



Webometrics Analysis of the Website and Feasible Approaches to Improve the Ranking of Universities

Lingyan Zhang¹, Yingyi Tang^{1,a*} and Zhibo Zhou^{2,b}

¹Network and Educational Technology Center, Jinan University, Guangzhou, China

²The College of Information Science and Technology, Jinan University, Guangzhou, China

^{a*}Corresponding Author. Email: tangyy@jnu.edu.cn

^bzhangly@jnu.edu.cn

Abstract. The authoritative world universities ranking institutions take the comprehensive strength of universities as the evaluation criterion and adopt data collection and comprehensive assessment on a global scale. The official website of a university is an important carrier of information about the university, such as its overview, talent cultivation, teaching quality, and research achievements. It is also an important assessment target for authoritative ranking institutions and a display window for the university's international education data. The current thesis is an empirical study on the online influence of university rankings based on the SEO query method of web econometrics search engines. The SEO data of well-known domestic university websites ranked high in authoritative rankings are obtained. The results show that indicators such as the number of indexed pages and the number of external links are positively correlated with university rankings, which can provide valuable guidance for other universities to improve their rankings. Also, the current thesis takes top-ranked universities in China as reference samples and conducts a comparative study between the data of the sample websites and the reference sample website on online influence indicators, such as the number of indexed pages and external links, so as to explore strategies for universities to achieve better positions on university ranking lists by elevating online influence and optimizing official website.

Keywords: Webmetrics, University Ranking, Website, Influence Evaluation.

1 Introduction

QS World University Rankings, Times Higher Education World University Rankings (THE) and USNews are regarded as the golden standards today among Global University ranking tables[1]. The QS World University Rankings is based on the overall strength of universities as the evaluation criterion, using data collection and comprehensive assessment on a global scale. The universities participating in the QS ranking provide relevant information such as the number of their faculty and students, and QS uploads it to Core, its data collection system. In addition to the data provided by the invited universities, QS also collects information from government departments,

such as the websites of education ministries and national statistics bureaus of various countries, as well as from online resources and other third parties[2]. To prevent universities from manipulating data artificially, QS as a global higher education research institution obtains data from 139 education departments, statistics departments and related websites in 56 countries around the world. Webometrics is a system that provides an assessment of all the best universities in the world through the university's website[3]. It is used for the evaluation of university websites[4] and social science research institutions[5]. Introducing webometrics into the evaluation of the influence of the website, has become a trend and research paradigm of quantitative evaluation[6]. In order to increase the ranking of universities, the influence evaluation based on webometrics should be taken into account[7]. Some studies take accessibility, usability and security as indicator of webometrics, explore the relationship between websites and rankings[8]. The current thesis attempts to study other webometrics indicators and investigate the relationship between websites and rankings.

2 Related Works

2.1 Selection of Analysis Indicators

When studying the relationship between university rankings and website influence, two indicators should be considered.

Reference Indicators for Authoritative Rankings. The QS assessment indicators include Academic Reputation, Graduate Employment Rate, Faculty-Student Ratio and International Faculty Ratio, International Student Diversity, International Research Network, etc[9]. The latest performance indicators of THE (SCORES) are divided into five aspects: Teaching; Research Environment; Research Quality; Industry; International Outlook[10]. Among them, the secondary indicators under the first-level indicator teaching include student-teacher ratio and proportion of doctoral, master's and bachelor's degree holders. It can be noted that both QS and THE's assessment include indicators on such as the student-to-faculty ratio and the international student-to-faculty ratio. However, universities in China have not performed well in attracting international students. According to information released by the official Weibo account of the QS, China has not performed well in attracting international students, with only Jinan University ranking among the top 300 globally. The proportion of international students is an indicator assesses the accessibility of universities to international students and the expected campus diversity. This is the indicator that Chinese universities receive the lowest average score of among all indicators.

Webometric Indicators. The indicators for evaluating the influence of a website consist of the number of website sections, number of indexed pages, number of articles, number of external links[11] and accessibility. High number of indexed pages means the website has received high attention, and the number calculated by different search engine may be different for the same English website. The number of external links

refers to the quantity of hyperlinks from external websites or pages pointing to that website, which include links in other formats such as text and images. The number of external links indicates the frequency with which a website is indexed, the attention it receives, and its online influence.

