientometric evaluation of the research output generated by the MSIT program. To do so, we have utilized two widely recognized bibliometric databases: Web of Science (WoS) and Scopus. Both WoS and Scopus serve as extensive repositories that collect and index a wide array of scholarly literature, encompassing journal articles, conference papers, books, and patents. Our objective in comparing the outcomes from these databases is to glean valuable insights into the similarities and differences when it comes to evaluating the scholarly contributions of MSIT researchers.

The MSIT program, marked by its focus on information technology and its interdisciplinary approach, nurtures research endeavors that span a diverse spectrum of topics and various fields (MSIT, 2001). As MSIT faculty members contribute to the ever-expanding body of knowledge in these areas, it becomes imperative to assess the visibility and impact of their research across different bibliometric platforms.

The decision to employ both WoS and Scopus databases arises from the understanding that each platform employs unique indexing techniques, citation databases, and impact metrics. Consequently, a comparative analysis ensures a comprehensive and all-encompassing perspective on the research productivity of the MSIT program, leaving no facet of its scholarly output unexamined.

Throughout this study, we delve into several key aspects of research productivity, including publication counts, citation patterns, collaboration trends, and research impact metrics. By evaluating the research productivity and impact metrics across both databases, we aim to identify any variations or discrepancies that may arise due to differences in their inclusion criteria, indexing methods, or citation sources.

The outcomes of this study will not only offer a comprehensive grasp of the scholarly contributions of the MSIT program but will also provide valuable guidance for researchers, educators, and administrators seeking to enhance the utilization of WoS and Scopus databases for research evaluation and decision-making.

In conclusion, this scientometric evaluation aims to illuminate the research productivity of the MSIT program by harnessing the extensive capabilities of both WoS and Scopus. Through a comparative analysis, our goal is to enhance the thorough assessment of the MSIT program's influence, fostering a deeper understanding of its contributions to the field of information technology and beyond.

2. Objectives

Following were some of objectives based on which the research (in Scopus &WoS from 2004-2022) under study was conducted:

1. To find out distribution of publications by year and citation count, ACPP and RCI.
2. To examine yearly publication growth.
3. To study research publications by type of documents.
4. To find out relative growth rate (RGR) and doubling time (DT).
5. To recognize top 10 countries in relation with number of publications.
6. To study relative distribution of journals by research area in WoS and Scopus.

7. To rank authors based on number of publications.
8. To identify the top ten sources those are preferred for publications.
9. To identify the Overlap in Journals in WoS and Scopus from 2004-2022.

3. Scope and Methodology

This study was limited in scope to evaluate the research productivity of MSIT faculty members. The WoS and Scopus database was utilized to analyze the research output of MSIT. In the WoS and Scopus search bar, the phrase "Maharaja Surajmal Institute of Technology" was typed. A separate file was created to store the number of records that were obtained. The downloaded data obtained from WoS and Scopus was further analyzed.

After studying the relevant literature in this field, it was observed that numerous studies have already been done to determine publication's growth of academic institutions using WoS, Scopus, Google Scholar, etc. But there was no study done so far on measuring the research productivity of MSIT which is affiliated to Guru Gobind Singh Indraprastha University, Delhi (GGSIPU, 1998).

The problem of the research paper was that it was observed that there are a lot of research publications of the MSIT faculty members (in UGC care, Scopus & Web of Science etc.) but still it was seen from the data obtained from WoS and Scopus that still a lot have to be done on publishing quality research publications. Hence, the research aimed to assess the research productivity of MSIT faculty members by utilizing the WoS and Scopus database.

3.1 About Web of Science (WoS)

WoS is highly regarded and widely used bibliographic database developed by Clarivate Analytics (former name "Thomson Reuters"). It acts as a thorough hub for academic and scholarly investigations, granting entry to an extensive repository of peer-reviewed materials, encompassing journal articles, conference papers, book chapters, patents, and more. WoS is celebrated for its meticulous selection and indexing procedures, rendering it an invaluable source for researchers, academics, and institutions on a global scale (Clarivate, n.d.).

3.1.1 Key Features of WoS

1. **Citation Indexing:** One of WoS's notable features is its citation indexing, which allows users to trace the citation history of individual articles and identify highly cited works. This capability is instrumental for measuring research impact and establishing citation networks within academic disciplines.
2. **Multidisciplinary Coverage:** WoS covers a broad range of academic disciplines, making it an excellent resource for researchers across various fields of study. It includes sciences, social sciences, arts, humanities, engineering, and more.
3. **Journal Selection:** WoS employs a strict and selective process for including journals in its database. It indexes only high-quality, peer-reviewed, and reputable journals, ensuring the credibility and reliability of the research literature available.
4. **Conference Proceedings:** In addition to journal articles, WoS also indexes conference proceedings, making it a valuable source for accessing the latest research presented at conferences and symposiums.
5. **Highly Cited Papers (HCP):** WoS identifies HCP which are articles that received a significant no. of citations relative to other works in the same field. This feature helps researchers identify influential and groundbreaking studies.
6. **Researcher Profiles:** WoS offers researcher profiles, allowing authors to claim their publications and track their citation metrics. This feature helps researchers showcase their work and monitor their scholarly impact over time.
7. **Collaboration and Networking:** The database facilitates collaboration by enabling researchers to identify potential collaborators and co-authors based on shared research interests and publication

history.

8. **Citation Metrics**: WoS provides various citation-based metrics, such as citation counts, impact factor and h-index which help evaluate the research impact of individuals, journals, and institutions (Wikipedia, n.d.).

3.1.2 Limitations of Web of Science

Despite its numerous advantages, Web of Science does have some limitations:

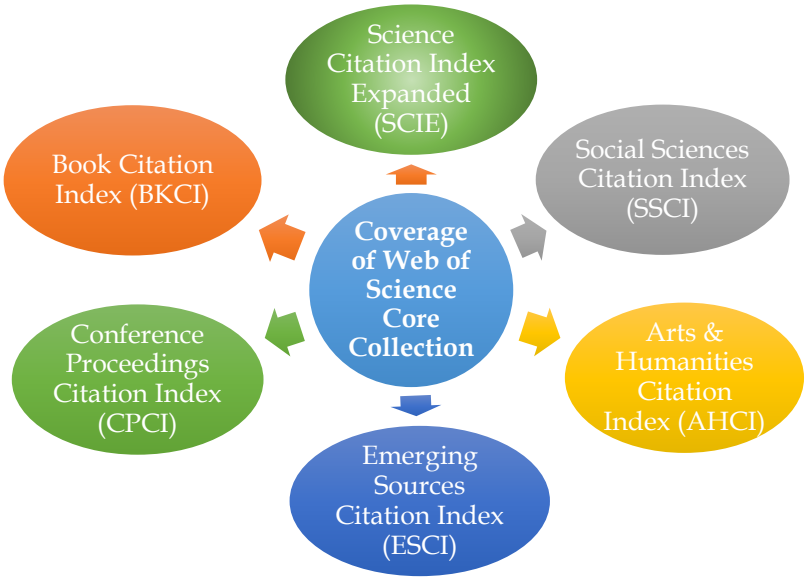
1. **Limited Open Access Coverage:** While WoS includes many open-access journals, its coverage of open-access literature may not be as extensive as some other databases, which could be a drawback for researchers seeking open-access content.
2. **Language Bias:** Majority of publications in WoS are in English, potentially leading to a language bias and limited access to research published in other languages.
3. **Time Lag:** A minor delay can occur between the publication of an article and its incorporation into WoS due to the database's dependence on manual indexing and quality assurance procedures (Wikipedia, n.d.).

Web of Science is a widely trusted and valuable bibliographic database that plays a critical role in academic research. Its comprehensive coverage, citation indexing, and robust selection of journals make it an essential tool for researchers seeking reliable and impactful scholarly literature.

3.1.3 Coverage

The Web of Science Core Collection stands as the central and flagship component of the Web of Science database, crafted by Clarivate Analytics. This collection encompasses esteemed journals, conference proceedings, and books spanning the realms of sciences, social sciences, arts, and humanities, enabling users to pinpoint high-quality research directly related to their areas of interest. It is an exhaustive, interdisciplinary, and carefully curated compilation of top-tier scholarly literature, granting access to an extensive array of research articles, conference papers, book chapters, and more. The Web of Science Core Collection is widely recognized as one of the most authoritative and dependable resources for academic research and bibliographic information. This repository comprises an impressive 1.9 billion cited references, with a historical record spanning back to 1900, encompassing over 85.9 million records. Moreover, it includes a rich selection of more than 21,000 peer-reviewed journals and access to over 300,000 conferences.

