Integrating Subjective Metrics and Sustainable Development Goals (SDGs) into University Webometrics Ranking.

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ABSTRACT

Since the onset of the environmental crisis, global education systems have been tasked with devising alternatives that align more effectively with ecological limits. Consequently, Higher Education Institutions (HEI) worldwide have assumed leadership roles to inspire and expedite societal transformation. They have integrated sustainable development initiatives (SDI) into their strategies, systems, processes, and routines while participating in networks of sustainable HEI. However, this continuous process encounters notable challenges and barriers. The integration of subjective metrics with Sustainable Development Goals (SDGs) into university webometrics ranking frameworks has gained prominence as institutions aim to holistically capture their societal impact. Subjective metrics, such as stakeholder perceptions and qualitative assessments, complement traditional web-based metrics and sustainability indicators, offering a more nuanced understanding of institutional performance. The study explores the integration of subjective metrics and Sustainable Development Goals (SDGs) into university webometrics rankings to provide a holistic assessment of institutional impact. Using a hybrid methodology, it combines traditional web-based metrics with stakeholder perceptions, qualitative assessments, and SDG contributions. The study analyzes existing frameworks, reviews literature on ranking methodologies, and proposes an integrated model for a more transparent and socially responsible evaluation of universities.

Keywords: Subjective Metrics, Sustainable Development Goals, University Webometrics, Higher Education, Metrics, Perception Analysis, SDG Integration

INTRODUCTION

The concept of university webometrics is rooted in the idea of measuring the visibility and impact of universities on the internet. The term "webometrics" combines web and metrics, focusing on the assessment of academic institutions through their online presence. University Webometrics Rankings are crucial for evaluating the digital visibility and academic influence of universities, providing an alternative to traditional rankings that primarily assess universities based on research output and academic reputation. Webometrics is often used in parallel with other rankings, such as the QS World University Rankings or Times Higher Education (THE), to provide a comprehensive overview of a university's position in the global higher education landscape.

Concept of University Webometrics

University Webometrics Ranking, primarily spearheaded by initiatives like the Webometrics Ranking of World Universities (Ranking Web of Universities), seeks to evaluate universities based on their online

presence, including factors such as website visibility, research dissemination, and engagement with the broader academic and societal communities. This approach looks beyond traditional indicators like citations or publications and delves into how well universities use the internet to share their knowledge, interact with other institutions, and promote academic achievements.

In recent years, the growing focus on sustainability in higher education has shifted attention toward a more comprehensive understanding of university performance. Traditional university rankings often prioritize objective factors such as research output, citation impact, and visibility, but subjective metrics (e.g., reputation, student satisfaction, faculty quality) and the United Nations Sustainable Development Goals (SDGs) are increasingly recognized as important components in assessing universities' roles in addressing global challenges. This section outlines the significance of these subjective metrics and SDGs, highlighting their contribution to sustainable development and how they can be integrated into university webometrics ranking systems.

Subjective Metrics in University Rankings

Subjective metrics reflect the perception of various stakeholders, including students, academic peers, and employers, regarding a university's overall quality and impact. Unlike objective metrics, which are based on quantifiable data (for example, number of publications or citation indices), subjective metrics are often qualitative and rely on surveys, reputation scores, and expert assessments. These metrics are essential because they provide a broader perspective on a university’s contribution to education and society, beyond just research outputs.

University Reputation and Student Satisfaction

University reputation is one of the most significant subjective metrics influencing rankings. It is commonly measured through surveys of academic peers, employers, and the broader public (Kehm, 2020). Reputation affects a university's ability to attract top faculty, students, and research funding, contributing to its overall impact. A strong reputation is indicative of trust in the university’s academic excellence, innovative teaching methods, and societal contributions.

Student satisfaction reflects the quality of student life, educational services, and support systems within a university. It encompasses factors like teaching quality, facilities, student services, and career support (Souto-Otero, 2019). Universities with high student satisfaction are likely to have better retention rates, higher graduation rates, and a more positive public image, making them attractive to potential students and faculty.

