Research Contributions of Top-Ranking Universities of Pakistan in SCOPUS Database: A Bibliometric Analysis

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Abstract

The purpose of this study is to explore and investigate the research productivity of top-ranking universities of Pakistan in the SCOPUS Database through the bibliometric lens. The present research used a quantitative method for data collection using bibliometric patterns. For identification of ranking, The Center for World University Rankings (CWUR) was consulted. The scientific research productivity of these universities was taken from the SCOPUS Database. Some other strategies such as bibliographic publication records, official websites, and Google Scholar profiles of faculty members were also consulted. Advanced searching techniques were used to avoid ambiguity and vagueness in the present record. A total of 118560 research papers were produced by faculty members of the five universities under study since their establishment. Among them, Quaid-I-Azam University Islamabad remained on top with 37718 publications. COMSAT University Islamabad ranked second with 22376 records. Agha Khan University Karachi ranked third with 9752 records, followed by the University of Punjab ranked fourth with 26207 publications. University of Agriculture Faisalabad (UAF) has contributed a total of 22407 publications. The findings of this study will be of immense help to the research faculties, stakeholders, the Higher Education Commission of Pakistan (HEC), and research scholars working in academia to know what research has been done in various fields. The study will set directions for the researchers of Pakistan to explore what fields they need to select for further research and inquiry. To maintain the quality and advancement in scientific research, this study is helpful for the scholarly world to maximize research productivity in various fields. The study provides a holistic sketch of the literature produced by top-ranking universities in Pakistan. Other Universities based in Pakistan will get insights to advance their research activities to the next level.

Keywords: Research productivities, Ranking of Pakistani Universities, Bibliometric, Research trends, Scientific Literature, SCOPUS database.

Introduction

Research plays a pivotal role in the growth of any profession. It can be disciplinary and interdisciplinary ideas where one can flourish themselves in their domain. Bako (2005) explained that research culture in universities and higher education is a framework that helps both students and research supervisors in capacity building and intellectual capital for all. Research is a systematic search and investigation for increasing the sum of knowledge and is the extended version of Research and Development (R&D) in capacity building. Ingenious authentic and incessant research activities take a nation to sustainable development. Research is an inventive task and its basic objectives are the growth of existing theories and the discovery of new knowledge through various organized methods (Hussain, 2021).

Through research, we can improve the body of knowledge, products, capital development, and services in different organizations. Universities are regarded as rich sources of knowledge. Research has become a vital part of educational institutions. Research has a long history in the region which is now called Pakistan. When Pakistan came into being in 1947, there were only two universities i.e. University of Punjab founded in 1882 at Lahore and the University of Sindh, Hyderabad founded in 1947. After the independence of

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Pakistan, two more universities were established in the initial three years i.e. the University of Peshawar founded in 1950 and the University of Karachi founded in 1951. Since then, several universities have been established in various parts of the country. The Higher Education Commission (HEC) of Pakistan previously known as the University Grants Commission (UGS) is playing a tremendous role in promoting research activities in the country. Presently, there are 233 HEC-recognized Universities and DAIs in Pakistan. All universities are imparting education in different disciplines and producing a handsome amount of research in the last few decades. The Scopus database was created by Elsevier back in 2004. It records abstracts and citations and is considered an authentic source for the provision of scientific documents and citation links. One of the most important features of Scopus is that it provides complete bibliographical details including institutional address for each research article.

The present study is an attempt to highlight the research contribution, indexed in the SCOPUS database, of the top five universities of Pakistan that appeared in the world ranking in 2022. These include Quaid-i-Azam University Islamabad, Comsats University Islamabad, Agha Khan University Karachi, University of the Punjab, and the University of Agriculture Faisalabad.

Objectives of the study
1. To investigate the total number of Publications produced by the Top 5 Ranking Universities in Pakistan
2. To identify the Subject contributions of Pakistani Universities indexed in the Scopus Database
3. To evaluate the contribution of Faculties of these universities in a different discipline
4. To discover the gap among the top-ranking universities in terms of research productivity.