Figure 1. Coverage of Web of Science Core Collection



1. **Science Citation Index Expanded (SCIE - Coverage from 1900 – till date):** SCIE covers a comprehensive range of scientific disciplines, making it a valuable resource for researchers and scholars across various fields. The coverage of SCIE includes major journals across 178 scientific disciplines and includes all cited references captured from indexed articles.
2. **Social Sciences Citation Index (SSCI - Coverage from 1900 – till date):** SSCI is a part of the WoS Core Collection, developed by Clarivate Analytics. It focuses on indexing high-quality, peer-reviewed scholarly literature from the social sciences and related disciplines. SSCI caters to wide subject areas within the social sciences, making it an essential resource for researchers, academics, and institutions across various fields of study.
3. **Arts & Humanities Citation Index (AHCI - Coverage from 1975 – till date):** AHCI covers subject areas within the arts and humanities disciplines. It includes high-quality, peer-reviewed scholarly literature from various fields, providing a comprehensive resource for researchers, academics, and institutions in the arts and humanities.
4. **Emerging Sources Citation Index (ESCI - Coverage from 2005 – till date):** ESCI is a part of the WoS Core Collection. Unlike SCIE and SSCI, which include journals with an established reputation and track record, ESCI focuses on indexing journals that are in the process of establishing their presence and influence in the scholarly community. It serves as a platform to highlight new and emerging research sources and to provide them with increased visibility to a global audience.
5. **Conference Proceedings Citation Index (CPCI - Coverage from 1990 – till date):** CPCI is a part of the WoS Core Collection. CPCI focuses on indexing conference proceedings from a wide range of academic disciplines. It provides researchers and scholars with access to valuable and influential research presented at conferences and symposia worldwide.
6. **Book Citation Index (BKCI - Coverage from 2005 – till date):** BKCI is a part of the WoS Core Collection which focuses on indexing scholarly books and book chapters from a wide range of academic disciplines. It provides researchers, scholars, and librarians with access to valuable and influential academic publications in book form.

3.2 About Scopus Database

The rapid expansion of academic research has created a growing demand for efficient and comprehensive tools to manage, access, and assess scholarly literature. Launched in 2004, Scopus has emerged as a prominent multidisciplinary abstract and citation database, encompassing journals, conference proceedings, patents, and various scholarly content. Scopus provides extensive coverage across a diverse range of academic disciplines, including the natural sciences, social sciences, arts and humanities, engineering, and medical fields.

Scopus stands out as one of the largest and most widely utilized bibliographic databases, offering access to an extensive collection of scholarly literature, with over 22,000 titles from more than 5,000 publishers worldwide. It covers the realms of medicine, technology, science, social sciences, and arts and humanities. Scopus holds approximately 55 million records dating back to 1823, and approximately 84% of these records include references dating from 1996.

3.2.1 Key Features of Scopus

1. **Multidisciplinary Coverage:** Scopus covers many academic disciplines, including natural sciences, engineering, technology, medicine, social sciences, arts & humanities. It offers a broad and diverse collection of scholarly literature from various fields of study.
2. **Extensive Content:** Scopus includes records from thousands of conference proceedings, trade publications, academic

journals and patents from all around the world. It provides researchers with a comprehensive view of the global scholarly landscape.

3. **Citation Tracking:** One of Scopus's primary features is its citation indexing, which allows researchers to track citations and measure the impact of individual articles and authors. This feature helps researchers understand the influence and relevance of their work within the academic community.
4. **Author Profiles:** Scopus provides researcher profiles that allow authors to claim their publications and monitor their citation metrics. It helps researchers showcase their work and connect with other scholars.
5. **Abstracts and Full-Text Access:** Scopus provides abstracts of articles and papers, allowing researchers to quickly assess the relevance of a publication to their research. In some cases, it also offers links to full-text versions of articles, depending on the journal's access policies.
6. **Metrics and Analytics:** Scopus provides a range of research metrics, including Cite Score, h-index, SJR (SCImago Journal Rank), and SNIP (Source-Normalized Impact per Paper), to assist researchers in assessing the influence and effectiveness of journals, authors, and institutions.
7. **Alert Services:** Researchers can set up alerts in Scopus to receive notifications when new publications matching specific criteria are added to the database, helping them stay updated with the latest research in their fields.

3.2.2 Limitations of Scopus

Scopus is widely used by researchers, academicians, institutions, and libraries for literature review, citation analysis, bibliometrics, and discovering the most relevant and impactful research in their respective fields. Its comprehensive coverage, citation indexing, and analytical tools make it a valuable resource for academic research and assessment. Scopus is a powerful and widely used bibliographic database, but like any tool, it has its limitations. Some of the main limitations of Scopus include:

1. **Incomplete Coverage:** While Scopus is extensive and covers a vast number of journals and conference proceedings, it may not include all publications from every academic discipline or region. Some niche or regional journals may not be indexed in Scopus, leading to potential gaps in certain subject areas.
2. **Time Lag:** There might be a time delay between the publication of an article and its indexing in Scopus. While Scopus is regularly updated, it may take some time for newly published articles to appear in the database.
3. **Language Bias:** Scopus primarily indexes publications in English, which may lead to a language bias. Research published in other languages may not be as well represented, limiting the access to non-English publications.
4. **Quality of Publications:** While Scopus emphasizes peer-reviewed and high-quality content, not all indexed journals may have the same level of rigor and academic standards. Some lower-quality or predatory journals may find their way into the database, potentially affecting the reliability of certain research outputs.
5. **Full-Text Access:** Scopus provides abstracts and citation information for most indexed records, but it may not always offer full-text access to articles. Researchers might have to acquire full-text access through institutional subscriptions or alternative methods.
6. **Book Coverage:** Although Scopus includes some book series and book chapters, its book coverage is not as extensive as its journal and conference proceedings coverage. Researchers looking for comprehensive access to scholarly books may need to use other databases or resources.
7. **Limited Subject Coverage for Non-STEM Fields:** Scopus's coverage in non-STEM

fields (science, technology, engineering, and mathematics) is generally strong, but it may not be as comprehensive or deep in some humanities and social science disciplines compared to more specialized databases in those fields.

8. **Data Accuracy:** As with any database, errors or inaccuracies in the data may occasionally occur. Researchers should exercise caution and verify information when relying on Scopus for bibliometric or citation analysis.

Despite these limitations, Scopus remains a valuable tool for researchers and supporting citation tracking and bibliometric analyses. However, researchers are encouraged to use multiple databases and information sources to ensure comprehensive coverage and a well-rounded understanding of the research landscape in their respective fields.

3.2.3 Coverage of Scopus

1. **Multidisciplinary Coverage:** One of the key strengths of Scopus is its ability to cover a diverse range of academic disciplines. This section explores the extent of coverage across natural sciences, social sciences, arts and humanities, engineering, and health sciences. Comparisons with other databases like WoS and PubMed will be made to highlight the comprehensiveness of Scopus.
2. **Content Breadth and Depth:** Scopus gives access to a vast variety of scholarly content, like journal articles, conference proceedings, patents, and more. This section delves into the depth of content representation, discussing factors such as the inclusion of abstracts, keywords, author affiliations, funding information, and supplementary materials.
3. **Geographic Reach and Language Inclusivity:** The global nature of academic research is reflected in Scopus's geographic coverage. This section examines the inclusivity of non-English language publications, regional research representation, and the impact of this on cross-cultural collaboration.
4. **Citation Analysis and Research Impact:** Scopus provides citation data that enable researchers to gauge the impact of scholarly work. This section investigates the accuracy and usefulness of Scopus's citation metrics, exploring how they contribute to understanding research influence and facilitating collaborations.

4. Literature Review

Numerous studies have been carried out recently applying scientometric analysis to determine the growth of research production.

Aydin (2017) conducted the research on "Research Performance of Higher Education Institutions", the article intends to raise awareness of "research performance," which plays a crucial role in university competition. The study makes an effort to summarize the findings of a thorough literature evaluation in the area of higher education research performance in order to achieve this goal. First, basic literature on research performance is discussed together with its concept definition and indicators. Then, a thorough presentation of the variables affecting research performance followed. The study concludes with the provision of a conceptual framework that will be useful to all university staff.

