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	Title of the Research Article Comparative Mechanisms for Assessing the Quality of Higher Education Institutions as a Tool for Enhancing Quality in Higher Education
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Abstract The ranking and evaluation of higher education institutions have become a central mechanism for assessing academic quality and competitiveness in the global knowledge economy. Since 2003, various international organizations and research institutions have introduced methodologies to systematically rank universities based on multidimensional criteria, including web visibility, academic mobility, research output, citation frequency, faculty quality, graduate employability, labor market reputation, research leadership, and contributions to scientific impact as measured by bibliometric indicators such as the H-index. Prominent systems include the Academic Ranking of World Universities (ARWU), Webometrics Ranking of World Universities, QS-Times Higher Education Rankings, and the Performance Ranking of Scientific Papers for World Universities. While these rankings offer comparative benchmarks for global higher education, they also highlight disparities, as some national universities remain underrepresented. In response, several countries have developed national ranking frameworks to reflect local priorities and ensure representation in the international higher education landscape. This paper explores comparative ranking mechanisms as strategic tools for enhancing quality assurance in higher education and discusses their implications for policy, institutional reform, and sustainable development of academic excellence.	
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Introduction

The issue of quality assurance in higher education has gained increasing importance in recent decades. University ranking systems, first introduced in 2003, serve as a comparative mechanism for assessing institutional performance

worldwide. These systems apply diverse criteria such as digital presence, academic publications, teaching quality, research excellence, and graduate employability.

Internationally recognized rankings such as ARWU (Shanghai Jiao Tong University, 2003), Webometrics (Cybermetrics Lab, Spain, 2004), QS-THE (United Kingdom, 2004), and the Performance Ranking of Scientific Papers (Taiwan, 2007) have established benchmarks for evaluating universities globally. However, the absence of representation for certain countries has prompted the creation of national ranking frameworks to ensure that local higher education institutions are evaluated according to both international and national standards.

This paper examines these comparative mechanisms in depth, analyzing their strengths, limitations, and implications for quality enhancement in higher education.

Background

In the early years of international ranking initiatives, many universities across different countries (e.g., Argentina, Australia, Brazil, Canada, Chile, Pakistan, and Ukraine) were excluded from global evaluations. This exclusion was largely due to several limitations: the absence of English-language versions of institutional websites, the failure to publish research outputs online, and the lack of articles published in international academic databases on behalf of these institutions. Consequently, national ranking mechanisms began to emerge to address these gaps. In post-Soviet states, Russia initiated national university ranking exercises in 2004 under the supervision of the Ministry of Education (implemented by the Patani Charity Society). Kazakhstan followed in 2006, launching its own ranking system to measure the performance of higher education institutions.

In Azerbaijan, the establishment of a national ranking system was initiated under the order of the Minister of Education of the Republic of Azerbaijan (Order No. 842, dated 11 October 2013). This initiative emerged as part of the “Competition for Supporting Public Initiatives,” particularly through the projects Educational Policy Initiatives and Research Initiatives in Education. The strategic foundation for this undertaking was reinforced by the State Strategy for the Development of Education in the Republic of Azerbaijan, approved by Presidential Decree on 24 October 2013. The project executor was the Organization of Specialists Educated Abroad (AKTAM). Within the framework of the project Defining the Ranking of Higher Education Institutions in the Republic of Azerbaijan, a set of proposals was developed to create a national ranking mechanism aimed at ensuring the representation of Azerbaijani universities in international evaluation systems. Given the dynamic nature of global science and the rapidly evolving labor market, the development of a flexible and robust national ranking model for Azerbaijan is now considered an urgent necessity.

Research Aim

The purpose of this study is threefold:

- To analyze the establishment and historical evolution of international, national, and subject-specific ranking systems, highlighting their necessity and strategic directions.
- To identify parameters for ranking secondary specialized education institutions, including semester and final examinations, state exams, academic qualifications of teaching staff, research productivity, creative achievements, and admission performance of graduates into higher education institutions.
- To propose recommendations for improving faculty quality, citation frequency of academic works, graduate employability, institutional reputation in the labor market, admission rates of international students, leadership in scientific research, and the significance of research output.

Research Object

The object of this study is the system of international, national, and subject-specific ranking mechanisms of higher education institutions.