Methodology
The study data were collected from the SCOPUS database which has worldwide recognition as a credible, comprehensive, prestigious, suitable, and popular database. (Kanmodi et al, 2022). The present study used a quantitative method for data analysis using bibliometric patterns. For identification of ranking, World University Rankings (CWUR) was consulted. The scientific research productivity of these universities was taken from the SCOPUS Database which has worldwide recognition as a credible, comprehensive, prestigious, suitable, and popular database. (Kanmodi et al, 2022). Some other strategies such as bibliographic publication records, official websites, and Google Scholar profiles of faculty members were also consulted. Advanced searching techniques were used to avoid ambiguity and vagueness in the present record. Moreover, a selection criterion based on the originality of the paper, relevancy to the top five universities of Pakistan, and English language was developed as given in table-1. The data was retrieved from the Scopus database. After extracting the data from the Scopus database, it was examined thoroughly by two reviewers who were expert researchers in the field of Library and Information Science, to make sure that all the data so retrieved had close relevancy to the theme. Microsoft Excel 2021 was used to analyze the bibliometric parameters of all publications.

Table 1:   Selection Criteria

	Inclusion criteria	Exclusion criteria
1.	Original research papers	Monographs, commentaries, editorial, letters, stories, and publications which are not original papers not relevant to the theme or not mentioning workplace/affiliation of the authors
2	Research papers relevant to Quaid-i-Azam University, Comsats University Islamabad, Agha Khan University Karachi, University of the Punjab (Lahore) and the University of Agriculture Faisalabad.	
3	Included only English language papers	Research papers not in the English language.

Review of Related Literature

The research adds to the horizon of information and education and leads the way to further development as well as opens the doors of the treasure house of knowledge. It is a kind of process in which try to reach the truth. Research helps us search for new problems, gather data about such problems, draw conclusions, and help us to frame recommendations. Researchers carefully investigate, make analyses, and explain, and verify facts. Research-based facts are logical, balanced, and based on experience. According to Rashid (2001), Research is a conscious effort to collect, verify, and analyze information. It is a systematized work to solve complex problems.

Research productivity, "performance" or "Output" is used interchangeably. "Research" means very careful, observant, and vigilant study or investigation of phenomena, predominantly to search and find out new particulars, information, and facts. While "Productivity" means the output produced in duration of time. In the context of universities and DAIs, research productivity means, the publication of books or papers in professional journals, or the presentation of research papers in conference proceedings (Hussain, 2022). According to Creswell (1986), Research Productivity includes research publications in professional journals and in conference proceedings, writing a book or chapter, gathering and analyzing original evidence, working with post-graduate students on dissertations and class projects, obtaining research grants, carrying out editorial duties, obtaining patents and licenses, writing of monographs, developing experimental designs, producing works of an artistic or creative nature, engaging in public debates and commentaries. According to Weidenborner, (2007) successful research project is more than a collection of information, it requires planning, which sources to consult, what kinds of notes to take, and how to put it all together into an effective paper. Metrics related to research and academic investigation account for most of the variance in the ranking positions that those initiatives seek to improve (Cevera et al 2020). The advent of world university rankings and the consequential academic "arms race" to become part of worldwide visibility has converted academic research from a university teacher's professional vocation into a vital strategic human capital resource. This "arms race" is part of global higher education policy change (Ryazanova & Jaskiene 2022).

University faculty members of Pakistani universities contribute a huge amount of research publications in the scholarly realm (Hussain, 2021). The present study is broadly based on a Bibliometric analysis of published research of top-ranking universities of Pakistan. The word bibliometric is combination of two words "Biblio" and "metric" Biblio mean book and metric mean measurement. Thus, bibliometrics means the application of statistics to

the study of bibliography (Tanveer, 2021). In the field of Libraries and Librarianship, bibliometric is used as a tool to quantify and measure the published knowledge, to highlight the growth of literature and inter-connect the association between various branches of knowledge (Arif, 2021).