Basavaraja M. T. (2018) studied on "Research Productivity of Academics as Reflected in Web of Science: A Scientometric Study", the study focussed to determine the research done by "Bangalore University (BU) and University of Mysore (UoM)" from 1989 - 2018. Using WoS, it was tried to locate data based on overall citations, average citations and h-index of faculties of these universities. "University of Mysore" & "Bangalore University" were typed in "Web of Science" search bar to know research done by these universities. As per findings of the study, the WoS database has 4838 publication records from the UoM and 2784 publication records from BU, majority of which are research papers (91.28% at Mysore and 91.38% at Bangalore). As per study, Rangappa

at the UoM had received the most citations among its faculty members (4027). At last study suggests that the faculty shall publish their research papers in scholarly publications having high impact factors and in peer reviewed journals.

Lalrindika and Akhandanand (2019) did a research on "Research Output of Faculty Members of Mizoram University" that dealt with the cross-sectional assessment of faculty's research productivity during the last five years. The study aimed to assess the progress of research across various dimensions, including journal articles, conference papers, book chapters, abstracts, books, reviews, research projects, M.Phil/Ph.D. production, and challenges in the publication process. Ultimately, the findings pointed to the need to enhance the involvement of academic institutions and faculty in research to foster both individual and institutional growth.

Gangadhar K C & Nagaraja A (2020) compared "Research Performance of Engineering Colleges in Karnataka as reflected in the Scopus Database" wherein they used Scopus database to evaluate the research output and citations belonging to the affiliated colleges with "Visvesvaraya Technological University (VTU)". Research of city & rural colleges were analyzed with regard to the distribution of publications geographically, national and international collaboration, patterns of research, colleges having high-productivity, publications in top referred journals and maximum cited papers.

Pradhan et. al. (2020) has published research article on "Research Performance of National Institute of Technology Rourkela", the main objective was to conduct a scientometric analysis of research articles authored by NIT (Rourkela) faculty members and indexed in Scopus. Employing various scientometric metrics, the study examined the quantitative expansion, authorship trends, intra-institutional collaborations, publication trends over time, frequently cited publication sources, and the distribution of papers by subject. Additionally, the study explored the international research collaboration patterns of the authors.

Armijos Valdivieso et. al. (2022) analyzed "Factors that Influence the Individual Research Output of University Professors". Through the utilization of multinomial logistic regression, the study investigated the variables that exerted influence on the research activities of university professors. The research productivity was found to be directly influenced by factors including age, academic ranking, research time allocation, financial resources, recognition, and the presence of research leaders. The study introduced a comprehensive model and deliberated on the implications for university authorities.

5. Result and Discussion

5.1 Distribution of Publications by Year and Citation Count, ACPP and RCI in Scopus & WoS

The formula for calculating Relative Citation Impact (R. Bhardwaj et al., 2013; S. Kumar, 2013; Mashroofa et al., 2023) (RCI) is:

$$RCI = \frac{\text{No. of Citations/Total Citations}}{\text{No. of Documents/Total Documents}}$$

The essential measure of research progress in any discipline is its quantity of literature produced. The year-wise distribution of research of MSIT Faculty that were published from 2004-2022 is shown below in Table 1.

- **Total Documents (RD):** It shows that total documents in WoS database is 348 whereas the total no. of documents in Scopus are 831. The year 2022 depicts a peak with 160 (19.25%) documents published in Scopus database which is the highest in no. whereas in WoS database total documents are in the year 2022.
- **Total Citations (TC):** The analysis shows that the citations are continuously increasing. The total citation till date is 5681 and 1996 in Scopus and WoS respectively. In the year 2022, the total no. of citations are 1963 and 753 in Scopus Web of Science database respectively.
- **Average Number of Citations Per Paper (ACPP):** Analysis depicts that in Scopus,

the highest average number of citations per paper in the year 2022 is 12.27 and 9.30 in 2021 in WoS database.

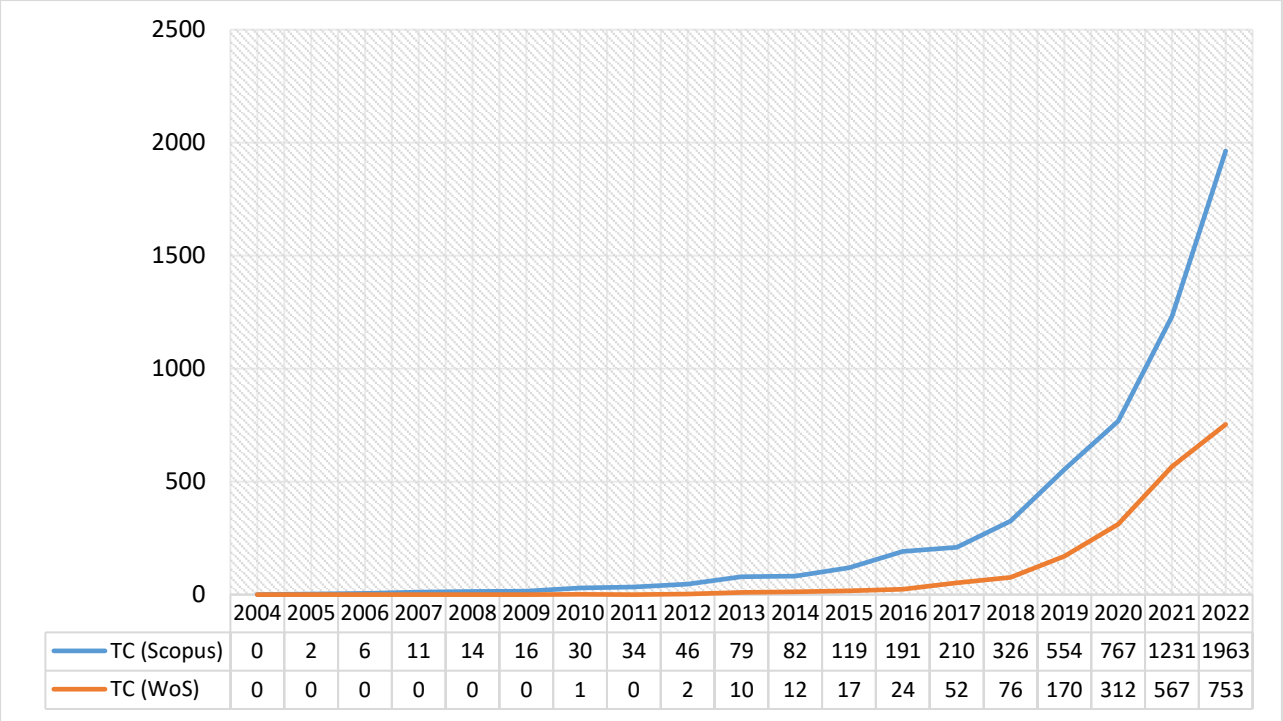
- **Relative Citation Impact (RCI):** The study shows that the highest relative citation impact as per in Scopus is in the year 2022 which is 1.79 and 1.62 in the year 2021 in WoS.

Table 1. Distribution of Publications by Year and Citation Count, ACPP and RCI in Scopus &WoS

Year	TD (Scopus)	TC (Scopus)	ACPP (Scopus)	RCI Calculation		RCI (Scopus)	TD (WoS)	TC (WoS)	ACPP (WoS)	RCI Calculation		RCI (WoS)
2004	3	0	0.00	0.00	0.00	0.00	1	0	0	0.00	0.00	0.00
2005	5	2	0.40	0.00	0.01	0.06	0	0	0	0.00	0.00	0.00
2006	4	6	1.50	0.00	0.00	0.22	1	0	0	0.00	0.00	0.00
2007	7	11	1.57	0.00	0.01	0.23	1	0	0	0.00	0.00	0.00
2008	11	14	1.27	0.00	0.01	0.19	6	0	0	0.00	0.02	0.00
2009	11	16	1.45	0.00	0.01	0.21	3	0	0	0.00	0.01	0.00
2010	14	30	2.14	0.01	0.02	0.31	4	1	0.25	0.00	0.01	0.04
2011	13	34	2.62	0.01	0.02	0.38	0	0	0	0.00	0.00	0.00
2012	23	46	2.00	0.01	0.03	0.29	2	2	1.00	0.00	0.01	0.17
2013	30	79	2.63	0.01	0.04	0.39	6	10	1.67	0.01	0.02	0.29
2014	27	82	3.04	0.01	0.03	0.44	2	12	6.00	0.01	0.01	1.05
2015	24	119	4.96	0.02	0.03	0.73	3	17	5.67	0.01	0.01	0.99
2016	56	191	3.41	0.03	0.07	0.50	14	24	1.71	0.01	0.04	0.30
2017	56	210	3.75	0.04	0.07	0.55	15	52	3.47	0.03	0.04	0.60
2018	63	326	5.17	0.06	0.08	0.76	28	76	2.71	0.04	0.08	0.47
2019	78	554	7.10	0.10	0.09	1.04	30	170	5.67	0.09	0.09	0.99
2020	102	767	7.52	0.14	0.12	1.10	60	312	5.20	0.16	0.17	0.91
2021	144	1231	8.55	0.22	0.17	1.25	61	567	9.30	0.28	0.18	1.62
2022	160	1963	12.27	0.35	0.19	1.79	111	753	6.78	0.38	0.32	1.18
	831	**5681**					**348**	**1996**				