Faculty Quality

Faculty quality is often assessed through subjective evaluations based on faculty qualifications, teaching effectiveness, and contributions to academic and societal development. Faculty who are engaged in high-quality research, have international experience, and participate in sustainable development projects contribute to the university’s academic standing. This metric is critical in the evaluation of a university’s educational and research output. (Finkelstein, M. J., 2023)

By integrating subjective metrics and SDGs into university webometrics rankings, a more complete picture of a university’s impact on sustainable development and societal contributions emerges, enhancing the relevance of rankings for global higher education and the achievement of SDGs. The figure below illustrates this integration, highlighting the interplay between traditional web-based metrics, subjective assessments, and sustainability indicators in evaluating institutional performance

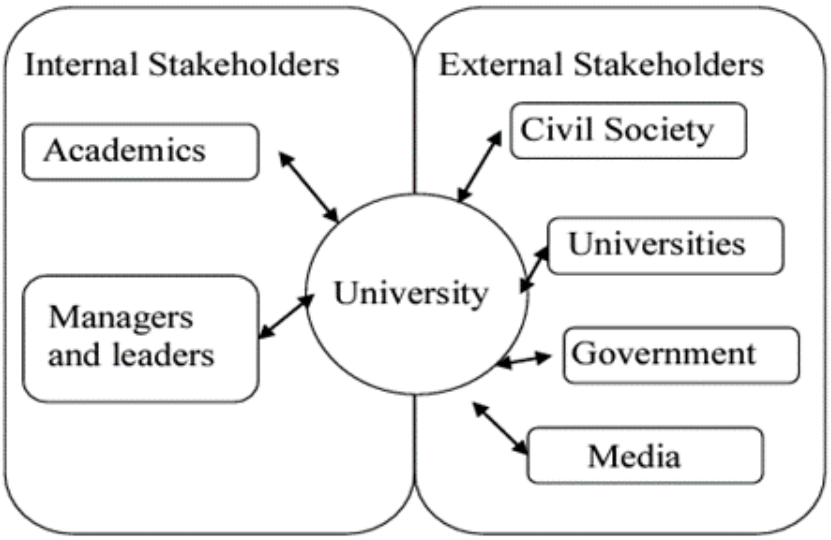

Figure 1. Integrating Subjective Metrics and SDGs in Webometrics

Existing Methods of Ranking Universities Based on Objective Factors

The existing methods used for university rankings, including Webometrics, generally combine a series of **objective metrics**. These objective factors tend to emphasize measurable aspects such as research publications, citation impact, and institutional visibility. Below are the key metrics commonly used in Webometrics rankings:

Research Publications

Research output is often the backbone of university rankings. This metric evaluates the quantity and quality of research produced by a university, measured through publications in peer-reviewed journals, conference papers, and other academic works.

Citation Impact

Citation impact refers to how often a university's research output is cited by others. It serves as an indicator of the quality and influence of the research produced. Strategies to improve citation impact include publishing in widely indexed journals, ensuring research relevance, collaborating with influential researchers, and engaging in interdisciplinary studies that attract broader scholarly attention.

Visibility

Visibility is a crucial element of university webometrics. It refers to the extent to which a university's content is visible on the web, including its presence in search engines, visibility on social media platforms, and overall web activity.

Excellence in Research (e.g., Scopus Indexing)

The number of papers published in top journals indexed in Scopus and Web of Science is another factor used in university rankings. These indexes focus on high-impact journals and databases, which often indicate the quality of research.

International Collaboration

This factor evaluates the global collaborations and partnerships that a university maintains. The number of international publications and research partnerships contributes to a university's reputation.

Ranking Factor	Description	Ways to Improve
Research Publications	Measures the quantity and quality of research output in peer-reviewed journals and conferences.	Publish in high-impact journals, encourage open-access, and interdisciplinary studies.
Citation Impact	Evaluates how often a university's research is cited, indicating its influence.	Collaborate with influential researchers, target relevant and trending topics, and enhance research visibility.
Visibility	Assesses online presence, including web traffic, social media engagement, and search engine indexing.	Improve university websites, share research on digital platforms, and optimize SEO strategies.
Excellence in Research (Scopus/Web of Science Indexing)	Reflects the number of publications in top-ranked, globally recognized databases.	Support faculty in publishing in indexed journals, foster quality research, and strengthen institutional research policies.
International Collaboration	Measures partnerships between universities and researchers worldwide, influencing research impact and citations.	Establish joint research projects, participate in international conferences, and increase academic mobility programs.

Figure 2. Key Objective Metrics in University Rankings

The Sustainable Development Goals (SDGs), introduced by the United Nations in 2015, serve as a global framework for addressing urgent challenges such as poverty eradication, environmental sustainability, and social equity. Universities, as centers for education, research, and innovation, are pivotal in advancing these goals by equipping individuals with the knowledge and skills required to address sustainability challenges. Beyond this, universities significantly contribute to global development through partnerships, policy advocacy, and community outreach initiatives (United Nations, 2015; Sachs et al., 2023).