Developing countries like Pakistan lag far behind as compared to the developed world where there is a strong research culture. According to a survey, developed countries spend an average of 2.87% (Germany) to 4.29% (Korea) of their GDP on R&D over the last 23 years while developing countries don't spend even 1% of the GDP on Research and Development ranging from 0.1% (Sri Lanka) to 0.82% (India) whereas Pakistan spends 0.29% of its GDP (Source: World Bank). However, since 2002, independent research trends, particularly in universities and DAIs, in Pakistan have increased and have witnessed a significant increase in producing M. Phil and PhDs (Lodhi, 2012). However, this does not bring the research culture any closer to being inspiring and the shortage of third-party supervision and dearth of quality academic professionals adversely affect it. Besides citing this tendency as an indicator of acceptance of the research trends in the country, Lodhi, (2012) cautioned for more efforts to bring balance between prevailing teaching traditions and a strong research culture in Pakistani universities and DAIs (Naseem, et.al, 2019). This study is an effort to highlight the research performance of top-ranking universities in Pakistan and abroad. The purpose of this study is to explore and investigate the research productivity of top-ranking universities of Pakistan in the SCOPUS Database through bibliometric Lense.

Data Analysis

Table 2 shows the ranking of the top five universities at the national and international levels. Quaid-i-Azam University stood in first position for the last few years in Pakistan but in the world ranking it took 742 positions, followed by Comsats University Islamabad with 809 positions in the world ranking. The Agha Khan University Karachi is third in ranking at the national level while in world ranking it stood at 1082 position, followed by the University of Punjab Lahore which occupies a fourth position at the National level while at the international level it stood at 1193 position followed by University of Agriculture Faisalabad with rank five at the national level while in international ranking it took 1340th position. In research performance rank Quaid-i-University stood at 698 positions followed by Comsats University with 773 ranking. The lowest in terms of research performance University of Agriculture Faisalabad took the 1279 rank with a 68.4 score (Source: Center for World University Rankings (CWUR) 2021-22).

Table-2:   Ranking of Top Five Universities of Pakistan

S. No.	Name of University	National rank	Number of publications	Worldwide rank	Research performance rank	Score
1	Quaid-I-Azam University	1	37818	742	698	70.0
2	COMSATS University	2	22376	809	773	71.5
3	Agha Khan University	3	9752	1082	1036	69.8
4	University of Panjab	4	26202	1255	1193	68.8
5	University of Agriculture Faisalabad (UAF)	5	22407	1340	1279	68.4

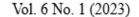Source: Center for World University Rankings (CWUR) 2021-22

Table 3 shows the overall contributions of the top five universities of Pakistan in ranking. Among them, Quaid-i-Azam University got first position with a total of 37818 publications followed by Comsats University Islamabad with 22376 publications. Agha Khan University stood 3rd with 97752 publications. However, the University of Punjab, Lahore was found to be at number four in terms of publications scoring 26202 publications followed by the University of Agriculture Faisalabad (UAF) with a total of 22407 publications. Thus, a total of 118555 articles were contributed by these universities as listed by the Scopus Database index agency.

Table-3: *Ranking of Research Productivity of the Top Five Universities*

S. No.	University/DAI	National rank	Total publications
1	Quaid-i-Azam University	1	37818
2	COMSATS	2	22376
3	Agha Khan University	3	9752
4	University of Punjab	4	26202
5	University of Agriculture, Faisalabad	5	22407
Grand total			118555

Table 3 shows the research productivity of Quaid-i-Azam University Islamabad. The table covers the subject area and total articles contributed by different departments. Physics and Astronomy Departments have contributed a handsome number of articles in impact factor journals (7165) out of 37818 articles followed by chemistry with 4456 articles. Articles in Material science, Engineering, and Mathematics are presenting a handsome amount of collections. The lowest contributions in terms of articles are Arts and Humanities and Veterinary with a total of 215 contributions. The overall contribution of Quaid-i-Azam University is far better than other top-ranking universities with a total of 37818 articles indexed in the Scopus database.