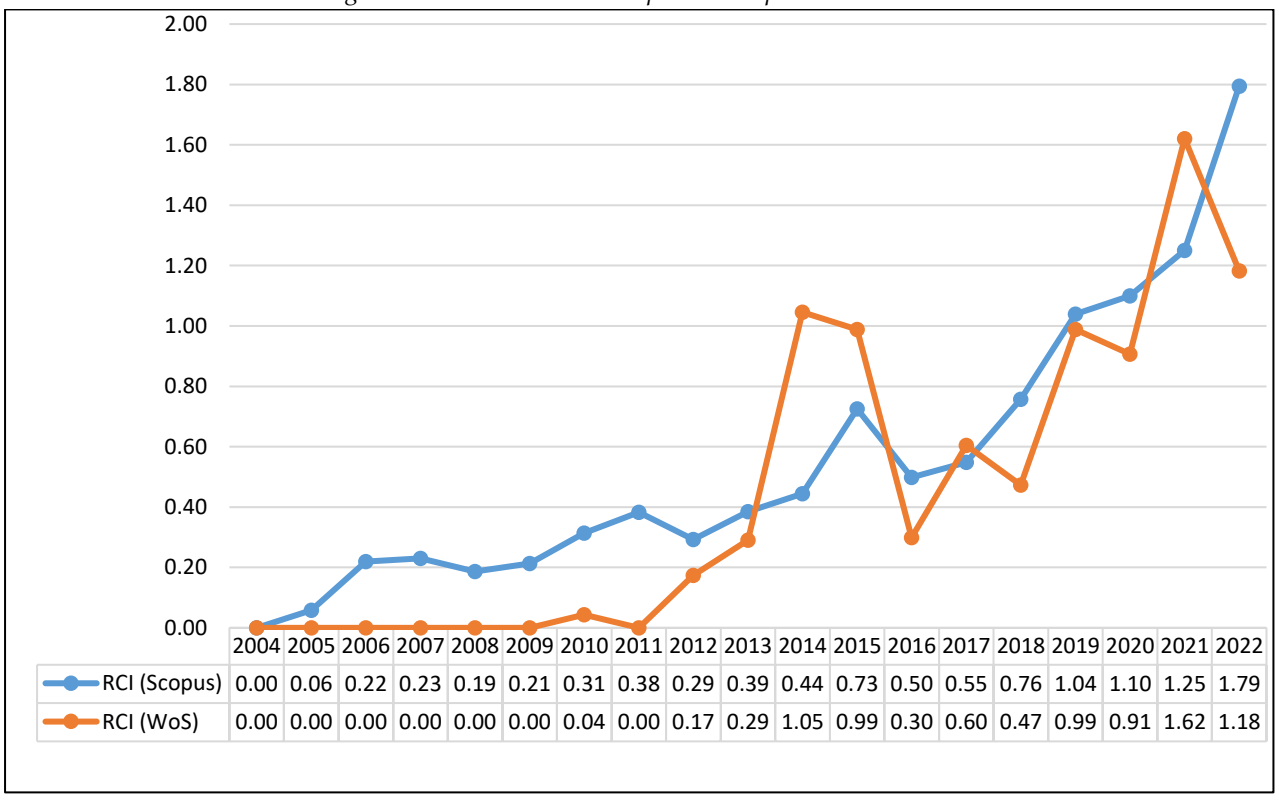
TD=Total Documents, TC=Total Citations, ACPP=Average number of Citations Per Paper, RCI= Relative Citation Impact

Figure 2. Distribution of Publications by Year and Citation Count



	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
TC (Scopus)	0	2	6	11	14	16	30	34	46	79	82	119	191	210	326	554	767	1231	1963
TC (WoS)	0	0	0	0	0	0	1	0	2	10	12	17	24	52	76	170	312	567	753

Figure 3. Relative Citation Impact in Scopus & WoS



	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
RCI (Scopus)	0.00	0.06	0.22	0.23	0.19	0.21	0.31	0.38	0.29	0.39	0.44	0.73	0.50	0.55	0.76	1.04	1.10	1.25	1.79
RCI (WoS)	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.00	0.17	0.29	1.05	0.99	0.30	0.60	0.47	0.99	0.91	1.62	1.18

5.2 Yearly Publication Growth

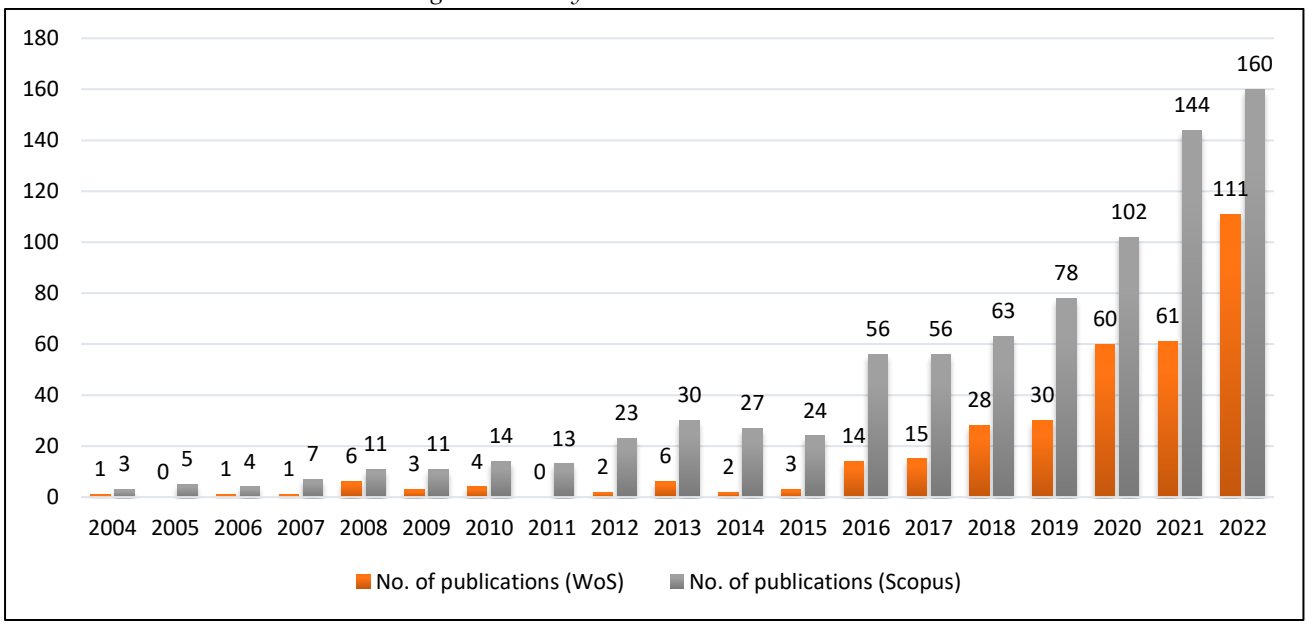
The table 2 portrays that MSIT Faculty have contributed 348 and 831 research publications from 2004-2022 in WoS and Scopus database respectively. Research productivity from 2004-2015 was very low but it increased exponentially after 2016.Productivity of the research in the 2022 have maximum 111 publications (31.90%) and 160 (19.25%) in WoS and Scopus database respectively. Lowest

research recorded in 2005 which have nil publications in WoS, while year 2004 has only 3 publications in Scopus. It shows that there are ups and down in publications in both databases from 2004-2015, after which the publications increased constantly.