In parallel, the increasing reliance on web-based data to evaluate institutional performance has revolutionized higher education assessments. Webometrics rankings, which primarily focus on quantifiable metrics such as research output, web visibility, and citation impact, have become popular tools for benchmarking universities. Despite their advantages, traditional webometrics often overlook the societal and qualitative dimensions of university contributions, particularly their alignment with SDGs (Webometrics Ranking of World Universities, 2023). This limitation underscores the need for integrating subjective metrics—such as stakeholder perceptions, employer reputation, and community feedback—into webometrics frameworks to create a more comprehensive evaluation system.

The inclusion of subjective metrics into ranking systems complements the traditional quantitative data, providing a balanced perspective on institutional performance. For instance, perceptions of students, faculty, and external stakeholders can offer valuable insights into a university's reputation, inclusiveness, and alignment with sustainability objectives. When aligned with SDGs, such metrics highlight the extent to which universities address global challenges and drive transformative change at local and international levels (Lozano et al., 2021; Filho et al., 2022).

The paper examines the role of subjective metrics in university webometrics rankings, proposing a framework to integrate these metrics with sustainability indicators aligned with the Sustainable Development Goals (SDGs). It critiques the current ranking systems, which mainly focus on objective data like research output, and suggests incorporating subjective measures such as stakeholder perceptions and universities' contributions to global sustainability. Using advanced data collection and processing tools, the study advocates for a more comprehensive ranking methodology that includes both qualitative and sustainability metrics. This approach addresses gaps in existing rankings and offers a roadmap for reimagining higher education assessments in the context of global sustainability, encouraging universities to emphasize social responsibility and environmental impact alongside academic performance.

The research employed a mixed-methods approach, combining qualitative and quantitative techniques to integrate subjective metrics and sustainability indicators into university webometrics rankings. The methodology involved a comprehensive literature review of existing ranking systems, followed by data collection from both objective sources (e.g., research output, citation indices, reputation scores) and subjective sources (e.g., surveys, interviews with university stakeholders, sustainability reports). Advanced data processing tools, such as machine learning algorithms and sentiment analysis, were used to analyze and quantify the subjective data. The research then developed a new ranking framework, incorporating both objective and subjective metrics, with a focus on SDG alignment and sustainability performance. Validation of the framework was conducted using case studies, applying the new methodology to a sample of universities. Materials used included surveys, data analytics software (example, Python, R), academic databases (example, Scopus, Web of Science), and institutional sustainability reports. The methodology applied was a combination of data analysis, statistical techniques, and framework development for a more holistic ranking system

REVIEW OF RELATED LITERATURE

University Rankings and Webometrics

University rankings have evolved significantly over the past decades, with webometrics emerging as a critical approach for assessing institutional performance. Traditional webometrics rankings focus on indicators such as web visibility, citation impact, and research productivity (Webometrics Ranking of World Universities, 2023). However, critiques of these systems highlight their overemphasis on quantitative metrics while neglecting qualitative and societal contributions (Van Vught & Ziegele, 2012). This gap has prompted calls for more inclusive frameworks that incorporate sustainability and stakeholder-driven metrics (Filho et al., 2022).

The Role of SDGs in Higher Education

The integration of SDGs into higher education has gained momentum since the launch of the 2030 Agenda for Sustainable Development. Universities play a vital role in advancing SDGs through education, research, and community engagement (United Nations, 2015). Recent studies have emphasized the importance of aligning institutional strategies with SDGs to address global challenges effectively (Sachs et al., 2023). For instance, Lozano et al. (2021) explored how higher education institutions incorporate sustainability principles into their curricula and operations, highlighting the need for robust assessment mechanisms to evaluate their impact.

Subjective Metrics in University Rankings

Subjective metrics, such as stakeholder perceptions, have gained recognition as essential components of university rankings. These metrics capture qualitative aspects of institutional performance, including reputation, inclusiveness, and societal impact (Lee & Haupt, 2020). Surveys and feedback mechanisms are commonly used to gather subjective data, providing insights into the experiences and perceptions of students, faculty, and external stakeholders (Lozano et al., 2021). The integration of subjective metrics into webometrics frameworks offers a more holistic approach to evaluating universities, particularly in the context of SDGs (Filho et al., 2022).

Analytical Trends in Metrics Integration

Advances in data collection and analysis tools have facilitated the integration of subjective and sustainability metrics into university rankings. Natural language processing (NLP) and machine learning techniques enable the analysis of qualitative feedback from stakeholders, offering new opportunities for aligning subjective metrics with SDGs (Sachs et al., 2023). Additionally, visualization tools, such as dashboards, can effectively

communicate the integration of diverse metrics, enhancing transparency and stakeholder engagement (Times Higher Education, 2023).

