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Assessment of Research Productivity of Indian School of Business (ISB), Hyderabad, India

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ABSTRACT

This study aimed to perform a scientometric analysis of the Indian School of Business, Hyderabad, from 2002 to 2020. The study has used different scientometric dimensions to evaluate the quantitative growth of research publications. The affiliation search was performed to find out the research publications by using the Scopus database. To make the analysis complete and to get better outcomes, authors have considered total publications produced since the inception of ISB, Hyderabad. This study has analysed the year-wise growth of publications, most preferred sources, authorship pattern, subject-wise distribution of papers, etc. Furthermore, the study also explored international research collaboration. During the study period, the study identified a total of 561 publications and 12029 citations. The study found that 2015 and 2018 are the most productive years with 52 publications. The majority of the papers have appeared under three authorship patterns, and the Degree of Collaboration and Collaborative Coefficient is apparent with a total of 0.90 and 0.57, respectively. The "Panel data models with spatially correlated error components" published by "Kapoor M., Kelejian H.H., Prucha I.R published in the Journal of Econometrics Section is a highly cited (335) paper, and Production and Operations Management is the topmost source for publication.

Keywords: *Authorship pattern, Subject domain, Open access, Research productivity, Indian School of Business, ISB, Hyderabad.*

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1. INTRODUCTION

Scientometrics is a discipline that analyses the quantitative aspects of scientific publications to explore science's trend and growth (Rajendran, 2011). The Scientometric approach to research productivity is considered one of the dimensions to measure an institution's academic performance. Research performance is one of the essential factors used by accreditation agencies like UGC, AICTE, NBA, BCI, etc., to rank higher learning institutes based on their performance. Research productivity of institutions as a whole and individual researcher's performance, in particular, is the basis of evaluation for such recognition agencies. It is intended practice to measure and evaluate research productivity to identify the faculty's research interest, institutional ranking, and reputation of the Institute and enable the Institution and individual to realize the shortfalls and upgrade the performance (Pradhan et al., 2020). Research productivity in higher education, particularly in business studies, is gaining importance in India's past decade. The ISB, Hyderabad, is among the foremost private institutions of its kind. It is an enduring symbol in the sphere of business and management education in India.

This study's primary purpose is to analyze the Indian School of Business (ISB) Hyderabad's research performance based on the Scopus Databases from 2002 to 2020. ISB Hyderabad is one of the premier private business schools in India, established in 2001. ISB, Hyderabad has more than 70 resident teachings and research faculty and has a pool of 150+visiting faculty from top global B-schools Excellence in MBA instruction and management research. ISB Hyderabad offers certificates in various post-graduate management programs. ISB became the 100th Triple Accredited business school in the world (AMBA, EQUIS, AACSB) upon achieving AMBA accreditation on 12 May 2020 (Wikipedia 2020). With this academic attainment, researchers felt to examine and evaluate research performance through different Scientometrics indicators.

2. REVIEW OF LITERATURE

Scientometrics techniques have also been used to measure and analyze the scientific information of particular institutions. So far, many such studies have been conducted at the national and global levels, and some have analyzed and drawn inferences to support the present research study (Pradhana et al., 2020).

Sahoo et al. (2015) analysed India's management schools' research productivity using the Directional Benefits-of-Doubt Model. The relative weights (RW) of the journal tier, total citations, impact factor, author h-index, several papers, and journal h-index is found varied from high to low, and both public and private schools research productivity were found similar. The study observed that the faculty who awarded Ph.D. degrees from abroad was found more productive rather than from Indian institutions. The authors have suggested a faculty exchange program between Indian and foreign institutions to advance the subject's field. Further IIMs at Ahmedabad and Bangalore and the ISB, Hyderabad have apparent more superstars than other schools among the top 5% researchers during 2004-2014. The study suggested that B schools should hire conditions among the research students admitted in schools should publish two articles in peer-reviewed journals to improve research productivity.

Anil Kumar & Dora (2012) attempted to identify the research trends published by IMA Ahmedabad from 1999 to 2010. The authors extracted data from Web of Science and Scopus databases. A total of 318 unique publications of IIMA have been identified from both the database and found an increasing number of publications under collaborative works and a decrease in single-author publications. Among the 318 publications, most of them have a multi-disciplinary nature of research, and 74% of publications have appeared in the form of articles. The authors recommended that the administration develop research-friendly policies and take the Institute's research output to the next level. Furthermore, the authors of IIMA should have collaborated with international authors to increase publications.