Research Subject

The subject of this study is the identification of principal parameters and indicators that ensure the alignment of higher education institutions with international, national, and subject-specific ranking systems.

Scientific Novelty

This research provides a theoretical generalization and justification of ranking mechanisms as instruments for enhancing the quality of higher education. The novelty lies in comparing higher and secondary specialized education institutions through ranking models, while also determining the level at which international experience can be applied to Azerbaijan's higher education system.

The study underscores the necessity of establishing a scientifically grounded methodology that considers the current state of higher education in Azerbaijan. It also examines how international best practices in quality assessment and ranking can be adapted to national needs. This analysis represents an important contribution to both pedagogical theory and the practice of higher education quality management.

International, National, and Subject-Specific Ranking Systems

The development of a higher education system is a key indicator of a nation's overall socio-economic status, quality of life, and level of social development. To measure such progress and ensure accountability, both international and national standards are necessary.

However, no ranking system can be considered entirely objective, nor do the existing systems align perfectly with one another. This is because quality indicators and achievements of universities cannot be fully captured by numerical values alone. To address this challenge, UNESCO's Higher Education Centre, in collaboration with an international expert group, developed the Berlin Principles—a framework of 16 guidelines designed to ensure transparency and comparability in ranking systems.

Although universities differ significantly in terms of faculty profiles, student populations, and disciplinary orientations (e.g., medicine, engineering, mathematics, architecture), the evaluation of research publications has been universally recognized as a key principle.

The measurability of quality and performance is enabled through reliable datasets and numerical indicators. Accordingly, each university can align its mission and vision with both international and national ranking standards to integrate more effectively into global education systems. Among the most widely recognized systems in international practice are the QS World University Rankings, Times Higher Education (THE), and the Academic Ranking of World Universities (ARWU–Shanghai Ranking).

3. Leading International University Ranking Systems

3.1. QS World University Rankings

Since 2004, the QS World University Rankings, developed by the company Quacquarelli Symonds, has assessed universities globally using a combination of academic and employer-based criteria. Institutions are evaluated across four main categories, with each factor contributing a maximum of 100 points. In addition to overall ranking, QS also evaluates performance by subject areas and faculties.

Table 3.1.1. Calculation Criteria for QS World University Rankings

Factor	Indicator	Description	Weighting (%)
Research Quality	Academic reputation	Score based on peer review	40
	Faculty research	Citation rate of	20

	citations	academic publications	staff
Graduate Employability	Employer reputation	Employer survey results	10
Internationalization	International faculty	Number of foreign academic staff	5
	International students	Number of enrolled foreign students	5
Teaching Quality	Faculty-to-student ratio	Ratio of faculty to students	20

3.2. Academic Ranking of World Universities (ARWU – Shanghai Ranking)

The Academic Ranking of World Universities (ARWU), initiated in 2003 by the Shanghai Jiao Tong University Ranking Committee, annually publishes a list of the world's top 500 universities. Initially, ARWU aimed to compare Chinese universities with leading global institutions. Over time, ARWU has become one of the most respected systems due to its robust, transparent, and evidence-based evaluation methodology.

Table 3.2.1. Calculation Criteria for ARWU – Shanghai Ranking

Factor	Indicator	Code	Weighting (%)
Education Quality	Alumni and faculty winning Nobel Prizes	Alumni	10
Faculty Excellence	Staff receiving field medals	Award	20
	Highly cited researchers in 21 fields	HiCi	20
Research Output	Publications in Nature and Science	N&S	20
	Publications indexed in SCI-Expanded and SSCI	SCI	20
Institutional Size	Performance relative to university size	Size	10
Total			100

3.3. Other Influential International Ranking Systems

Several additional reputable systems also contribute to the global evaluation of universities:

1. Newsweek Global Universities Ranking – Top 100 global universities.
2. Webometrics Ranking of World Universities – Developed by the Cybermetrics Laboratory, Spain.
3. Google Search G-Factor Ranking – Based on Google indexing and references.
4. MINES Professional Ranking – Evaluates universities specializing in engineering and technology.
5. HEETACT – Performance Ranking of Scientific Papers for World Universities, developed by Taiwan's Higher Education Evaluation and Accreditation Council.
6. Leiden Ranking – Conducted by the Centre for Science and Technology Studies (CWTS), Leiden University, Netherlands.
7. SCImago Institutions Ranking – Uses Scopus data to compare over 17,000 journals and institutions.
8. Global University Ranking – Compiled by Wuhan University, China.