THE ROLE OF SUBJECTIVE METRICS AND THE UNITED NATIONS SDGS IN UNIVERSITY RANKINGS

Subjective metrics provide valuable insights into the qualitative aspects of university performance that quantitative data cannot capture. These metrics include:

1. Student and Faculty Perceptions: Assessing satisfaction levels with academic programs, campus facilities, and overall experiences (Lozano et al., 2021).
2. Employer Reputation: Evaluating the preparedness of graduates for the workforce.
3. Community Engagement: Gauging the perceived impact of universities on local and global communities.

By incorporating subjective metrics, webometrics rankings can better reflect the societal and cultural relevance of universities (Filho et al., 2022). The United Nations Sustainable Development Goals (SDGs), adopted in 2015, provide a universal framework for addressing global challenges such as poverty, inequality, climate change, and sustainable economic growth. Universities play a pivotal role in achieving these goals through education, research, and community engagement. The integration of SDGs into university rankings can provide a more holistic view of a university's contribution to global sustainability, emphasizing not only academic and economic achievements but also social responsibility.

Integrating SDGs in University Operations

SDGs serve as a guiding framework for universities to align their educational programs, research activities, and campus operations with global sustainability goals. Universities that actively contribute to the SDGs often do so through research that addresses climate change, affordable education, and sustainable communities, among others (Buchanan, 2020). Furthermore, universities incorporating SDGs into their curriculum prepare students to become leaders in promoting sustainability in their respective fields.

Research for Sustainable Development

Academic research is a key driver of progress toward achieving the SDGs. Universities contribute to SDGs by engaging in research projects that address environmental sustainability, social justice, and economic inclusion (Müller, 2021). Measuring the extent to which universities incorporate SDGs into their research agenda can provide valuable insights into their contribution to global sustainable development.

Community Engagement and Social Impact

Universities also engage with their local communities to promote the SDGs, through initiatives that address issues such as poverty, gender equality, and education. These community engagement efforts can be seen as an essential aspect of universities' roles in sustainable development, as they directly impact societal well-being. For example, Community-driven projects and university partnerships with local organizations to promote SDGs like "Decent Work and Economic Growth" (SDG 8) and "Reduced Inequality" (SDG 10) can be key indicators in evaluating a university's social contribution.

INTEGRATING SUBJECTIVE METRICS AND SDGS INTO WEBOMETRICS

Integrating subjective metrics (such as reputation, student satisfaction, and faculty quality) and SDGs into webometrics rankings allows for a more nuanced understanding of a university's holistic contribution to global sustainability. Subjective metrics assess qualitative factors such as academic reputation and student experience, while SDGs assess how well universities contribute to the achievement of global sustainability

objectives. Combining both subjective metrics and SDGs can provide a more comprehensive evaluation of a university's role in addressing contemporary global challenges and fostering sustainable development.

RESULTS AND DISCUSSION

The current landscape of university rankings, such as Webometrics, largely relies on objective metrics—primarily focusing on tangible factors like research output, visibility, and web presence. However, with the increasing importance of sustainability, social responsibility, and stakeholder satisfaction, universities are now being encouraged to go beyond mere academic performance and contribute to global sustainable development goals (SDGs). Additionally, subjective metrics like reputation, student satisfaction, and faculty quality play a critical role in capturing the holistic value of a university.

This paper proposes an integration model that blends subjective metrics and the United Nations SDGs into Webometrics rankings, creating a more comprehensive and socially responsible framework for evaluating universities.

Traditional Webometrics Rankings

Webometrics ranks universities based on their digital presence, research output, and visibility. Traditional Webometrics ranking factors generally include:

1. Volume of Research Publications (citations, impact factor, open access publications)

Objective: Quantitative assessment of research output based on databases like Scopus, Google Scholar, and Web of Science.

2. Web Presence and Visibility

Objective: Website visibility metrics, domain impact, and internationalization, typically measured through web traffic and visibility on search engines.

3. Research Excellence Indicators

Objective: Citations, publications, and participation in international collaborations.

While these indicators give a good sense of academic rigor, they do not fully capture the societal contributions of universities or the impact of their educational practices and institutional reputation. Furthermore, the environmental sustainability of these institutions, their contributions to societal well-being, and student experiences are not adequately reflected in traditional rankings.