Javed et al. (2020) evaluated research performance in higher educational institutes of Islamabad state from 2008 to 2017. The study traced out that only 1% of the country's population and around 11% of Higher Education Commissions recognized universities in Islamabad. Higher education institutes located in Islamabad contributed 34% of Pakistan's total publications. Authors have identified 36561 research publications from both private and public higher education institutes located in Islamabad territory. The study found that public sector universities contributed a significant portion of total publications, whereas the private sector universities less than 8% of the total publications. The public sector university publications received more citations than private sector universities. From all the observations, the authors suggested a need

to align their research priorities with HEC and other international institutions and institutions in neighboring countries to focus on their research activities.

Jeyshankar (2015) evaluated the research performance and trends of the Indira Gandhi Centre for Atomic Research (IGCAR). The authors used the Scopus database to extract related data and employed Scientometrics indicators to examine the publication trend. From 1989 to 2013, a total of 5171 records were included. The Relative Growth Rate was found downward from 1990 (0.54) to 1995 (0.15), and doubling Time increased from 1.27 to 8.22 during 1989 - 2013. It was also identified that the majority (97%) of papers came under collaborative authorship patterns, with the degree of Collaboration varying from 0.84 to 0.99. The authors recommended that the science policymakers and administrators make adequate infrastructure/equipment facilities and adequately direct the research activities.

Khan & Ahangar (2015) conducted a study to examine the research productivity of Government Medical College Jammu (MCJ) and provides a Bibliometrics profile of biomedical publications. The authors have used the SciVerse- Scopus database to harvest data related to research publications of Government Medical College Jammu published from 1973 to May 2011. A total of 514 publications were contributed from 28 different departments. The Department of General Medicine contributed the highest (18%) publications. Most highly cited publications were found from the department's pediatrics with an Average citation (4%). Furthermore, the highest (91%) publications of MCJ appeared under team efforts, and 63% of publications contributed in 'Articles' form of publications. The study suggests that authors should produce high-quality works published in free online publications that significantly increase the paper's impact.

3. Objectives

The main objectives of the study are:

- To analyse the year wise growth pattern of research publications of Indian School of Business (ISB), Hyderabad during 2002-2020;
- To examine the authorship pattern and to find out the Degree of Collaboration (DC) and Collaborative Coefficient (CC);
- To calculate the Annual Growth Rate (AGR), Relative Growth Rate (RGR) of publications, and Doubling Time (Dt);

- To find out the topmost highly cited publications;
- To find out the most collaborative institutes and countries;
- To find out the top funding agency in the field of business and management.

4. Methodology

This present study's main objective was to highlight the research trends in the Indian School of Business (ISB), Hyderabad, during 2002-2020. This particular study aims to analyze the research performance of the Indian School of Business (ISB), Hyderabad since its inception. The researchers have obtained publication data from the Scopus database, a product of Elsevier. A search was carried out by accessing Scopus, the largest abstract and citation database of peer-reviewed literature: scientific journals, books, and conference proceedings. The following search string used for retrieval of data is "AF-ID ("Indian School of Business" 60104532) AND (EXCLUDE (PUBYEAR, 2021)) AND (EXCLUDE (PUBSTAGE, "aip"))" on 30 October 2020. A total of 561 publications were retrieved and cleaned as per the requirement. Finally, it was processed by the scientific tools and techniques to ascertain the achievement of the study objectives.

5. RESULTS AND DISCUSSION

5.1 Year-wise growth pattern of publications with citations

Table 1 and figure.1 shows the year-wise growth pattern of research publications published by the Indian School of Business (ISB) Hyderabad from 2002 to 2020. A total of 561 publications were found during the study period, and the frequency of the publications shows an increasing trend during the last twenty years. From 2002 to 2005, the publication growth of ISB Hyderabad was found less productive (3.20%), and that could be due to the Institute's initial level establishment with limited researchers and infrastructure. The study results indicated that in 2015 and 2018, the research's growth pattern was at its maximum (19.60%). For all the 561 publications, a total of 12029 citations were received. The average citations per paper varied from 0.68 to 91.80 during 2002-2020. Table 1 represents the year wise growth pattern of publications in terms of its total publications produced, cumulative percentage, and total citations (TNC) received, along with the data on average citation per publication (ACPP).