4. The Case of Azerbaijan: Towards a National Ranking System

In Azerbaijan, the creation of a national ranking system for higher education institutions has become essential. Several indicators are particularly emphasized to align national universities with international standards:

4.1. Academic and Teaching Staff Indicators

- Ratio of professors to students.
- Ratio of doctors of science to students.
- Ratio of associate professors to students.
- Ratio of PhD holders to students.
- Ratio of staff without academic degrees to students.
- Ratio of foreign faculty to students.
- Ratio of master's students to total students.
- Ratio of foreign master's students to total students.
- Ratio of doctoral candidates to students.
- Ratio of foreign doctoral candidates to students.
- Ratio of foreign undergraduate students to total students.

4.2. Research and Scientific Activity Indicators

- Number of scientific publications per academic staff member.
- Number of international publications per academic staff member.
- Number of publications in impact factor journals per academic staff member.
- Number of monographs per academic staff member.
- Number of textbooks and teaching manuals per academic staff member.
- Number of patents registered in Azerbaijan per academic staff member.
- Number of patents registered abroad per academic staff member.
- H-index of faculty across disciplines.

4.3. University Web Presence Indicators

- Number of external citations/links to the university website.
- Number of valuable files available on the website.
- Number of internal pages and directories on the university website.
- Quality and functionality of the university website.

5. The Berlin Principles on Ranking Higher Education Institutions

In 2004, the European Centre for Higher Education (UNESCO-CEPES) and the Institute for Higher Education Policy (United States) convened an international expert group on ranking. This group formulated the Berlin Principles on Ranking of Higher Education Institutions (Berlin, May 2006), which presented general principles and standardized methodologies for university rankings (Hazelkorn, 2015; UNESCO, 2006).

According to these principles, university rankings should be established across three independent categories:

1. Academic resources and institutional capacity – including faculty qualifications, student achievements, teaching quality, financial resources, and infrastructure.
2. Internal evaluation – assessments by teachers and students within the institution.
3. External evaluation – employer assessments of graduates, including input from national and local authorities, as well as large and small enterprises.

Within each category, numerous criteria are applied. For example, the academic resources category includes seven criteria and thirty-nine indicators, with data collected directly from universities. Students answer structured questionnaires in seven groups, while faculty and students participate in surveys. To assess graduate employability, both public and private organizations provide information on recent hires, thereby identifying universities whose graduates are most successful in the labor market.

Thus, the overall ranking of a higher education institution is determined by aggregating materials collected across these three categories. Predetermined evaluation scores cover resources, faculty quality, student performance, the proportion of international students, research capacity, financial management, admissions, teaching results, international collaboration, and socio-cultural activities.

6. Principles for Developing a National Ranking in Azerbaijan

The application of ranking systems in Azerbaijan must consider both international guidelines and local specificities. The following guiding principles are emphasized:

- Recognition of the diversity of institutions and their missions (state vs. private universities).
- Consideration of Azerbaijan's linguistic, cultural, economic, and historical contexts, alongside careful adaptation of international practices.
- Reliance on verified and independent sources of data.
- Implementation of organizational rules that enhance the credibility of rankings.
- Ensuring transparency of factors and methodologies used in rankings so that end-users clearly understand them.

The objectives of establishing a national ranking are as follows:

1. To provide reliable information for decision-making to stakeholders (prospective students, parents, policymakers, employers, and international organizations).
2. To stimulate competition and development among universities.
3. To encourage the creation and strengthening of internal quality assurance centers.
4. To identify levels of academic autonomy and integrity within universities.
5. To promote self-governance and accountability in higher education institutions.

7. Academic Staff Evaluation Criteria

Globally, evaluation of academic staff quality is based on relatively common parameters, such as Nobel or Fields awards, citation frequency, and overall reputation. For example, at the University of North Carolina (USA), academic staff are evaluated across three dimensions (Shin & Toutkoushian, 2011):

1. Teaching and curricular development
 - Academic qualifications by discipline.
 - Course design and delivery.
 - Supervision of student research.
 - Mentorship of teaching assistants.
 - Development of new curricula.
2. Research, creativity, and professional contributions
 - Peer-reviewed publications.
 - Conference presentations.
 - Creative works and innovations.
3. Service to university, community, and profession
 - Contributions to university governance.
 - Public engagement and media presence.
 - Professional service activities.