2.2 The Importance of an Official Website for Ranking

The official website of a university is an important carrier of basic information about the university, such as the overview of it, talent cultivation, teaching quality and research achievements. It is also an important way to showcase the university's educational achievements, competitiveness and research capacity, and for perspective students especially, an important way to learn about a university. Some ranking agencies always check official university websites for the latest information[12].

In current thesis, a comparison is conducted between websites of two groups of universities. The first group includes the the official websites of the top 9 domestic "Double First-Class" comprehensive universities in mainland China on the 2023 and the 2024 QS World University Rankings, which are chosen as reference samples. The sample list of reference official websites is as shown in Table 1:

Table 1. List of sample websites.

Serial Number	Website	Domain	Ranking
1	Peking University	https://www.pku.edu.cn	12nd
2	Tsinghua university	https://www.tsinghua.edu.cn	14th
3	Fudan University	https://www.fudan.edu.cn	34th
4	Zhejiang University	https://www.zju.edu.cn	42nd
5	Shanghai Jiao Tong University	https://www.sjtu.edu.cn	46th
6	Ustc	https://www.ustc.edu.cn	94th
7	Nanjing University	https://www.nju.edu.cn	133rd
8	Wuhan University	https://www.whu.edu.cn	194th
9	Tongji university	https://www.tongji.edu.cn	212nd

The second group includes the official website of Jinan University (<https://www.jnu.edu.cn>) , which is selected as the research sample. In recent years, Jinan University performed well in the mainstream rankings of authoritative institutions. When it made its debut in the QS World University Rankings in 2021, it was ranked 33rd among mainland Chinese universities.

Through the analysis of the official websites of the above samples, it is found that they all have set up columns such as school overview, enrollment and employment, education and teaching, scientific research, and exchange and cooperation. The information carried includes employment rate, proportion of international teachers, proportion of international students, and data on internationalized education, all of which align with the assessment indicators of QS and THE. Therefore, The official website is very important for the assessment of ranking.

3 Data Acquisition and Analysis

3.1 Data Acquisition

The SEO Data of the Reference Sample Website. Search Engine Optimization is one of the most important and powerful sources of a website to rank on top of a search engine[13]. Researchers usually adopt commercial search engines and web crawlers[14]to obtain the number of articles. There has always been controversy over whether web crawlers affect the data security of source websites. Hence the current study adopts commercial engine Google(advanced search commands), using the site command to query the number of indexed pages of the official website to analyze the attention given to it. The command is executed as site: Domain Name. Use the link command to search for external links of a specific website, and the command is executed as link: Domain Name. This is a key factor of rankings and weights. The tool adopted for evaluating the domestic influence of a website is the third-party tool-Zhanzhangzhijia. On its official website (<https://outlink.chinaz.com/>), one can query the number of links connected to a certain website in terms of the backlink query. High-quality backlinks are crucial for search engine rankings[15]. Use the SEO query tool on the website of Zhanzhangzhijia to obtain the number of backlinks of the university's official website and the results are only based on the Chinese search engine Baidu.

The search results of commands "site" and "link" are dynamically changing. Starting from 2024, Google's "site" and "link" commands will no longer display the number of indexed pages and external links. However before that, we conducted a search experiment in 2023, the data is shown in Table 2:

Table 2. SEO data statistics(the search was conducted on November 19, 2023).

Domain	No. of indexed pages	No. of external links	No. of backlinks
https://www.pku.edu.cn	5,240,000	1,290,000	6,038
https://www.tsinghua.edu.cn	11,800,000	1,600,000	8,306
https://www.fudan.edu.cn	3,440,000	576,000	2,700
https://www.zju.edu.cn	951,000	411,000	2,822
https://www.sjtu.edu.cn	363,000	592,000	2,438
https://www.ustc.edu.cn	928,000	299,000	1,130
https://www.nju.edu.cn	554,000	620,000	1,653
https://www.whu.edu.cn	603,000	390,000	1,966
https://www.tongji.edu.cn	1,560,000	871,000	1,510

Data of Sample Website. The official website of Jinan University (www.jnu.edu.cn) has 660,000 indexed pages and 1.01 million external links. To obtain the content release data of the school's website cluster in the past three years, we execute the SQL query statements in the database:

The query results and the rankings of Jinan university in the past three years are shown in Table 3.