Table 2. Yearly Publication Growth

Year	No. of publications (WoS)	No. of publications (Scopus)	Percentage (WoS)	Percentage (Scopus)	Cumulative of Publication (WoS)	Cumulative percentage (WoS)	Cumulative of Publication (Scopus)	Cumulative percentage (Scopus)
2004	1	3	0.29	0.36	1	0.29	3	0.36
2005	0	5	0.00	0.60	1	0.29	8	0.96
2006	1	4	0.29	0.48	2	0.57	12	1.44
2007	1	7	0.29	0.84	3	0.86	19	2.29
2008	6	11	1.72	1.32	9	2.59	30	3.61
2009	3	11	0.86	1.32	12	3.45	41	4.93
2010	4	14	1.15	1.68	16	4.60	55	6.62
2011	0	13	0.00	1.56	16	4.60	68	8.18
2012	2	23	0.57	2.77	18	5.17	91	10.95
2013	6	30	1.72	3.61	24	6.90	121	14.56
2014	2	27	0.57	3.25	26	7.47	148	17.81
2015	3	24	0.86	2.89	29	8.33	172	20.70
2016	14	56	4.02	6.74	43	12.36	228	27.44
2017	15	56	4.31	6.74	58	16.67	284	34.18
2018	28	63	8.05	7.58	86	24.71	347	41.76
2019	30	78	8.62	9.39	116	33.33	425	51.14
2020	60	102	17.24	12.27	176	50.57	527	63.42
2021	61	144	17.53	17.33	237	68.10	671	80.75
2022	111	160	31.90	19.25	348	100.00	831	100.00
	348	**831**	**100.00**	**100.00**				

Figure 4. Yearly Publication Growth



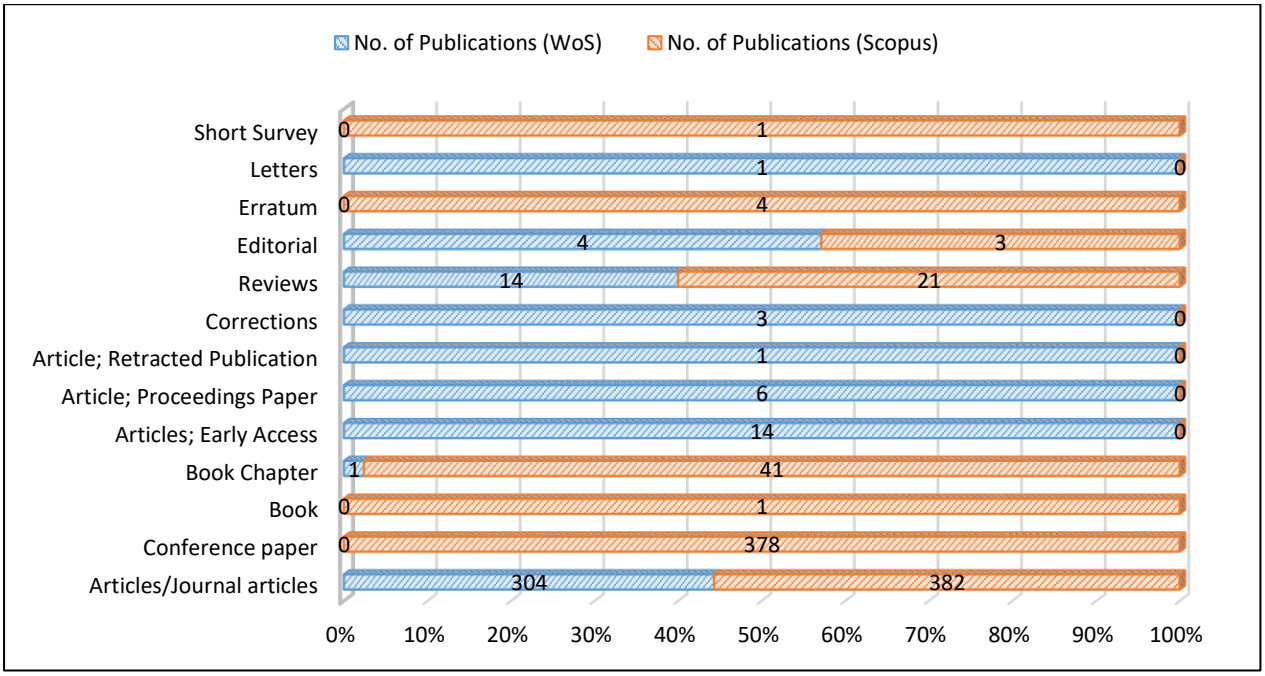
5.3 Research Publications by Type of Documents

The records type in the WoS and Scopus database are depicted below in Table 3. It reveals that 87.36% publications are published under Articles/Journal articles in the WoS while only 45.97% publications are published Articles/Journal articles in Scopus. In comparison to other types, it shows that faculty of MSIT has published more no. of research articles. Additionally, the research that WoS doesn't include the conference proceedings as part of package subscribed but 45.49% papers are published in conference paper/proceedings in the Scopus database.

Table 3. Research Publications by Type of Documents

Documents Type	No. of Publications (WoS)	No. of Publications (Scopus)	Percentage (WoS)	Percentage (Scopus)
Articles/Journal articles	304	382	87.36	45.97
Conference Paper / Proceedings	(not included)	378	0	45.49
Book	0	1	0	0.12
Book Chapter	1	41	0.29	4.93
Articles; Early Access	14	0	4.02	0
Article; Proceedings Paper	6	0	1.72	0
Article; Retracted Publication	1	0	0.29	0
Corrections	3	0	0.86	-
Reviews	14	21	4.02	2.53
Editorial	4	3	1.15	0.36
Erratum	0	4	0	0.48
Letters	1	0	0.29	0
Short Survey	0	1	0	0.12
Total	**348**	**831**	**100.00**	**100.00**

Figure 5. Research publications by Type of Documents



5.4 Relative Growth Rate (RGR) and Doubling Time (DT)

The concept of RGR was introduced in 1919 by V. H. Blackman (Royal Society Publishing, 2017) whereas the roots of the concept of doubling time lie in ancient mathematical inquiries and practical financial transactions, making it a fundamental concept in various domains (Scholarly Community Encyclopedia, n.d.). RGR is no. of research articles increased per unit of time (R. S. Kumar & Kaliyaperumal, 2015; R. Senthilkumar & M. Muthukrishnan, 2017). Formula used to know the mean RGR over a specific period of interval:

$$RGR = \frac{W2-W1}{T2-T1}$$

W1 = log of initial no. of articles;

W2 = log of final no. of articles after a specific period of interval

T2-T1 = "Unit difference between initial time and final time".

Doubling Time is time taken by research publications to be double in size (R. Bhardwaj et al., 2013; Rathika & Thanuskodi, 2021). "Between Relative growth rate and doubling time there is a direct equivalence" (Bradford). Formula for calculating research productivity is:

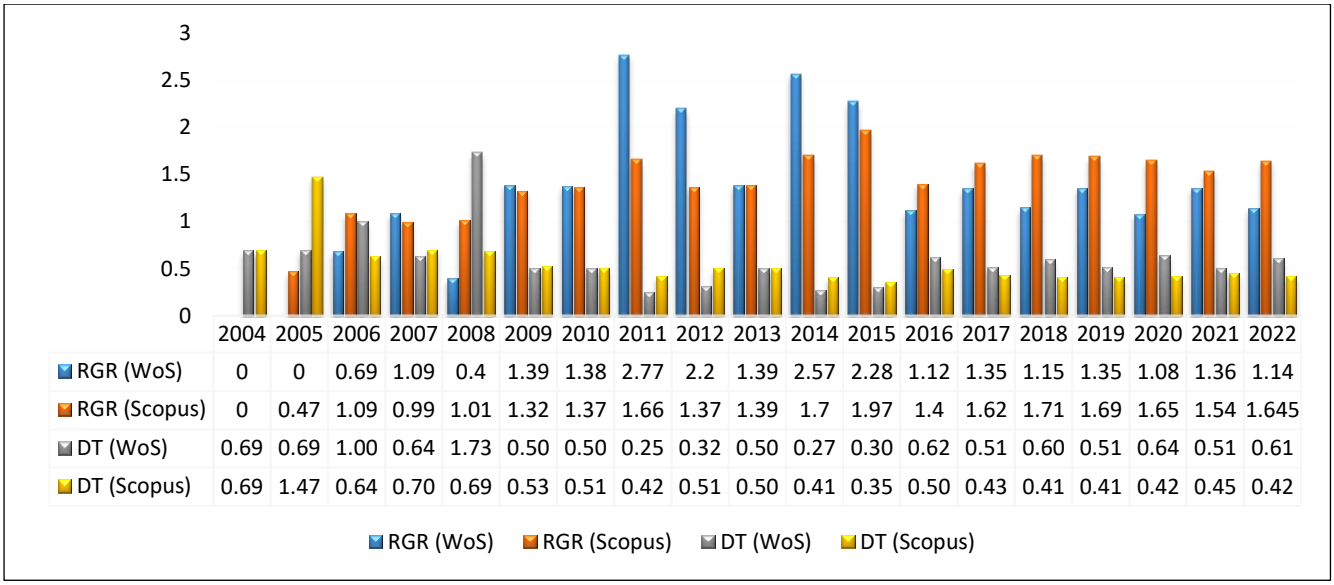
$$DT = \frac{0.693}{RGR}$$

The table 4 shows RGR and DT of MSIT's publication in WoS and Scopus. RGR has increased to 1.1 in 2022 from 0 in 2004 in WoS whereas from 0 in 2004 to 1.6 in 2022 in Scopus. The study also shows that DT is maximum in 2008 in case of Web of Science while 1.47 in 2005 in case of Scopus.