Table-3: *Research productivity of Quaid-i-Azam University, Islamabad*

Subject field	Articles	Subject field	Articles
Physics and Astronomy	7165	Immunology & Microbiology	588
Chemistry	4456	Earth and Planetary Science	479
Materials Science	4017	Multidisciplinary	448
Engineering	3569	Econometrics and Fin..	265
Mathematics	2472	Decision Sciences	258
Biochemistry, Genetics and Molecul	2281	Health Professions	206
Agricultural and Biological Sciences	2044	Psychology	182
Medicine	2039	Management and Account.	170
Chemical Engineering	1668	Arts and Humanities	128
Environmental Science	1416	Veterinary	87
Computer Science	1271	Neuroscience	119
Pharmacology, Toxicology & Phar.	1159	Nursing	56
Energy	647	Undefined	3
Social Sciences	623	Dentistry	2
Total 37818			

Table 4 shows the research contributions of Comsats University Islamabad. Among all departments, the Department of Engineering has produced a handsome number of articles (3662) followed by Computer Science with 3484 articles. Other disciplines like Mathematics, material sciences, and Earth sciences etc. have contributed a good number

of articles shown in Table 3. The lowest disciplines in terms of research contribution are Neuroscience, nursing, and dentistry which need further attention from the stakeholders. Overall Comsats University Islamabad has produced 22376 articles in the Scopus index database with high-impact factor journals.

Table-4: *Research Productivity of Comsats University, Islamabad*

Subject field	Articles	Subject field	Articles
Engineering	3662	Multidisciplinary	358
Computer Science	3484	Earth and Planetary Sciences	315
Physics and Astronomy	2737	Economics, Econometrics & Fin.	313
Mathematics	2248	Immunology and Microbiology	281
Materials Science	1682	Pharmacology, Toxicology	278
Biochemistry, Genetics and Molecul.	932	Decision Sciences	249
Chemistry	923	Arts and Humanities	79
Medicine	902	Psychology	74
Environmental Science	794	Health Professions	63
Agricultural and Biological Sciences	685	Veterinary	55
Energy	671	Neuroscience	49
Social Sciences	563	Nursing	9
Chemical Engineering	546	Dentistry	3
Business, Management and Account	420	Undefined	1
Total 22376			

Table 5 shows the research productivity of Agha Khan University Karachi. This university has produced a bulk of quality research in Medicine with a total of 6481 articles followed by Biochemistry, Genetics, and Molecula with 669 articles. The last contribution in terms of research is Economics, Energy, and Material Sciences with less than 10 articles. Overall, Agha Khan University Karachi has contributed a total of 9752 articles in the Scopus Database with high-impact factor journals. However, the stakeholders of this University may concentrate on producing a good amount of research in the future while retaining top-ranking universities in Pakistan.

Table-5: *Research Productivity of Agha Khan University, Karachi*

Subject field	Articles	Subject Field	Articles
Medicine	6481	Dentistry	+9
Biochemistry, Genetics & Molecula	669	Chemistry	34
Immunology and Microbiology	436	Computer Science	30
Social Sciences	436	Engineering	30
Nursing	361	Business, Manag & accounting	28
Pharmacology, Toxicology & Phar..	239	Mathematics	17
Agricultural and Biological Sciences	188	Chemical Engineering	14
Neuroscience	168	Physics and Astronomy	13
Multidisciplinary	140	Earth	10
Psychology	128	Decision Sciences	7
Veterinary	84	Economics, Econometrics and Fin.	7
Environmental Science	79	Energy	6
Arts and Humanities	75	Materials Science	5
Health Professions	58		
Total 9752			

Table-6 shows the research productivity of Punjab, one of the oldest universities in the region which contribute a good sum of research from time to time. The ranking of Punjab

University at the national level remains at 5, however, other universities are emerging in research productivity. As far as its contribution is concerned the Physics and Astronomy Department has contributed a huge number of publications followed by Agricultural and Biological Sciences with 2950 articles. Material science, Chemistry, and Biochemistry has also contributed a sum of good collections however, the less contributions were made by health professionals and the Dentistry discipline. Overall Punjab University contributed 2627 articles in the Scopus Index Database.
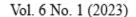
Table-6: *Research Productivity of Punjab University, Lahore*