Table 1: Year-wise growth pattern of publications with citations

Year	TNP	TNC	ACPP	Year	TNP	TNC	ACPP
2002	3	224	74.67	2012	36	808	22.44
2003	5	459	91.80	2013	39	1669	42.79
2004	5	167	33.40	2014	39	775	19.87
2005	5	73	14.60	2015	52	803	15.44
2006	14	426	30.43	2016	36	708	19.67
2007	18	1182	65.67	2017	39	436	11.18
2008	29	795	27.41	2018	52	387	7.44
2009	30	653	21.77	2019	50	304	6.08
2010	32	981	30.66	2020	38	26	0.68
2011	39	1153	29.56	Total	561	12029	33.96

Note: TNP=total number of publications, TNC=Total number of Citations, ACPP=average citation per paper

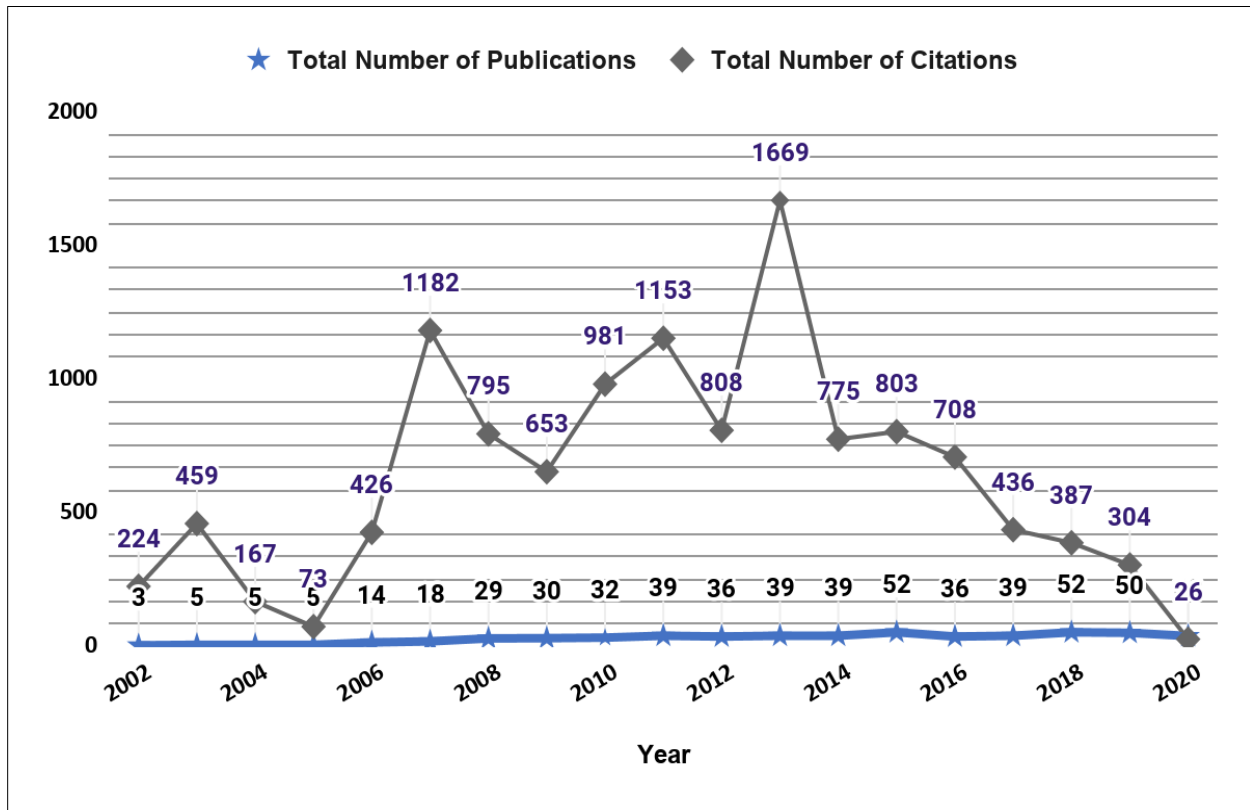


Fig.1: Year-wise growth pattern of publications with citations

5.2 Authorship pattern with DC and CC

Collaboration in research is one of the significant factors for the growth of publications and better opportunity to work together. The analysis of 561 publications of ISB Hyderabad,

majority, i.e., 507 publications, were published under multiple authorship patterns. Three authors published a maximum of 187 articles, followed by 186 articles published by double authors. The number of collaborative research papers to the total number of research papers in the discipline during a specific period is known as Degree of Collaboration. The degree of Collaboration is determined as per the formula $C = \frac{Nm}{Nm+N_s}$. It varied from 0.67 to 1.00 in different years, with an average (mean) collaboration of 0.90. The highest degree of Collaboration, 1.00, is calculated in the year 2004 as well as 2005. Further, to measure Collaboration's strength, the formula of Collaboration Coefficient $CC = 1 - \left(\sum (j=1)^k \binom{1}{j} \right)$ (Ajiferuke, 1988) has been used. It is measured and found that the CC is varied from 0.44 to 0.64 in different years, and the total average CC is found 0.57. The highest collaboration coefficient, 0.64, is calculated in 2013 (Yadav et al., 2020). It is evident from the study that the average CC is more prominent than 0.6. It reveals that the ISB, Hyderabad, is performing better in collaborative research.