Table 3. The ranking of Jinan University.

Year	No. of articles on the official website	No. of articles on all secondary websites	Ranking among mainland Chinese universities in QS	Ranking among mainland Chinese universities in THE
2022	1,601	16,204	43rd	45th
2023	1,827	11,468	44th	45th
2024	2,081	18,849	40th	39th

The ranking data is sourced from the official websites of the QS and the THE. From 2022 to 2024, Jinan University was ranked 43rd, 44th, 40th and 39th respectively among mainland Chinese universities in the QS, and 45th, 45th, 39th and 40th among mainland Chinese universities in THE.

3.2 Results Analysis

Analysis of the Relationship between SEO Data and University Rankings. As can be seen from Table 2, in the 2023QS ranking, the differences in the number of entries are quite obvious. Peking and Tsinghua hold a strong position in terms of the number of indexed pages. Peking University, ranked 12th by QS, has 5.24 million entries; Tsinghua University, ranked 14th by QS, has 11.8 million entries; Fudan University, ranked 34th by QS, has 576,000 entries. From the search results of the external link command and the backlink query results of the webmaster Tools, it can be seen that Peking University and Tsinghua University, ranked similarly on QS, have slightly different numbers of external links, but they are much more than that of Fudan University and of Zhejiang University, the later two ranked 34th and 42nd respectively. The changing trends of indexed volume, external links and backlinks in relation to university rankings are shown in Figure 1:

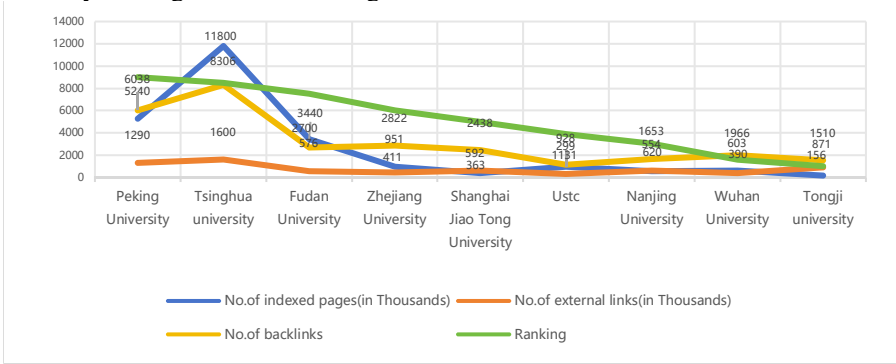


Fig. 1. The changing trends of indexed volume, external links and backlinks in relation to university rankings.

As can be seen from Figure 1, the changing trends of the indexed volume, external links and backlinks and university rankings tend to be consistent. The above data shows

that the number of indexed pages, the number of external links and the university ranking are positively correlated.

Due to the small sample size and the uncertainty of the correlation between factors, the grey correlation analysis[16] was selected to conduct correlation analysis on the three factors affecting the ranking, and identify the factor among the three factors that has the greatest similarity to the ranking change. The QS ranking is defined as the reference sequence. The procedures are summarized as follows:

Step 1: The reference sequence is denoted as $Y=[y(1), y(2), y(k)]^T$. The three factors, number of indexed pages, external links and backlinks, are defined as comparability sequences, denoted as $X_k=[x_k(1), x_k(2), \dots, x_k(n)]^T$.

Step 2: Initialize three indicators and perform dimensionalization processing.

Step 3: Calculate the grey relational coefficients through Formula 1.

$$\xi_i(k) = \min_k \left(\frac{\min |y_k - x_k| + \rho \max |y_k - x_k|}{\max |y_k - x_k| + \rho \max |y_k - x_k|} \right) \quad (1)$$

In Formula 1, ρ is the resolution coefficient, which is usually taken as 0.5.

