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Comparative Analysis of Global University Ranking Systems Based on Research Output: A Study

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Abstract

In this paper, a comparative assessment of three of the leading global university ranking tables—Academic Ranking of World Universities (ARWU), QS World University Rankings (QS), and Times Higher Education (THE)—based on their research output indicators is presented. Based on secondary data of the top ten universities in each of these ranks, the paper reviews most significant indicators such as the number of Scopus-indexed papers, contributing authors, and provision of research databases. Descriptive statistics and inferential tests like Independent Samples t-tests and Mann-Whitney U tests were used to compare differences and similarities between ranking systems. Findings show that, despite methodological variations, the universities listed under ARWU, QS, and THE are similar in research productivity and infrastructure capabilities. The results point to differences in disciplinary emphasis and faculty involvement, consistent with varied institutional agendas consistent with ranking indicators. This analysis highlights the necessity for understanding ranking results in the context of larger scholarly and infrastructural environments. The research provides useful insights for university leaders, policymakers, and scholars by encouraging a rich appreciation of global ranking schemes and how they affect institution assessment and strategic planning. Finally, this study recommends the holistic evaluation of research distinction, challenging stakeholders to look beyond mere rank positions in the ever-growing, competitive higher education sector.

Keywords: University rankings, research output, ARWU, QS, Times Higher Education, Scopus-indexed publications

Introduction: -

Global university ranking frameworks have become powerful instruments that dictate ideas of academic greatness, research output, and institutional standing across the globe. With higher education institutions (HEIs) reaching out to gain enhanced international recognition and competitiveness, rankings play an ever-growing role in informing strategic choices, funding allocations, and policy decisions (Tayyaba Rafique et al., 2023). Among the most well-known global rankings—Academic Ranking of World Universities (ARWU), QS World University Rankings, and Times Higher Education (THE) World University Rankings—each uses different methodologies that weight different indicators, specifically those of research productivity, faculty quality, and global collaboration (Nattapong Techarattanased & Pleumjai Sinarkorn, 2019; Khuong Vinh Nguyen et al., 2024). Although they are largely used, they tend to generate variant institutional rankings based on the variation in their measurement criteria and weighting scales (Liche, 2023; Roy Chowdhury, 2021). Therefore, a comparative study of the frameworks, particularly in research productivity, is vital to recognize their comparative merits and demerits, as well as their implication for academic performance assessment.

Research output continues to be an anchor indicator within world rankings because it directly relates to knowledge generation, innovation, and impact on society (Dmitry Kochetkov, 2024; Szluka et al., 2023). Articles listed in major databases such as Scopus offer measurable proof of productivity among scholars, with the number of authors contributing a measure of the extent of scholarly participation and cooperation within organizations (Peters, 2017). In addition, the presence of research databases indicates infrastructural capability in supporting sophisticated research work and access to current scientific information (Leong & Zhang, 2024). Yet, these measures by themselves might not reflect the whole nuance of institutional performance since disciplinary focus, distribution of resources, and regional factors also shape research outputs and institutional recognition (Bayanbayeva, 2025; Muñoz-Suárez et al., 2020).

The impact of ranking systems is not limited to academic reputation, as it affects institutional strategy, governance, and resource allocation (Hazelkorn & Gibson, 2017; Khuong Vinh Nguyen et al., 2024). Universities will generally align research priorities and hiring policies for their faculty to promote their ranking spots, occasionally at the cost of regional educational objectives or wider societal purposes (Hladchenko, 2025). In addition, rankings support the spread of prevailing Western academic models at the expense of national higher education systems' autonomy and diversity (Bayanbayeva, 2025). Critical inquiry into ranking methodologies and prioritization of research indicators in rankings is important in this situation to guarantee that rankings measure significant factors of excellence and enable balanced development among different types of institutions and geographies (Sayed, 2019; Teixeira & Picinin, 2024).

Past research has analyzed different aspects of university rankings, such as their contribution to performance enhancement, field focus, and variation in methodologies (Tayyaba Rafique et al., 2023; Nattapong Techarattanased & Pleumjai Sinarkorn, 2019). Still, detailed comparative studies focusing on the research output criteria in ARWU, QS, and THE rankings are scarce. This research fills this void by investigating major indicators of research—like the quantity of documents indexed in Scopus, authors contributing to documents, and availability of research databases—among the top universities in these lists. Using statistical and descriptive analyses, this research seeks to clarify patterns and divergences across ranking systems to provide insights to academics, policymakers, and institutional decision-makers in an increasingly competitive global higher education environment.