Table 2: Authorship Pattern

Year	TNP	Ns	Nd	NT	Nf	Nf>	DC	CC
2002	3	1	0	2	0	0	0.67	0.44
2003	5	1	2	2	0	0	0.80	0.47
2004	5	0	1	4	0	0	1.00	0.63
2005	5	0	3	1	1	0	1.00	0.58
2006	14	3	2	5	4	0	0.79	0.52
2007	18	3	7	4	3	1	0.83	0.51
2008	29	1	12	12	3	1	0.97	0.59
2009	30	3	12	10	3	2	0.90	0.55
2010	32	2	13	6	7	4	0.94	0.59
2011	39	5	12	14	6	2	0.87	0.55
2012	36	3	13	12	3	5	0.92	0.58
2013	39	2	8	13	9	7	0.95	0.64
2014	39	4	18	8	5	4	0.90	0.55
2015	52	8	13	20	6	4	0.84	0.54
2016	36	3	16	9	5	3	0.92	0.56
2017	39	2	16	16	3	2	0.95	0.58
2018	52	4	13	20	11	5	0.92	0.61
2019	50	7	14	18	2	9	0.86	0.55
2020	38	2	11	11	6	8	0.95	0.62
Total	561	54	186	187	77	57	0.90	0.57

Note: Ns=Number of Single Authored Articles, Nd=Number of Double Authored Articles, Nt=Number of Triple Authored Articles, Nf=Number of Four Authored Articles

5.3 Average Growth rate (AGR), Relative Growth rate (RGR), and Doubling times (DT)

Table 3 shows the growth rate of literature in ISB Hyderabad from 2002 to 2020. The Average Growth Rate (AGR) & Relative Growth Rate (RGR) are two indicators of Scientometrics used to determine the growth rate of research output. The AGR determined as per the formula $AGR = \frac{\text{end value} - \text{first value}}{\text{first value}} \times 100$ and found a total average growth rate of 1376.32 during 20 years of the study period. The variation trend in AGR is observed from 0.00 (2002) to -24.00 (2020). Further, the RGR determines the growth in terms of a rate of increase in size per unit of size. For calculating the mean relative growth rate (RGR) over the specific period of the interval, the formula $RGR = (1 - 2^r) = \frac{\ln(W2) - \ln(W1)}{T2 - T1}$ is employed and found it varies from 0 to 0.07 from 2002 to 2020. Whereas Doubling time (Dt) is used to indicate the period required for a quantity to double in size or value. To know the Dt, the researchers applied a formula for $\text{Doubling Time} = D(t) = \frac{0.693}{RGR}$. However, the Doubling Time (DT) has found a periodical growth over the years from 0 to 0.33. It is evident from the table that AGR & RGR and Dt are inversely proportional in the business and management studies at the Indian School of Business.

Table 3: Average Growth rate (AGR), Relative Growth rate (RGR), & Doubling times

Year	TNP	AGR	TC	W1	W2	RGR	Dt
2002	3	0	3	0	1.10	0.00	0
2003	5	66.67	8	1.10	2.08	0.98	0.33
2004	5	0.00	13	2.08	2.56	0.49	0.27
2005	5	0.00	18	2.56	2.89	0.33	0.24
2006	14	180.00	32	2.89	3.47	0.58	0.20
2007	18	28.57	50	3.47	3.91	0.45	0.18
2008	29	61.11	79	3.91	4.37	0.46	0.16
2009	30	3.45	109	4.37	4.69	0.32	0.15
2010	32	6.67	141	4.69	4.95	0.26	0.14
2011	39	21.88	180	4.95	5.19	0.24	0.13
2012	36	-7.69	216	5.19	5.38	0.18	0.13
2013	39	8.33	255	5.38	5.54	0.17	0.13
2014	39	0.00	294	5.54	5.68	0.14	0.12
2015	52	33.33	346	5.68	5.85	0.16	0.12
2016	36	-30.77	382	5.85	5.95	0.10	0.12
2017	39	8.33	421	5.95	6.04	0.10	0.11
2018	52	33.33	473	6.04	6.16	0.12	0.11
2019	50	-3.85	523	6.16	6.26	0.10	0.11
2020	38	-24.00	561	6.26	6.33	0.07	0.11