Portfolios are prepared for each staff member, and the results of evaluation determine reappointment, promotions, or tenure.

8. Graduate Employability and Socio-Economic Impact

Graduate employability and reputation in the labor market remain key ranking factors. Employer surveys and evaluations typically consider:

- Professional qualifications and skills.
- Readiness for full-time work.
- Ability to transition between different activities.
- Capacity for teamwork and leadership.
- Creativity and problem-solving abilities.
- Strength of fundamental and theoretical training.

Graduates are also assessed for their post-education benefits, classified into four categories: public economic, public social, private economic, and private social benefits (OECD, 2019).

Table 8.1. Socio-Economic Benefits of Higher Education Graduates

Public Economic Benefits	Public Social Benefits	Private Economic Benefits	Private Social Benefits
Increased tax revenues	Reduced crime rates	Higher living standards	Better health and longevity
Increased productivity	Growth in donations and social services	Easier entry into labor markets	Better welfare for children
Increased consumption	Enhanced civic responsibility	Greater investment capacity	More rational consumer decisions
Improved labor adaptability	Social cohesion and equality	Improved working conditions	Higher individual social status
Reduced state dependency	Improved technological adaptability	Career mobility	Increased leisure and cultural activities

9. International Comparison: Graduate Employment Rates

According to Eurostat data, employment rates of graduates aged 20–34 who completed higher education within the last three years vary significantly across Europe (Eurostat, 2022). The highest rate was recorded in Malta (96.7%), followed by Iceland (95.8%) and the Netherlands (94.8%). Other examples include:

- Germany – 94.3%
- United Kingdom – 88.4%
- Finland – 88.3%
- France – 84.4%
- Spain – 77.9%
- Turkey – 64.2%
- Italy – 62.8%
- Greece – 59.0%

These figures demonstrate significant variation across countries, underscoring the importance of aligning national ranking systems with labor market outcomes.

10. Research Leadership and Evaluation of Scientific Output

10.1. The Concept of the Research University

The notion of the research university originated in 1818 with the model of Humboldt University in Germany. Over two centuries, this tradition has created the foundations for integrating teaching and research while maintaining institutional diversity in missions and visions (Altbach, 2011; Clark, 1995). The status of a research university requires clear commitments to advanced inquiry and innovative research productivity.

All major international ranking systems allocate significant—sometimes predominant—weight to research performance and scientific publications. For universities in the Republic of Azerbaijan to achieve higher representation in these rankings, the primary condition is the recruitment and retention of professional, productive researchers, alongside the provision of favorable working conditions and structured career development opportunities.

When productive researchers are engaged, any higher education institution can legitimately claim the status of a “research university” or “research-based institution,” provided it meets the following requirements:

- Recruitment of highly skilled academic staff with strong research capabilities.
- Allocation of additional time for faculty to conduct research.
- Provision of financial resources to support research activities.
- Establishment of appropriate research infrastructure.
- Involvement of doctoral candidates and research assistants in institutional projects.
- Prioritization of scholarly publications in faculty evaluation and promotion processes.

10.2. Metrics for Assessing Research Output

The evaluation of research performance and scientific publications relies on several metrics of varying significance:

1. Total number of publications – Useful as a measure of productivity but limited in reflecting the impact or quality of research.
2. Total number of citations – Indicates the utility of research by demonstrating how often it is used as a reliable reference in subsequent studies.
3. Citations per publication – Balances productivity and impact by enabling comparison between experienced scholars with many publications and early-career researchers with fewer outputs. However, since citations often require several years to accumulate, this measure can sometimes disadvantage highly productive scholars.
4. High-impact publications – Emphasis on outputs that exceed a specific citation threshold (e.g., five or more citations), highlighting contributions that are widely recognized and influential.
5. H-index – Introduced in 2005 by Argentine-American physicist Jorge Hirsch (Hirsch, 2005), the h-index measures both productivity and citation impact. It reflects the number of publications (h) that have received at least h citations each.

Mathematically:

$$h\text{-index} = n_a$$

where n_a represents the number of papers (h) that have been cited at least h times.