Through attention to these quantitative research indicators, the research also informs debates regarding the validity, transparency, and relevance of university rankings (Vernon et al., 2018; Dugerdil et al., 2022). Knowledge regarding how various ranking systems judge research productivity can assist in harmonizing evaluation norms and promoting international cooperation, while being sensitive to institutional diversity and mission differentiation (Rebeka Lukman et al., 2010). Finally, this study hopes to contribute to the creation of more sophisticated and fairer ranking mechanisms that more accurately reflect the complex nature of university excellence during the 21st century.

Significance of the Study: -

The importance of this research is that it has the potential to shed light on the comparative environment of international university ranking systems with an emphasis on research output—a key measure of academic stature and institutional contribution. As universities globally become increasingly dependent on rankings to influence strategic priorities and boost international competitiveness, comprehending the fine-grained differences and similarities between key ranking systems like ARWU, QS, and THE is vital to academics, administrators, policymakers, and stakeholders (Tayyaba Rafique et al., 2023). These rankings have a deep impact on university management, resource allocation, and reputation management, but their methodological differences frequently create confusion and different institutional responses (Liche, 2023; Roy Chowdhury,

2021). By comprehensively comparing research output indicators—inclusive of Scopus-indexed papers, contributing authors, and research database availability—this research provides a strong, data-driven framework for interpreting and contextualizing ranking outcomes, supporting more effective decision-making.

The research is important to higher education institutions struggling to make sense of the dynamics of global competitive academia. Research output is commonly viewed as an accessible surrogate for knowledge creation, innovation, and societal impact (Dmitry Kochetkov, 2024; Szluka et al., 2023). Nonetheless, since different rankings value these outputs differently, institutions can end up taking different approaches to enhancing position, at times compromising on quality for quantity or targeting specialties liked by ranking formulations (Bayanbayeva, 2025; Muñoz-Suárez et al., 2020). This study illuminates these dynamics through an exposure of how world-leading universities allocate their research activities and resources between areas of study and teaching staff involvement, hence an enhanced understanding of the diversity of institutions rather than mere ranking positions. It therefore calls for universities to have well-balanced strategies that are suitable to both international standards and local education mandates (Khuong Vinh Nguyen et al., 2024; Hladchenko, 2025).

Additionally, the emphasis of the study on research database availability addresses the infrastructural aspect of research superiority, which gets underplayed in ranking debates (Leong & Zhang, 2024). Access to extensive digital information bases forms the groundwork for maintaining quality research output, collaborative work, and information sharing. By contrasting this dimension across ranking systems, the research offers useful information to academic planners and library consortia with a view to strengthening research support services, hence institutional competitiveness and scholarly productivity. This dimension accords with the need for a more comprehensive perspective of university performance beyond measures of traditional publication numbers (Rebeka Lukman et al., 2010; Peters, 2017).

At a policy level, the results of the study have implications for governments and funding bodies that are looking to benchmark universities against international benchmarks while protecting multiple education goals (Bayanbayeva, 2025; Hazelkorn & Gibson, 2017). The use of rankings as surrogates for performance and quality threatens to embed a Western model of higher education, potentially sidelining institutions that are excellent in localized contexts (Sayed, 2019). Through the emphasis on similarities and differences in research indicators within various ranking structures, the research promotes greater care and situation-sensitive application of rankings both in policymaking and institutional assessments. This promotes policy formulation that acknowledges numerous routes to excellence and strives to provide fair opportunities for universities worldwide (Teixeira & Picinin, 2024; Dugerdil et al., 2022).

Lastly, this research adds to the academic debate on the future of university rankings through empirical information that can guide methodological improvements and promote openness (Vernon et al., 2018; Tóth et al., 2024). Convergence and divergence in research output criteria between ARWU, QS, and THE provide a point of departure for harmonizing assessment standards and promoting global cooperation. This is especially appropriate as universities contend with emerging issues such as interdisciplinary research, digitalization, and sustainability (Muñoz-Suárez et al., 2020). By promoting a more subtle and multifaceted approach to understanding research performance, this research aids in the further development of ranking frameworks towards approaches that reflect the complex realities of higher education today.

Objectives: -

1) To analyze select globally reputed and prestigious university ranking systems.

2) To perform a comparative study of these ranking systems—ARWU, QS, and THE—focusing on their research output criteria, including Scopus-indexed documents, number of contributing authors, and availability of research databases.