Proposed Model for Integrating Subjective Metrics and SDGs

To address these gaps, we propose a new Webometrics ranking model that incorporates subjective metrics (reputation, student satisfaction, faculty quality) and a sustainable development framework based on the United Nations SDGs. This model aims to holistically assess universities' contributions to global development while maintaining academic excellence.

Subjective Metrics Integration

Subjective metrics refer to aspects that are inherently harder to measure but provide a comprehensive view of a university's impact on stakeholders. These can be gathered through surveys, peer reviews, and reputation assessments. Key subjective metrics include:

- **University Reputation**

This is measured through surveys of academics, industry professionals, alumni, and students. This would be the qualitative aspect of the university's influence and global recognition (Usher, 2022).

- **Student Satisfaction and Employability**

This factor gauges how well universities meet the needs of their students, focusing on satisfaction, career services, and the employability of graduates (O'Neil et al., 2021).

- **Faculty Quality and Research Engagement**

Assessing the quality of faculty involves peer evaluation, their involvement in groundbreaking research, and their international collaborations. This subjective metric could also include feedback from faculty regarding institutional support and development (Finkelstein, 2023).

Integration of SDGs into University Rankings

The integration of SDGs into university rankings shifts the focus from academic output alone to a more holistic approach that encompasses the role universities play in addressing global challenges. Universities will be evaluated based on how well they contribute to each of the **17** SDGs, considering both research output and institutional practices. Some critical SDGs relevant to universities include:

- **Goal 4 (Quality Education)**: Universities will be ranked on how effectively they provide accessible, quality education to diverse groups, promoting lifelong learning opportunities for all.
- **Goal 13 (Climate Action)**: Evaluating universities' efforts in reducing their carbon footprint, promoting environmental sustainability, and integrating climate-related research.
- **Goal 10 (Reduced Inequality)**: Ranking universities based on their inclusivity, efforts to reduce inequality, and promote diversity and equal opportunities in education.
- **Goal 17 (Partnerships for the Goals)**: The extent to which universities collaborate with governmental organizations, businesses, and NGOs to achieve global sustainable development (Leal Filho et al., 2022).

Model Framework: Hybrid Ranking System

The proposed model can be structured into three key categories:

1. Academic and Research Excellence

1. Research Output (Objective)
2. Research Citations (Objective)
3. Collaborative Partnerships (Objective and Subjective)
4. Reputation (Subjective)

2. Social Responsibility and SDG Contributions

a. SDG-Specific Indicators (Objective and Subjective)

1. Goal 4 (Quality Education)
2. Goal 13 (Climate Action)
3. Goal 10 (Reduced Inequality)

b. Community Engagement (Subjective)

I. Alumni engagement, volunteerism, and collaboration with local communities.

3. Stakeholder Satisfaction and Institutional Quality

1. Student Satisfaction (Subjective)
2. Faculty and Teaching Quality (Subjective)
3. Employability (Subjective)

Each of these categories would contribute a weighted score to the final Webometrics ranking. The weights can be customized based on the emphasis a university wishes to place on each factor (example, SDG contributions or academic output).

Comparing Traditional Webometrics with the Proposed Model

Traditional Webometrics Ranking:

1. Focuses heavily on research output and web presence.
2. Ignores social impact and quality of the educational experience.
3. Limited engagement with the sustainability agenda and global development challenges.
4. More reliant on quantitative metrics that don't capture the holistic contributions of the university.

New Hybrid Ranking Model:

1. Includes subjective metrics such as reputation, student satisfaction, and faculty quality to offer a fuller picture of the university's impact.
2. Integrates SDGs, measuring how universities contribute to sustainability, equity, and global development.
3. Combines qualitative and quantitative assessments, offering a more comprehensive, balanced, and societally relevant evaluation.
4. Shifts the focus from purely academic achievement to community engagement and global citizenship.

CONCLUSION AND FUTURE RESEARCH

By integrating subjective metrics and SDGs into the Webometrics ranking model, this paper introduces a more balanced and socially responsible approach to ranking universities. The hybrid model not only rewards academic excellence but also emphasizes the importance of sustainable development and the social responsibility of universities. Future research can explore the weighting system for the various factors, evaluate the reliability of subjective data, and test the model using real-world data to assess its validity and practicality in reshaping the university ranking landscape.

University Webometrics is an essential tool for evaluating the online presence, academic visibility, and overall digital impact of universities. It emphasizes objective metrics such as research publications, citation impact, visibility, and international collaboration. These rankings have increasingly become a vital component of the university evaluation process, complementing traditional academic indicators such as research quality and institutional reputation.

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