Table 4. Relative Growth Rate and Doubling Time

Year	Total publications (WoS)	Total publications (Scopus)	Cumulative no. of records (WoS)	$Log_e 1^p$ (No. of publications in WoS)	$Log_e 2^p$(of Cumulative of no. of publications in WoS)	Cumulative no. of records in Scopus	$Log_e 1^p$ (No. of publications in Scopus)	$Log_e 2^p$ (of Cumulative of no. of publications in Scopus)	RGR (WoS)	RGR (Scopus)	DT (WoS) (0.693/R)	DT (Scopus) (0.693/R)
2004	1	3	1	0.0	0.0	3	1.1	1.09	0.0	0.0	0.69	0.69
2005	0	5	1	0.0	0.0	8	1.6	2.08	0.0	0.5	0.69	1.47
2006	1	4	2	0.0	0.7	12	1.4	2.48	0.7	1.1	1.00	0.64
2007	1	7	3	0.0	1.1	19	2.0	2.94	1.1	1.0	0.64	0.70
2008	6	11	9	1.8	2.2	30	2.4	3.4	0.4	1.0	1.73	0.69
2009	3	11	12	1.1	2.5	41	2.4	3.71	1.4	1.3	0.50	0.53
2010	4	14	16	1.4	2.8	55	2.6	4.01	1.4	1.4	0.50	0.51
2011	0	13	16	0.0	2.8	68	2.6	4.22	2.8	1.7	0.25	0.42
2012	2	23	18	0.7	2.9	91	3.1	4.51	2.2	1.4	0.32	0.51
2013	6	30	24	1.8	3.2	121	3.4	4.79	1.4	1.4	0.50	0.50
2014	2	27	26	0.7	3.3	148	3.3	4.99	2.6	1.7	0.27	0.41
2015	3	24	29	1.1	3.4	172	3.2	5.15	2.3	2.0	0.30	0.35
2016	14	56	43	2.6	3.8	228	4.0	5.43	1.1	1.4	0.62	0.50
2017	15	56	58	2.7	4.1	284	4.0	5.65	1.4	1.6	0.51	0.43
2018	28	63	86	3.3	4.5	347	4.1	5.85	1.2	1.7	0.60	0.41
2019	30	78	116	3.4	4.8	425	4.4	6.05	1.4	1.7	0.51	0.41
2020	60	102	176	4.1	5.2	527	4.6	6.27	1.1	1.7	0.64	0.42
2021	61	144	237	4.1	5.5	671	5.0	6.51	1.4	1.5	0.51	0.45
2022	111	160	348	4.7	5.9	831	5.1	6.72	1.1	1.6	0.61	0.42

Figure 6. Relative Growth Rate and Doubling Time



	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
RGR (WoS)	0	0	0.69	1.09	0.4	1.39	1.38	2.77	2.2	1.39	2.57	2.28	1.12	1.35	1.15	1.35	1.08	1.36	1.14
RGR (Scopus)	0	0.47	1.09	0.99	1.01	1.32	1.37	1.66	1.37	1.39	1.7	1.97	1.4	1.62	1.71	1.69	1.65	1.54	1.645
DT (WoS)	0.69	0.69	1.00	0.64	1.73	0.50	0.50	0.25	0.32	0.50	0.27	0.30	0.62	0.51	0.60	0.51	0.64	0.51	0.61
DT (Scopus)	0.69	1.47	0.64	0.70	0.69	0.53	0.51	0.42	0.51	0.50	0.41	0.35	0.50	0.43	0.41	0.41	0.42	0.45	0.42

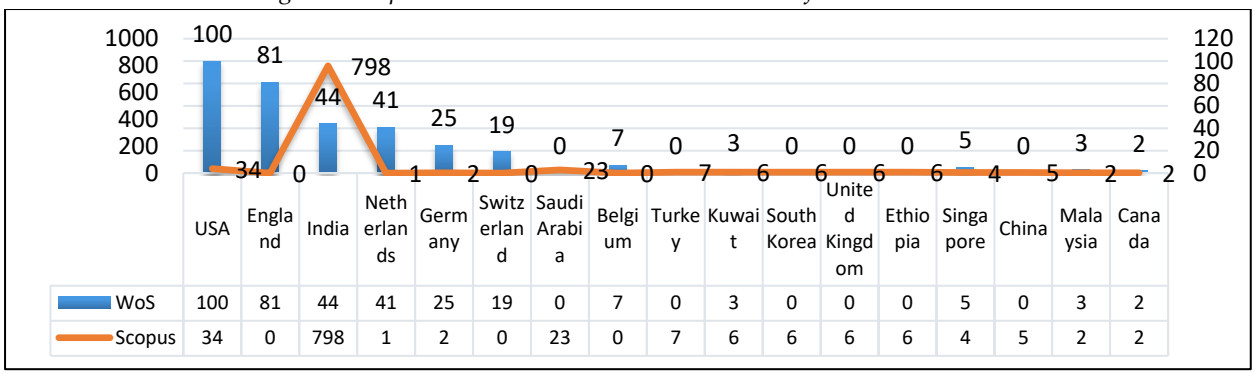
5.5 Top Ten Countries in Relation with No. of Publications

As depicted in the Table 5, in case of publishing countries, USA is in the top ten countries with 100 publications (28.74%) and Canada is at 10th rank with only 2 publications in case of Web of Science. Whereas India is in the top ten countries with 798 publications (96.03%) and Singapore is at 10th rank with only 4 publications in case of Scopus (R. K. Bhardwaj, 2016).

Table 5. Top Ten Countries in Relation with No. of Publications

Country	WoS			Scopus		
	No. of Publications	%	Rank	No. of Publications	%	Rank
USA	100	28.74	1	34	4.09	2
England	81	23.28	2	0	0.00	
India	44	12.64	3	798	96.03	1
Netherlands	41	11.78	4	1	0.12	
Germany	25	7.18	5	2	0.24	
Switzerland	19	5.46	6	0	0.00	
Saudi Arabia	0	0.00		23	2.77	3
Belgium	7	2.01	7	0	0.00	
Turkey	0	0.00		7	0.84	4
Kuwait	3	0.86		6	0.72	5
South Korea	0	0.00		6	0.72	6
United Kingdom	0	0.00		6	0.72	7
Ethiopia	0	0.00		6	0.72	8
Singapore	5	1.44	8	4	0.48	10
China	0	0.00		5	0.60	9
Malaysia	3	0.86	9	2	0.24	
Canada	2	0.57	10	2	0.24	