Subject field	Articles	Subject field	Articles
Physics and Astronomy	3130	Earth and Planetary Sciences	652
Agricultural and Biological Sciences	2950	Energy	464
Materials Science	2204	Multidisciplinary	438
Chemistry	2071	Business, Management and Accou..	340
Biochemistry, Genetics and Molecula.	1962	Economics, Econometrics and Fin.	244
Engineering9	1879	Arts and Humanities	201
Medicine	1760	Psychology	182
Environmental Science	1239	Decision Sciences	181
Mathematics	1162	Nursing	107
Computer Science	1135	Veterinary	96
Pharmacology, Toxicology and Pharm..	1018	Neuroscience	76
Social Sciences	1001	Health Professions	67
Immunology and Microbiology	838	Dentistry	19
Chemical Engineering	779	Undefined	12
Total 26207			

Table 7 shows the research productivity of the University of Agriculture Faisalabad (UAF). The University has contributed a handsome amount of research publications in different disciplines. The agricultural and Biological Science discipline has produced a total of 8087 articles followed by Biochemistry and Genetics with 2147 contributions. Chemistry and Engineering discipline has also contributed a handsome number of publications above one thousand. The least contribution is made in the disciplines of Psychology, Dentistry, and Decision sciences which needs further attention. The overall University of Agriculture Faisalabad (UAF) has contributed a total 22407 articles to the Scopus index database.

Table-7: *Research Productivity of the University of Agriculture, Faisalabad*

Subject field	Articles	Subject field	Articles
Agricultural and Biological Sciences	8087	Multidisciplinary	304
Biochemistry, Genetics and Molecula..	2147	Earth and Planetary Sciences	273
Environmental Science	2118	Computer Science	259
Chemistry	1496	Nursing	192
Engineering	1048	Mathematics	156
Medicine	911	Economics, Econometrics and Finance..	131
Veterinary	841	Business, Management and Accounting.	97
Materials Science	835	Arts and Humanities	33
Chemical Engineering	724	Health Professions	26
Immunology and Microbiology	642	Neuroscience	23
Physics and Astronomy	635	Decision Sciences	20
Pharmacology, Toxicology & Pharm.	610	Psychology	5
Energy	403	Dentistry	3
Social Sciences 387	387	Undefined	1
Total 22407			

Conclusion

Research is a continuing process, in which we search for truth or try to reach near reality. Research highlights new problems, collects data or information about problems draw conclusions, and make recommendations. The researcher carefully investigates data, analyzes data, explains data, verifies the facts, research corrects the mistakes, research advances the knowledge. Knowledge gained through research is always objective and scientific. Research Productivity includes research publications in professional journals, conference proceedings, writing a book or chapter, gathering and analyzing original evidence, working with post-graduate students on dissertations and class projects, obtaining research grants, carrying out editorial duties, obtaining patents and licenses, writing of monographs, developing experimental designs, producing works of an artistic or creative nature, engaging in public debates and commentaries. Pakistan has been witnessing an upward trend in IF publications since 2002 and has witnessed a remarkable increase in producing PhDs. This study has shed light on the research performance of top-ranking universities in Pakistan and abroad. The study will cover the gap in the research productivity of these universities and be helpful for a scholarly realm in Pakistan in stepping into research culture and impact factor journals. The study reveals that an overall total of 118355 publications were published by the top five ranking Universities in Pakistan indexed in the Scopus database. The contribution of Quaid-i-Azam University was 37818 followed by Comsats University Islamabad with 22376 publications followed by Agha Khan University Karachi with a total of 9752 publications. The contribution of Punjab University was 26202 followed by the University of Agriculture Faisalabad (UAF) with a total of 22407 Publications. Based on the conclusion, the following recommendations are made by the researchers to further strengthen the research collaborations of these universities in highly indexed databases like Web of Science and Scopus Indexing agencies:

Recommendations

- There should be research counselling programme in each university to target high impact factor journals for scientific research.
- Leadership and management should encourage faculties and students to collaborate joint venture projects in order to sustain the quality and ranking of these universities.
- Allocation of sufficient resources for training and support of fculty in case of an educational institutions like all others.
- High quality journals with good impact factor may be targetted for largest outreach.
- Research and training programme for doctoral students and scholars at the universities may be organized to produce quality research at large .
- Weak areas of research should be addressed in order to enhanced the research productivities of these discipline.
- Government of Pakistan should increase a handsome amount of budget for higher education and quality publications.