For example, ten citations to one article are equivalent to one citation each for ten articles—both cases yield an h-index of 1.

10.3. Strengths and Limitations of the H-index

The h-index, sometimes referred to as the Hirsch index, is widely used to evaluate scientific productivity and professional reputation. While it provides a more balanced measure compared to total publications or citations alone, it still presents limitations by reducing scholarly achievement to a single numerical value.

Nevertheless, the h-index is considered more reliable than raw counts of publications or citations, as it excludes:

- Authors with only one or two highly cited publications without sustained research activity.
- Researchers with multiple low-impact publications that receive minimal citations.

Thus, the h-index encourages not only higher publication output but also greater emphasis on producing impactful and frequently cited work (Bornmann & Daniel, 2007; Egghe, 2006).

11. The H-index and Its Application in Ranking Systems

11.1. Formal Definition of the H-index

Figure 1.3.1 illustrates the dependency graph of the h-index value. Formally, if we let $f(i)$ represent the citation count of the i -th publication, the h-index can be computed as follows:

- Arrange the citation counts in descending order.
- Identify the last position in the sequence where the number of citations $f(i)$ is greater than or equal to its rank i . This position corresponds to the h-index.

For example:

- An author with five publications (A, B, C, D, E) receiving 10, 8, 5, 4, and 3 citations respectively has an h-index of 4, because the fourth publication received 4 citations, while the fifth received only 3.
- Another author with five publications receiving 25, 8, 5, 3, and 3 citations has an h-index of 3, because the fourth publication received only 3 citations.

Mathematically:

$$h\text{-index}(f) = \max_i \min(f(i), i)$$

where $f(i)$ is the number of citations for publication i .

It should be noted that the h-index is automatically calculated and displayed in platforms such as Google Scholar, eliminating the need for manual calculation.

11.2. Strategies for Increasing the H-index

In the competitive academic environment, researchers may seek to increase their h-index through two main approaches:

1. Self-citation of previous work in new research publications.
2. Increasing the total number of publications, even if each receives only a small number of citations.

11.2.1. Motivations for Self-Citation

Authors may cite their previous work for several reasons (Bartneck & Kokkelmans, 2011; Ioannidis, 2015):

- To update and improve earlier studies.
- To enhance visibility of prior work by linking it in higher-ranked journals.
- To ensure previous findings remain in circulation within the scientific literature.
- To promote new work by drawing attention to earlier publications.
- To revive poorly cited or overlooked studies.
- To strengthen their reputation as an expert within a field.
- To reinforce the methodological soundness of previous work by offering additional supporting examples.
- To increase overall citation counts numerically.

11.2.2. Increasing Publication Volume

Alternatively, even with few citations per paper, a greater number of publications raises the probability of being cited, which in turn contributes to a higher h-index.

11.3. Limitations of the H-index

The applicability of the h-index differs across disciplines. For instance, in the humanities, social sciences, and mathematics, citation practices vary significantly, making direct cross-disciplinary comparisons problematic (Waltman & van Eck, 2012).

The h-index should therefore not be regarded as an optimal, universal mechanism for comparing scholarly impact across fields. Instead, it should be complemented with additional qualitative and quantitative indicators.

11.4. Conclusion

The creation of a national ranking system for higher education institutions in Azerbaijan requires attention to international best practices, particularly the integration of research metrics. The following measures are critical:

- Ensuring universities maintain active, accessible websites that meet international standards.
- Increasing the publication of research outputs in impact factor journals.
- Expanding student and faculty exchange programs with foreign institutions.
- Recruiting highly skilled and productive researchers.
- Providing financial resources and infrastructure to support research.
- Integrating doctoral students and research assistants into institutional research projects.
- Emphasizing scholarly publications in faculty evaluation and promotion processes.

Although the h-index alone has limitations, it remains a more effective tool than raw publication or citation counts, as it balances productivity and impact. It also discourages unsustained research activity, since consistent publication and citation across multiple outputs are required to maintain a high score.

Rankings, therefore, function not only as an external quality assurance mechanism but also as a tool for self-improvement. Universities must interpret their relative positions as feedback for addressing weaknesses and promoting internal reforms. Importantly, the results of rankings should be transparent to government, society, parents, and most critically, prospective students.

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Conflict of Interest

The author declares no conflict of interest related to this research.

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