Figure 7. Top Ten countries in relation to the No. of Publications



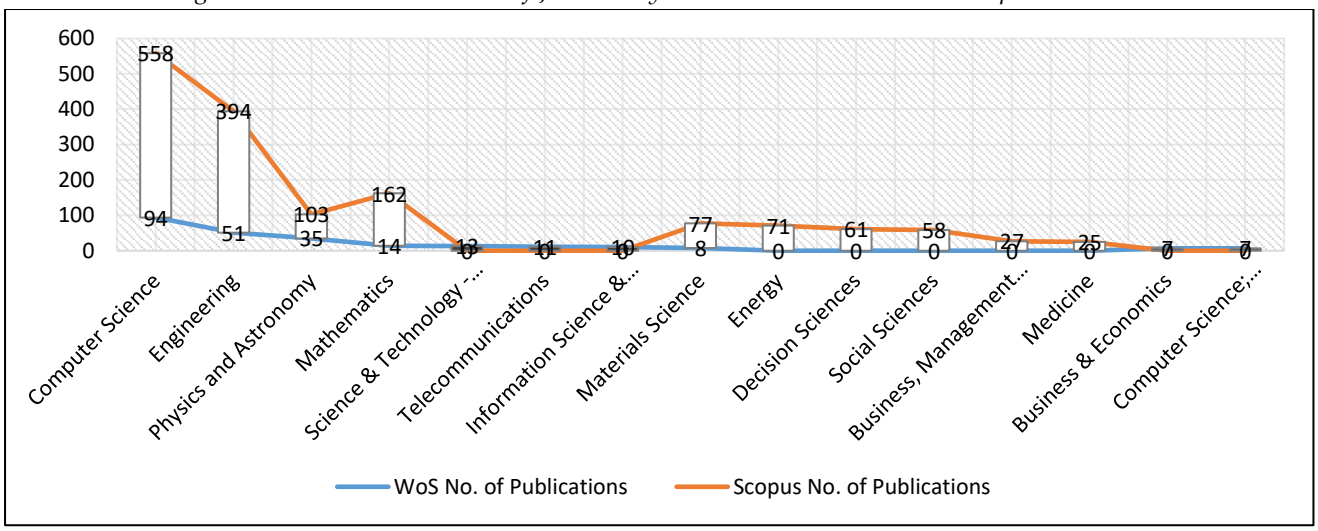
5.6 Relative distribution of Journals by Research Area in WoS and Scopus

The table 6 shows relative distribution of journals by research area in WoS and Scopus. The majority of records are found under the category of computer science. From the table, it is clear that the preferred subject for publications is Computer Science with 94 publications in case of Web of Science and same is the case with Scopus wherein 558 publications are published under Computer Science subject.

Table 6. Relative Distribution of Journals by Research Area in WoS and Scopus

Research Areas	**WoS**		**Scopus**	
	No. of Publications	**Preferred Research Area**	**No. of Publications**	**Preferred Research Area**
Computer Science	94	1	558	1
Engineering	51	2	394	2
Physics and Astronomy	35	3	103	4
Mathematics	14	4	162	3
Science & Technology - Other Topics	13	5	0	0
Telecommunications	11	6	0	0
Information Science & Library Science	10	7	0	0
Materials Science	8	8	77	5
Energy	0	0	71	6
Decision Sciences	0	0	61	7
Social Sciences	0	0	58	8
Business, Management and Accounting	0	0	27	9
Medicine	0	0	25	10
Business & Economics	7	9	0	0
Computer Science; Telecommunications	7	10	0	0

Figure 8. Relative Distribution of Journals by Research Area in WoS and Scopus



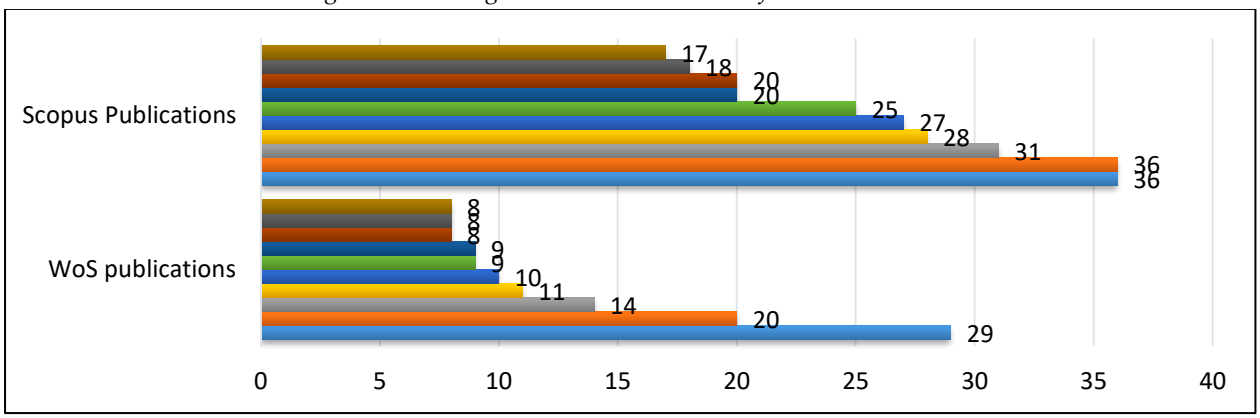
5.7 Ranking Authors Based on No. of Publications

The authors ranking based on no. of publications is shown in table 7. Arya, Yogendra has published maximum papers in Web of Science (having 29 papers) as well as Scopus (having 36 Papers).

Table 7. Ranking Authors Based on No. of Publications

Authors	WoS			Authors	Scopus		
	No. of publications	%	Rank		No. of publications	%	Rank
Arya, Yogendra	29	8.33	1	Arya, Yogendra	36	4.33	1
Azad, Puneet	20	5.75	2	Bansal, Poonam	36	4.33	2
Gahlot, Ajay	14	4.02	3	Rathee, Neeru	31	3.73	3
Gupta, Koyel Datta	11	3.16	4	Azad, Puneet	28	3.37	4
Kaur, Prabhjot	10	2.87	5	Kaur, Prabhjot	27	3.25	5
Gupta, Deepali	9	2.59	6	Tushir, Meena	25	3.01	6
Rathee, Neeru	9	2.59	7	Arora, Tajinder Singh	20	2.41	7
Dahiya, Naveen	8	2.30	8	Mann, Suman	20	2.41	8
Deshwal, Deepti	8	2.30	9	Dahiya, Naveen	18	2.17	9
Mann, Suman	8	2.30	10	Sharma, Tripti	17	2.05	10

Figure 9. Ranking Authors Based on No. of Publications



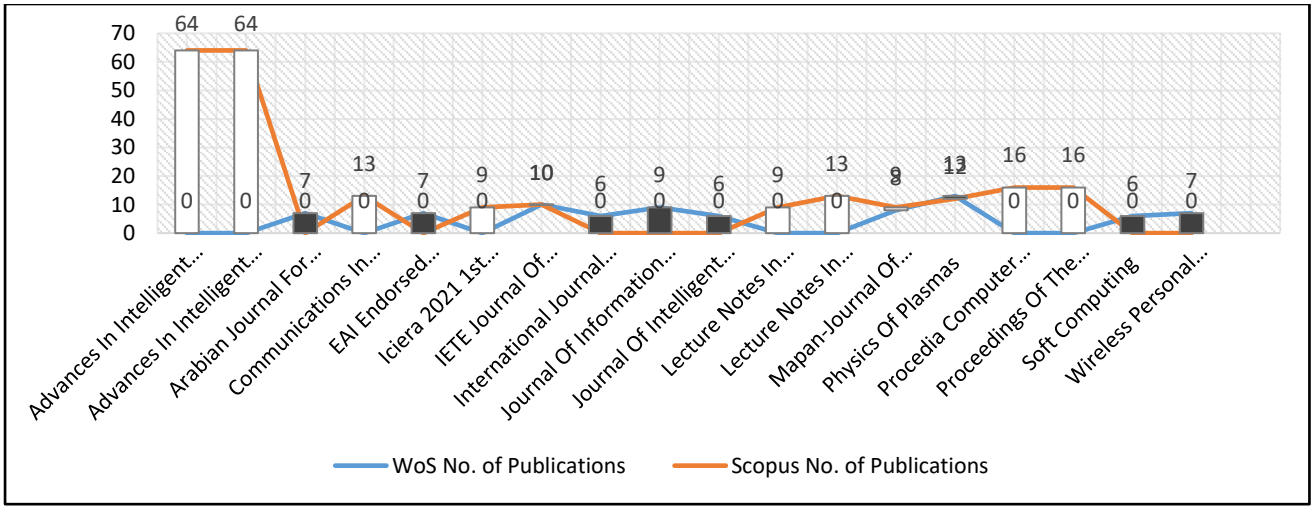
5.8 Top Ten Source/Journals that are Preferred for Publications

From the table 8, it can be seen that "Physics of Plasmas" is top ranked preferred source for publication consisting 13 research papers, followed by IETE Journal of Research with 10 articles in case of Web of Science whereas "Advances in Intelligent Systems and Computing" is the top ranked preferred source for publication consisting 64 research articles, followed by Procedia Computer Science with 16 articles in case of Scopus.