Reference

Arif, A. & Hussain, A. (2021). Bibliometric Analysis of Regional Studies. A Quarterly Journal of Institute of Regional Studies. *Library Philosophy and Practice, (e-journal), 5157.*

Bako, S. (2005). Universities, research and development in Nigeria: time for a paradigmatic shift. Proceedings of the 11th General Assembly of CODESRIA, on Rethinking African Development: Beyond Impasse, Towards Alternatives, 6-8.

Cevera, A, et al (2020). Higher education policy: Why hope for quality when rewarding quantity? *Research Policy*, 49(8). 17-26.

Creswell. (1986). Measuring faculty research performance. Jossey-Bass Inc, San Francisco.

Haq, I. U., & Faridi, R. A. (2021). Evaluating the research productivity of Pakistan in the 21st Century. In *Handbook of research on records and information management strategies for enhanced knowledge coordination,* IGI Global.

Higher Education Commission (2005). Higher education: Medium term development framework 2005-10.Islamabad: HEC

Hussain Mr, A. (2021). Electronic Theses: Why Pakistan is lagging behind. *Library Philosophy and Practice*. (e-journal) 5742

Hussain, A (2021). Research Data Management Services: Role of Academic Libraries. The Radical Outlook, Retrieved January2, 2023 from: https://theradicaloutlook.com/role-of-academic-libraries-in-research-data-management-service/

Hussain, A. (2022). Research Output of Canadian Journal of Information and Library Science (CJILS): A Bibliometric Analysis from 1993-2021. *Library Philosophy and Practice*, (e- journal), 6934.

Hussain, A., Haseeb, M., & Mustafa, M. (2021). Bibliometric Perspective of Margalla Paper: A Flagship Journal of National Defense University, Islamabad, *Pakistan. Journal of Advances in Library and Information Science,* 10(4), 300-307.

Hussain, A., Sadiq, A., & Zeeshan, H. M. (2022). Journal of Education for Library and Information Science (JELIS) Through Bibliometric Lenses. *Library Philosophy and Practice (e-journal),7042.*

Iqbal, M. Z., & Mahmood, A. (2011). Factors related to low research productivity at higher education level. *Asian social science*, 7(2), 188.

Kanmodi, K.K. et al. (2022). A Scopus-Based Bibliometric Analysis of Global Research Contributions on Milk Fluoridation. *International Journal of Environmental Research and Public Health,* 19, 8233. Retrieved December 15, 2022 from: https://doi.org/10.3390/ ijerph19148233

Lodhi, A. S. (2012). A pilot study of researching the research culture in Pakistani public universities: The academics' perspective. Procedia. Social and Behavioral Sciences, 31(2011), 473–479. Rerieved December 20, 2022 from: https://doi.org/10.1016/j.sbspro.2011.12.089

Naoreen, B., & Adeeb, M. A. (2014). Investigating academic research culture in public sector universities of Pakistan. Procedia-Social and Behavioral Sciences, 116, 3010-3015.

Naseem, I., Tahir, M., Afridi, A., & Saeed, B. B. (2019). A descriptive analysis of research culture in Pakistan. FWU Journal of Social Sciences, 13(2), 36-50.

Rashid Muhammad. (2001). Educational Research. National Book Foundation, Islamabad, Pakistan.

Ryazanova, O. & Jaskiene, J. (2022). Managing individual research productivity in academic   organizations: A review of the evidence and path forward. Research Policy, 51(2), (104448)

Tanveer, M. et.al, (2021) . Evaluating the Scholarly Literature on Information Literacy indexed   in the Web of Science Database. Library Philosophy and Practice (e-journal), 5230.

World Bank Open Data 1996-2014. Retrieved June 8, 2022 from: data.worldbank.org