Total	561	1376.32	1122	6.33	7.02	0.10
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*Note: AGR=Annual Growth Rate, CT=Cumulative Total, RGR=Relative Growth Rate
Dt= Doubling times

5.4 Top ten Highly Cited Publications

Table 4 specifies the top ten highly cited publications by the authors of ISB Hyderabad. “The researchers publish their work in a wide range of journals with different impact factors (Vellaichamy 2015).” The data observed from the table that Kapoor M., Kelejian H.H., Prucha I.R authored "Panel data models with spatially correlated error components" published in Journal of Econometrics Section stand top position with 335 citations and ACPP 0.12. Lin M., Lucas H.C. followed it, Shmueli G. authored "Too big to fail: large samples and the p-value problem" published in Information Systems Research stands the second position with 327 citations and ACPP 0.11. As shown in the table placed under the top ten cited publications, the remaining publications have received 320 to 200 range citations with 0.12 to 0.7 ACPP.

Table 4: Top ten Highly Cited Publications

Sl. No.	Authors	Title	Year	Source title	TNC	ACPP
1	Kapoor M., Kelejian H.H., Prucha I.R.	Panel data models with spatially correlated error components	2007	Journal of Econometrics	335	0.12
2	Lin M., Lucas H.C., Shmueli G.	Too big to fail: Large samples and the p-value problem	2013	Information Systems Research	327	0.12
3	Wu F., Mahajan V., Balasubramanian S.	An Analysis of E-Business Adoption and Its Impact on Business Performance	2003	Journal of the Academy of Marketing Science	320	0.12
4	Carrie Armel K., Gupta A., Shrimali G., Albert A.	Is disaggregation the holy grail of energy efficiency? The case of electricity	2013	Energy Policy	301	0.11
5	Gubbi S.R., Aulakh P.S., Ray S., Sarkar M.B., Chittoor R.	Do international acquisitions by emerging-economy firms create shareholder value in the case of Indian firms	2010	Journal of International Business Studies	287	0.11
6	Kamdar D., Van Dyne L.	The Joint Effects of Personality and Workplace Social Exchange Relationships in Predicting Task Performance and Citizenship Performance	2007	Journal of Applied Psychology	267	0.10

7	Kumar A., Bezawada R., Rishika R., Janakiraman R., Kannan P.K.	From social to sale: The effects of firm-generated content in social media on customer behavior	2016	Journal of Marketing	257	0.09
8	Morrison E.W., Wheeler-Smith S.L., Kamdar D.	Speaking Up in Groups: A Cross-Level Study of Group Voice Climate and Voice	2011	Journal of Applied Psychology	220	0.08
9	Chakrabarti R., Gupta-Mukherjee S., Jayaraman N.	Mars-Venus marriages: Culture and cross-border M & A	2009	Journal of International Business Studies	204	0.08
10	Chopra S., Reinhardt G., Mohan U.	The importance of decoupling recurrent and disruption risks in a supply chain	2007	Naval Research Logistics	200	0.07

5.5 Top ten Highly Collaborative Countries

Figure-2 shows that the top ten highly collaborative countries with their research output. The United States (346) has the largest share with ISB Hyderabad, followed by the United Kingdom (40) and Canada (29), Singapore (27), China (21), Australia (16), France (10), and so on. Out of the given 10 countries, the majority of documents have come from European countries such as USA, UK and Canada.