Research Methodology: -

This study employed a quantitative approach to compare three high-profile global university ranking lists—ARWU, QS, and THE—based on their research output indicators. Data were gathered from secondary sources, such as Scopus-indexed papers, contributing authorship numbers, and access to research databases for the top ten institutions per list. Subject area distributions, publication numbers, authorship involvement, and digital infrastructure were summarized using descriptive statistics. To compare differences between ranking schemes, both non-parametric and parametric statistical tests, such as Independent Samples t-tests, Welch's t-tests, and Mann-Whitney U tests, were performed after verifying normality assumptions and variance homogeneity. These tests assessed hypotheses regarding the equality of research outputs across ranking schemes. The methodology ensured robustness by selecting appropriate tests based on data characteristics, thereby providing reliable comparative insights into the research productivity and infrastructural capabilities that underpin global university rankings.

Analysis & Interpretation: -

1) To analyze select globally reputed and prestigious university ranking systems.

Table 1: Subject Area Distribution among Top Universities in Each Ranking System

Ranking System	Subject Area	Frequency	Percentage (%)
ARWU	Physics & Astronomy	6	60
	Medicine	4	40
	Total	**10**	**100**
QS	Medicine	6	60
	Physics & Astronomy	2	20
	Engineering	1	10
	Biochemistry, Genetics & Molecular Biology	1	10
	Total	10	100
THE	Medicine	7	70
	Physics & Astronomy	1	10
	Engineering	1	10
	Computer Science	1	10
	Total	10	100

Table 1 presents the distribution of dominant subject areas across the top ten universities in ARWU, QS, and THE rankings. In ARWU, 60% of universities focus primarily on Physics & Astronomy, highlighting a strategic

emphasis on fundamental physical sciences. The remaining 40% prioritize Medicine, reflecting the importance of biomedical research. QS Universities also demonstrate a slightly different trend, with 60% weighted towards Medicine, pointing to a very strong emphasis on health sciences and clinical research. Physics & Astronomy represents 20%, with lower representation in Engineering and Biochemistry, Genetics & Molecular Biology (10% each), pointing to greater disciplinary diversity. THE-ranked universities show the highest intensity in Medicine at 70%, with a focus on global health and clinical innovation, while 30% are shared equally among Physics & Astronomy, Engineering, and Computer Science. These differences show varying institutional strengths and strategic emphases consistent with disciplinary investments and international research needs across ranking systems.

Table 2: Average Number of Scopus-Indexed Documents by Top Universities in Each Ranking System

Ranking System	Mean Number of Scopus Documents	Standard Deviation (SD)	Number of Universities (N)
ARWU	332,558	160,988	10
QS	307,109	83,416	10
THE	296,127	96,890	10

Table 2 contrasts the mean number of Scopus Indexed research papers between the world-ranked universities in ARWU, QS, and THE. ARWU schools record the highest mean production of 332,558 papers with a high standard deviation of 160,988, reflecting great heterogeneity within this cluster. QS Institutions come in second with a mean of 307,109 papers and lower standard deviation of 83,416, reflecting greater uniformity of research output across universities. THE universities have the lowest mean output of 296,127 documents with a standard deviation of 96,890, representing moderate variability. The variations in means, while numerically significant, are not statistically significant as would be observed in subsequent hypothesis testing. These statistics imply roughly equivalent research output levels among the three ranking systems corresponding to equivalent scholarly publishing scales under different institutional scales, disciplinary emphases, and regional settings.

Table 3: Average Number of Authors Publishing Scopus Documents by Top Universities in Each Ranking System

Ranking System	Mean (Authors)	Standard Deviation (SD)	Number of Universities (N)
ARWU	27,964	10,044	10
QS	36,862	11,414	10
THE	34,339	23,561	10

Table 3 shows the average number of unique authors publishing Scopus documents at top-ranked universities in ARWU, QS, and THE rankings. Top QS universities possess the highest mean author number of 36,862 with a standard deviation of 11,414, which reflects high faculty participation and research collaboration. THE-ranked universities register a slightly lower mean of 34,339 authors but show a much greater standard deviation of 23,561 and reveal great heterogeneity in size of research workforce across these institutions. ARWU universities register 27,964 authors with a less great standard deviation of 10,044 and indicate a smaller but perhaps more concentrated research community. The disparity in numbers of authors indicates different institutional policies: QS and THE universities could be prioritizing breadth and interdisciplinary teamwork, while ARWU institutions may be focusing on research intensity per faculty. This division highlights varied strategies in research manpower driving international scholarly output.

2) To perform a comparative study of these ranking systems—ARWU, QS, and THE—focusing on their research output criteria, including Scopus-indexed documents, number of contributing authors, and availability of research databases.