Table 8. Top Ten Source/Journals that are Preferred for Publications

WoS		Scopus	
Preferred Journal	**No. of Publications**	**Preferred Journal**	**No. of Publications**
Physics of Plasmas	13	Advances in Intelligent Systems and Computing	64
IETE Journal of Research	10	Procedia Computer Science	16
Journal of Information & Optimization Sciences	9	Proceedings of the 10th Indiacom 2016 3rd Int.Conf. on Com. for Sus. Global Dev.	16
Mapan-Journal of Metrology Society of India	8	Communications in Computer and Information Science	13
Wireless Personal Communications	7	Lecture Notes in Networks and Systems	13
EAI Endorsed Transactions on Scalable Information Systems	7	Physics of Plasmas	12
Arabian Journal for Science and Engineering	7	IETE Journal of Research	10
Soft Computing	6	ICIERA 2021 1st International Conference on Industrial Electronics Research and Applications Proceedings	9
Journal of Intelligent & Fuzzy Systems	6	Lecture Notes in Electrical Engineering	9
International Journal of Information Retrieval Research	6	Mapan Journal of Metrology Society Of India	9

Figure 10. Top Ten Source that are Preferred for Publications



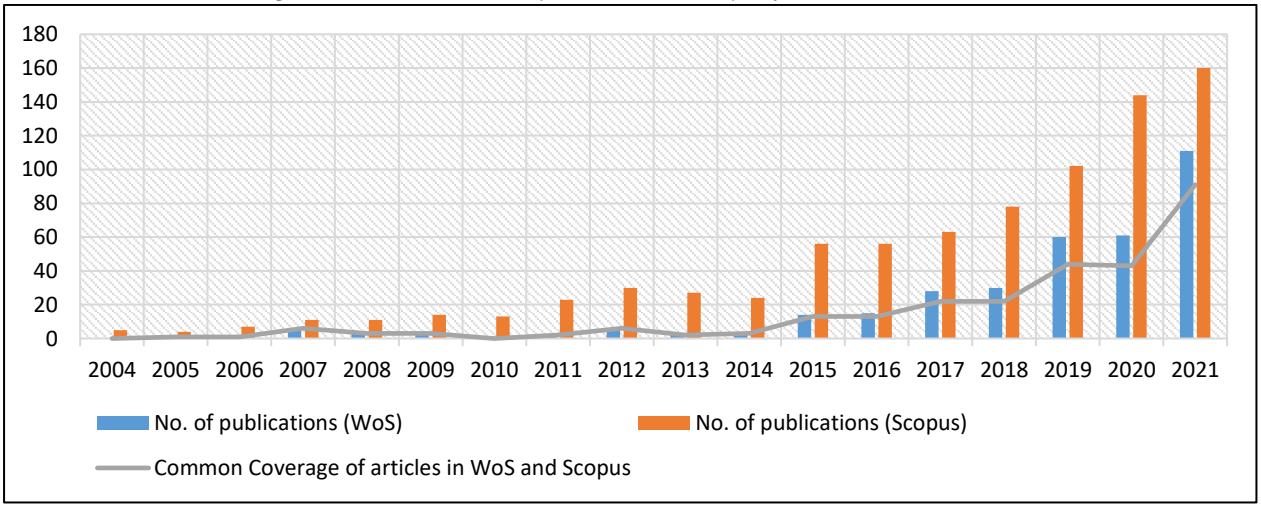
5.9 Journals Overlap in WoS and Scopus from 2004-2022

The table 9 shows the Journals Overlap in WoS and Scopus from 2004-2022. The total Journals published in WoS and Scopus from 2004-2022 is 1179. Out of the total journals the overlap journals are 23.32% that means the journals are both indexed in WoS and Scopus (Stahlschmidt & Stephen, 2022; Tebikew & Dereb, 2021).

Table 9. Journals Overlap in WoS and Scopus from 2004-2022

Year	No. of publications (WoS)	No. of publications (Scopus)	Common Coverage of articles in WoS and Scopus
2004	1	3	0
2005	0	5	0
2006	1	4	1
2007	1	7	1
2008	6	11	6
2009	3	11	3
2010	4	14	3
2011	0	13	0
2012	2	23	2
2013	6	30	6
2014	2	27	2
2015	3	24	3
2016	14	56	13
2017	15	56	13
2018	28	63	22
2019	30	78	22
2020	60	102	44
2021	61	144	43
2022	111	160	91
	348 (29.52%)	**831 (70.48%)**	**275**
	Total = 1179		**(Overlap by 23.32%)**

Figure 11. Journals Overlap in WoS and Scopus from 2004-2022



6. Findings

1. Table 1 shows that the total no. of documents in WoS & Scopus are 1179. Year 2022 depicts a peak with 160 (19.25%) documents published in Scopus database which is the highest in number whereas in WoS database the highest number of published documents is in 2022. It also shows that the total citation till date is 5681 and 1996 in Scopus and WoS database respectively. In year 2022, the total no. of citations is 1963 and 753 in Scopus Web of Science database respectively. Table 1 also depicts that the highest average no. of citations per paper in 2022 is 12.27 and 9.30 in the year 2021 in WoS database. Also, the highest relative citation impact as per in Scopus is in the year 2022 which is 1.79 and 1.62 in the year 2021 in Web of Science database.
2. Productivity of research from 2004-2015 was very low as depicted in table 2 but it increased exponentially after 2016. Year 2022 have maximum productivity that accounted for 111 papers (31.90%) and 160 (19.25%) in Web of Science and Scopus database respectively.
3. Table 3 shows that 87.36% publications are published under Articles/Journal articles in the WoS while only 45.97% publications are published Articles/Journal articles in Scopus. WoS does not include conference paper/proceedings as a part of package subscribed but 45.49% papers are published in conference paper/proceedings in the Scopus database.
4. Table 4 shows that the RGR has increased from 0 in 2004 to 1.1 in 2022 in Web of Science whereas from 0 in 2004 to 1.6 in 2022 in Scopus. The study also shows that DT is maximum in 2008 in case of Web of Science while 1.47 in 2005 in case of Scopus.
5. USA is in the top ten countries with 100 publications (28.74%) and Canada is at 10th rank with only 2 publications in case of Web of Science as per table 5. Whereas India is in the top 10 countries with 798 publications (96.03%) and Singapore is at 10th rank with only 4 publications in case of Scopus.
6. The majority of records are found under the category of computer science. As per table 6 the preferred subject for publications is Computer Science with 94 publications in case of WoS and same is the case with Scopus wherein 558 publications are published under Computer Science subject.
7. Table 7 shows that Arya, Yogendra has published maximum papers in Web of Science (having 29 papers) as well as Scopus (having 36 Papers).
8. "Physics of Plasmas" is top ranked preferred source consisting 13 research articles, followed by IETE Journal of Research with 10 articles in case of Web of Science as depicted in table 8 whereas "Advances in Intelligent Systems and Computing" is top ranked preferred source for publication consisting 64 research articles, followed by Procedia Computer Science with 16 articles in case of Scopus.
9. The total Journals published in WoS and Scopus from 2004-2022 is 1179 as shown in table 9. Out of the total journals the overlap journals are 23.32% that means the journals are both indexed in WoS and Scopus.

7. Limitations and Research Gaps

The challenged faced for conducting the above research was that the coverage of web of science does not cover research papers published in conference proceeding. Various universities were contacted to extract to hatch the data of published research papers in conference proceeding under web of science database but the publisher "Clarivate" is giving the restricted access to the universities. Conference proceeding (that is part of core collection of journals at WoS) was not taken while analyzing the data due to the non-availability of said package. So, there is a scope of including the same upon the availability of data from the said resource.

8. Conclusion

Academic performance is neither straight forward not easy to measure. The Quality of

Teaching is rarely measured because of the reason that the assessment is not easy and no wide known parameters. Most of the academic global information was disseminated through fewer refereed journals and that too is not in SCI, ESCI, WoS or Scopus journals.

Nearly two decades has been taken to evaluate the research productivity of MSIT faculty members through scientometric analysis. The research was found to be growing quickly and optimistically, and the citations are increasing that reveals the research quality. Faculty members preferred to publish their research in journals. The results of current study will also help various funding organizations and policy-making authorities, including UGC, NAAC, NBA, and GGSIPU, take the necessary actions to encourage researchers to participate in research activities. The study's findings might serve as a motivator for faculty members' and the institution's enthusiasm in bolstering their research efforts. Overall, the results of this study will assist academics in conducting more fruitful research that yields more publications in their area.

The study compared WoS and Scopus journals, revealing unbalanced coverage between countries and languages, potentially introducing biases in comparative analyses.

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