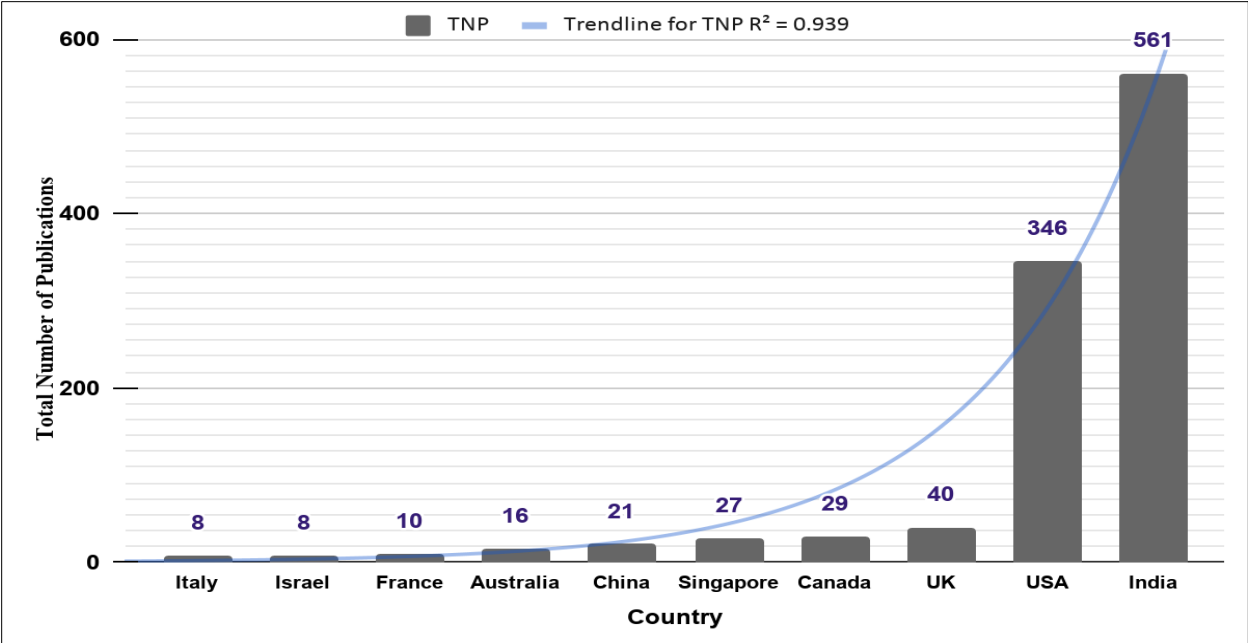


Fig.2: Top ten Highly Collaborative Countries

5.6 Most Preferred Sources

Table 5 illustrates the top ten most preferred sources which published more publications which were contributed by the authors of ISB, Hyderabad. The data available in the table, the Production and Operations Management, was declared a highly preferred source of publication with 19 articles. Whereas, the Journal of the Academy of Marketing Science, 17 articles were published, and International Series in Operations Research and Management Science was ranked third by publishing 16 articles. Information Systems Research published 14 articles and secured the fourth position in the most preferred sources list.

Table 5: Most Preferred Sources

Source	TNP	Cite Score*	SJR*	SNIP*
Production and Operations Management	19	4.7	2.843	1.950
Journal of the Academy of Marketing Science	17	16.8	5.309	4.986
International Series in Operations Research & Management Science	16	1.1	0.894	3.087
Information Systems Research	14	6.6	3.235	2.619
Economic and Political Weekly	13	0.6	0.298	0.644
Journal of Applied Psychology	13	10.7	6.423	3.692
Operations Research	11	4.9	3.539	2.509
Strategic Management Journal	11	11.5	8.430	3.624
Management Science	10	7.0	5.439	3.254
Naval Research Logistics	8	1.5	0.602	0.756

Note: * indicates the year as per cite score, SJR & SNIP was calculated (2019)

5.7 Subject-wise Distributions

Table 6 shows the subject-wise distribution of research output produced from 2002 to 2020. This is intended to know the authors' interest and total involvement in producing a publication on their specialization. It showed that most of the subjects were overlapped with each other. The study concluded that most (295) of the scholarly publications were published in Business, Management, and Accounting, which would be easily predicted. These publications were outputs of scholars and faculties of the school of business. Followed by Economics, Econometrics, and Finance with 163 publications, Decision Sciences with 144, Social Sciences with 125, Computer Science with 108, and so on.

Table 6: Subject-wise Distributions

Subject area	TNP
Business, Management, and Accounting	295
Economics, Econometrics, and Finance	163
Decision Sciences	144
Social Sciences	125
Computer Science	108
Engineering	66
Mathematics	56
Psychology	27
Environmental Science	23
Medicine	21
Agricultural and Biological Sciences	15