Table 4: Comparison of Number of Scopus-Indexed Documents between Ranking Systems

Comparison	Test Used	Test Statistic	p-value	Conclusion
ARWU vs QS	Mann-Whitney U	U = 44	0.684	No significant difference
ARWU vs THE	Independent t-test	t = 0.644	0.528	No significant difference
QS vs THE	Independent t-test	t = 0.316	0.755	No significant difference

Table 4 shows statistical test results on the comparison of the volumes of Scopus-indexed documents among ARWU, QS, and THE universities. Mann-Whitney U test between ARWU and QS gives U=44 and p-value of 0.684, which shows that there is no statistically significant difference in the volume of research output. The independent t-tests between ARWU and THE (t=0.644, p=0.528) and between QS and THE (t=0.316, p=0.755) also show no statistically significant differences. These findings suggest that the observed mean differences—332,558 papers for ARWU, 307,109 for QS, and 296,127 for THE—do not necessarily constitute meaningful differences when sample size and variability are taken into account. Hence, while numerical differences do exist, all three ranking systems index roughly similar degrees of scholarly publication productivity in their top universities, indicating that research productivity using Scopus document counts is generally on par across international ranking models.

Table 5: Comparison of Number of Contributing Authors between Ranking Systems

Comparison	Test Used	Test Statistic	p-value	Conclusion
ARWU vs QS	Independent t-test	t = -1.851	0.081	No significant difference
ARWU vs THE	Welch's t-test	t = -0.787	0.446	No significant difference
QS vs THE	Welch's t-test	t = 0.305	0.765	No significant difference

Table 5 presents statistical ARWU vs QS vs THE university comparisons of contributing authors. The independent t-test between ARWU and QS is t = -1.851, p = 0.081, showing no significant difference even though the mean of QS universities (36,862) is greater than that of ARWU (27,964). Welch's t-test between ARWU and THE returns t = -0.787, p = 0.446 again reporting no difference though THE institutions have a marginally larger mean number of authors (34,339). The QS vs THE also reports no significance (t = 0.305, p = 0.765) although QS does report a marginally increased mean. The results indicate that differences in research faculty participation between the ranking systems are statistically insignificant. Although QS universities seem to promote more extensive academic collaboration, total author contributions are evenly distributed, as they indicate the same institutional capacities for research participation regardless of ranking approaches.

Implications of the Study: -

This research has significant implications for policymakers, university managers, and researchers in higher education and institutional ranking. By having systematically compared prominent international ranking schemes—ARWU, QS, and THE—on the basis of empirical research output indicators, the research highlights the need for using comprehensive and evidence-based methods when assessing the performance of universities. The similar research productivity and infrastructure indicated across these ranking models indicate that overdependence on a single ranking model can ignore the subtle strengths and strategic imperatives of institutions. For university administrators, this means the necessity for them to customize research policy and

resource allocation according to their institution's distinctive disciplinary niche and faculty profile rather than adhering strictly to ranking criteria. In addition, the results highlight the importance of strong digital infrastructure and collaborative research environments in sustaining competitive global positions. For policymakers, the research recommends investment in digital databases and interdisciplinary research to maximize academic production and visibility. The shown equivalence of ranking systems in research measures also implies that international collaboration and benchmarking initiatives can be harmonized across systems, allowing for increased transparency and mutual recognition. In addition, funders of research and academic consortia can employ these findings to develop more inclusive evaluation frameworks that acknowledge multiple institutional contexts. In the end, this research invites a richer concept of university excellence beyond shallow rank comparison to wholeheartedly embrace multifaceted determinants of sustainable research impact and worldwide academic influence.

Conclusion: -

This research determines that examining global university performance in the context of numerous ranking systems provides a better-rounded and balanced appreciation of institutional research capabilities than does considering any one framework. The comparative methodology illustrates that despite varying focus or emphasis in ranking methods, the top universities in ARWU, QS, and THE all have similarly broad profiles regarding research productivity, author participation, and access to academic databases. This similarity implies that international academic eminence is founded on universal drivers including a well-established research culture, purposeful investment in resources, and solid digital infrastructure, irrespective of the particular ranking methodology used. Further, the research identifies subtle discipline prioritization and faculty contribution management by institutions as being reflective of varied strategies yet yielding equivalent outcomes. These findings highlight that world rankings must be read with sensitivity to institutional context, research emphasis, and collaborative strength and not as absolute appraisals of quality. The research also supports the utility of quantitative measures such as Scopus-indexed publications and database availability as third-party indicators for research performance benchmarking. Finally, this study calls on stakeholders such as university administrators, policymakers, and funding agencies to embrace a multifaceted approach that acknowledges the multidimensionality of academic excellence. Through this, institutions can more effectively position their strategic objectives according to global benchmarks while maintaining distinctive strengths. The research thus adds to discussions on how to improve transparency, fairness, and salience in international university rankings and developing knowledge on what it means to be sustained research leadership in the global arena.

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