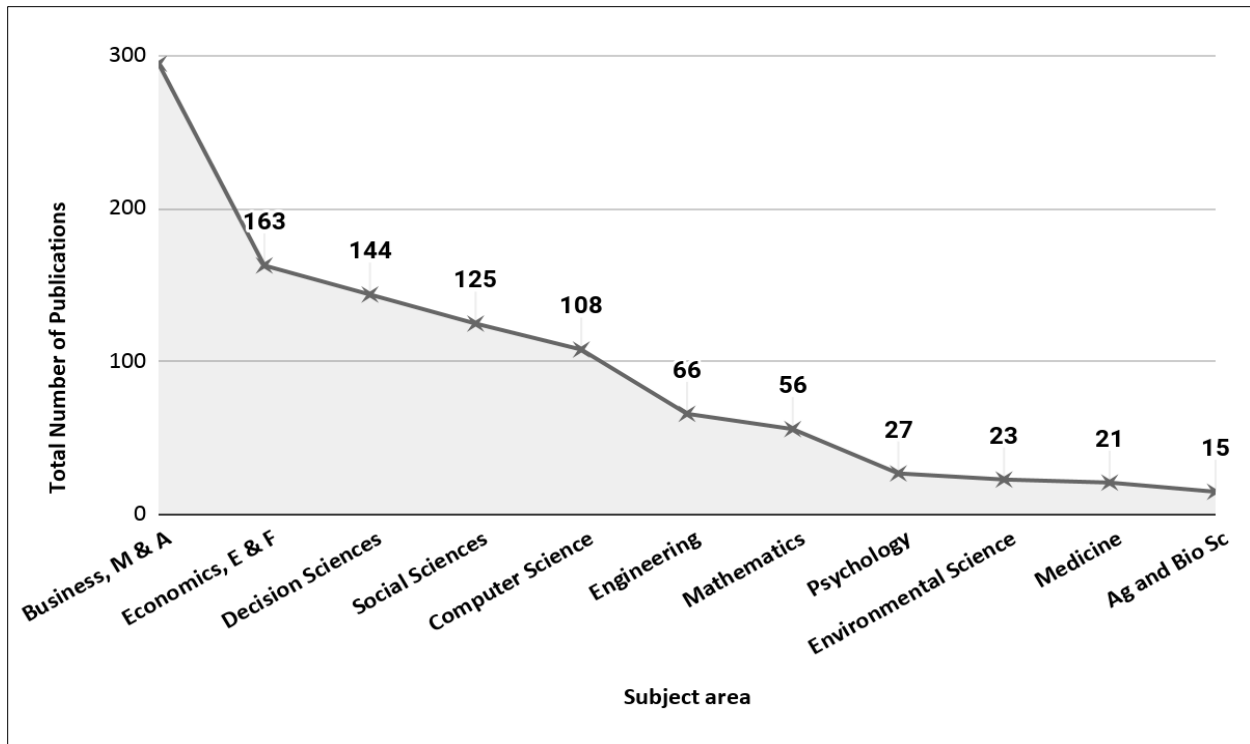


Fig. 3: Subject-wise Distributions

5.8 Top most collaborative institutions

Figure-4 demonstrates the top ten collaborative institutions. ISB, Hyderabad has published 561 publications, among which 233 (41.53%) were published and collaborated with other institutions as indicated in the fig.4

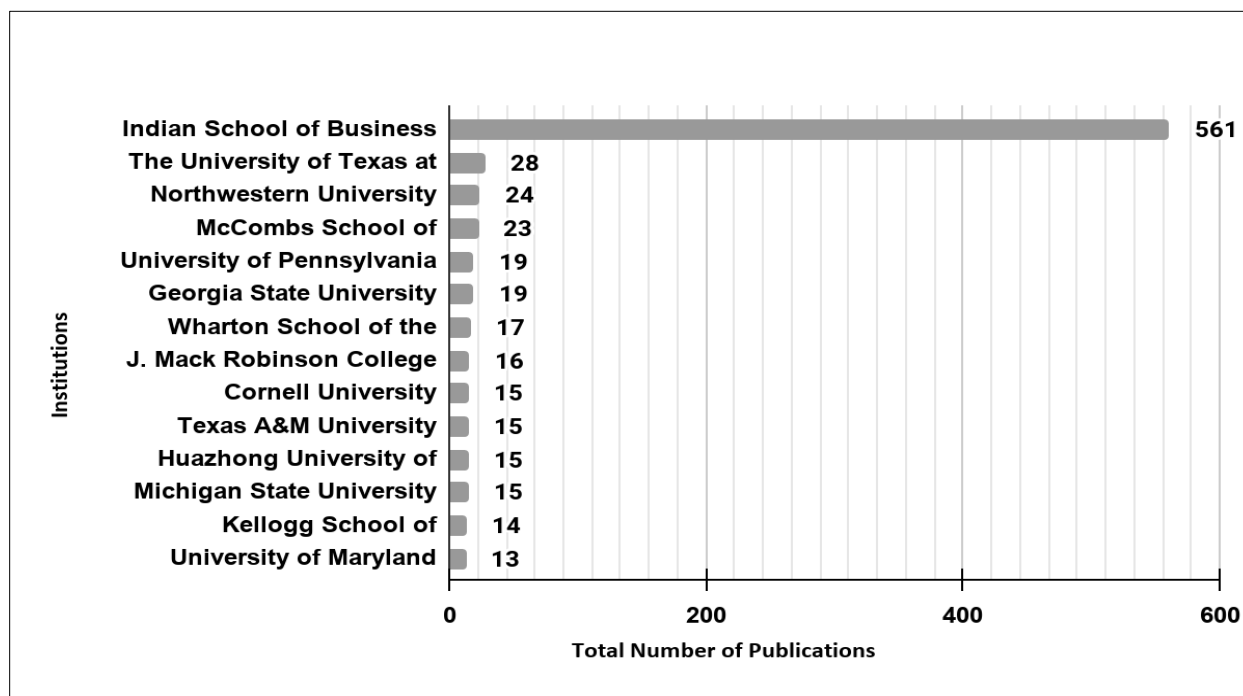


Fig. 4: Top most collaborative institutions

5.9 Top ten Highly Funding Agency

Table 7 shows the rank of the top ten research funding agencies/institutions. It was inferred that the National Science Foundation was the top most funding agency by funding nine publications. Bill and Melinda Gates Foundation stood the second rank in the top ten most funding agencies by funding six publications. Followed by the Canadian Institutes of Health Research stood third place, which funded for three publications. The remaining funding agencies are listed in Table 8, supporting ISB, Hyderabad, to research publications.

Table 7: Top ten Highly Funding Agency

Founding sponsor	TNP
National Science Foundation	9
Bill and Melinda Gates Foundation	6
Canadian Institutes of Health Research	3
European Research Council	3
Social Sciences and Humanities Research Council of Canada	3
Department for International Development	2
International Development Research Centre	2
National Natural Science Foundation of China	2
Stanford University	2
Strategic Management Society	2

6. Findings:

- 1) The Year 2002 was least productive for ISB, Hyderabad in terms of research output with only three publications. Maximum research productivity was found in 2015 and 2018, with 52 publications each year. The publications' quality was found outstanding in 2003 with average citations per paper of 91.80 and was found inadequate in 2020 with average citations per paper of 0.68. In the entire study period, a total of 651 papers were published with average citations of 33.96.
- 2) The majority of the publications of ISB, Hyderabad, were published by multiple authors, i.e., 507 out of 561 publications were authored by more than one person. It was found that maximum (187) publications were authored by three persons, followed by 186 publications having double authors. The highest degree of Collaboration, i.e., 1.0, was derived in 2004 and 2005. The highest collaboration coefficient, i.e., 0.64, was observed in 2013.
- 3) The average Growth Rate for 20 years of the study period was 1376.32 and varied from 0 to -24 from 2002 to 2020. Relative Growth Rate varied from 0 to 0.07 from 2002 to 2020. Doubling Time was observed to be increasing from 0 to 0.33 in the study period.
- 4) The United States had the maximum Collaboration with ISB, Hyderabad, in research, i.e., 346 publications of ISB have collaborated with the United States. The United Kingdom stands in the second position by collaborating 40 publications, followed by Canada (29), Singapore (27), China (21), and so on.
- 5) Production and Operations Management was the most preferred source by authors of ISB, Hyderabad for publishing with 19 research works. Journal of the Academy of Marketing Sciences was second most preferred in which 17 scholarly writings were published, followed by International Series in Operations Research and Management Science (16) and Information Systems Research (14), etc.
- 6) Most of the Research Works published by ISB, Hyderabad, was on Business, Management, and Accounting with 295 publications. Economics, Econometrics, and Finance were ranked second with 163 publications, followed by Decision Sciences (144), Social Sciences (125) and Computer Science (10), etc.

- 7) After funding nine publications, National Science Foundation was the top funding agency, followed by Bill and Melinda Gates Foundation (6), Canadian Institutes of Health Research(3), etc.

7. Conclusion:

Several factors may affect the research productivity of an individual as well as the Institution. The research performance must be taken into account motivational, infrastructural, and institutional research environment and the communication among peers, which impact the productivity of research. Over 20 years time span, the Indian School of business's research activities, Hyderabad, have shown a substantial fluctuation. To suggest, the researcher should be encouraged to publish in high impact factor journals that may enhance the quality of research. The publishing journals should be chosen wisely to upgrade the research impact. The application-based research should be focused on that may help in strengthening the citations. The Institute should also consider increasing international research collaborations and creating separate research support (grant) and international agencies to carry out research and development activities.

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