Step 4: Calculate grey correlation degree through Formula 2.

$$\gamma_i = \frac{1}{n} \sum_{i=1}^n \xi_i(k) \quad (2)$$

In Formula 2, n is the number of comparability sequences.

After running the correlation analysis code, the results are as shown in Table 4:

Table 4. Correlation degree result.

Evaluation items	Correlation degree	Ranking of items
No. of indexed pages	0.753	3
No. of external pages	0.892	2
No. of backlinks	1.000	1

The greater the degree of correlation, the stronger the correlation between the comparability sequence and the reference sequence. It turns out that among the three factors, the two external link factors have a greater impact on the ranking. Backlinks based on Chinese search engines have a strong correlation with the ranking.

Comparatively, it can be seen from Table 3 that the number of websites of Jinan University has decreased in the past three years, from 221 to 197 though, the content released on the official website sees a substantial growth instead, which was 1,601 pieces of articles released in 2022 and 2,081 pieces in 2024, with an increase of nearly 30% in 2024 compared to 2022. The total number of secondary website releases in 2024 also increased by 15% compared with 2022. From 2022 to 2024, Jinan University's ranking among mainland universities has risen from 45th to around 39th.

Research on Correlation between the Volume of Content Released and Rankings.

The factors influencing the ranking are analyzed by the above-mentioned grey relational degree analysis. As the university's THE ranking has changed more than its QS ranking in the past three years, the THE ranking is defined as the reference sequence.

After running the above grey correlation analysis program in the same way, the results are shown in Table 5:

Table 5. Correlation between the volume of content released and rankings.

Evaluation items	Correlation degree	Ranking of items
No. of articles on the official website	0.979	1
No. of articles on all secondary websites	0.448	2

The greater the degree of correlation, the stronger the correlation between the comparability sequence and the reference sequence. The results show that the "ranking" of the reference sequence has the strongest correlation with the factor of official website release volume. The ranking gradually rises as the content released increases.

4 Conclusion

In response to the online influence and the inclusion of websites, the following optimization measures are taken to enhance the online influence of university rankings.

The first measure is to create a star-shaped regular content update mechanism. The authority of different sections of the official website is divided according to the source of the content to be released, so that information can be updated in a timely manner, by each department to improve timelines. The star-shaped regular content update mechanism helps to build an information update channel directly from the production end by each department to the release end, namely the official website, so that the update content related to the algorithm indicators of QS and THE ranking can be captured timely by domestic and foreign search engines.

SEO optimization for the website. The SEO optimization includes the following measures: optimization towards the internal link structure of the website to facilitate users' browsing; detection of dead links by SEO tools to delete dead links, hidden links and other illegal links; optimizing the timeliness of website content, and increasing the number of effective external links.

Chinese and English websites revision. The access speed to the official websites from outside China will be significantly accelerated by revision of both Chinese and English websites and the deployment of overseas CDN services. Still, the technical website optimization not only improves user experience and attracts more perspective international students to visit the websites and also will increase traffic from search engines.

To improve accuracy, authenticity and timeliness, information on the secondary website needs to be updated timely and remains consistent with that of the university's official website. Also, the volume and the time of the content released can be collected in terms of some technical means, such as SQL database queries. By that, the latest information and its time of update on the secondary website within a certain time period can be collected, so that non-active websites can be singled out for amelioration.

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The authors have no competing interests to declare that are relevant to the content of this article.

References

1. M. Mussard , A. P. James:Engineering the Global University Rankings: Gold Standards, Limitations and Implications,IEEE Access, vol. 6, pp. 6765-6776(2018).
2. R. Tan:Analysis of the Data Collection and Processing Process of the QS World University Rankings System. New Education Era, no. 45, p. 142(2019).
3. Y. Anistyasari, A. Kurniawan, and S. C. Hidayati:Does Website Usability Impact Webometrics Ranking of University?. in 2021 Fourth International Conference on Vocational Education and Electrical Engineering (ICVEE), pp. 1-4(2021).
4. R. J. J. E. T. Deshmukh , I. Research:Webometric analysis Agriculture University websites for Maharashtra state.J Emerging Technologies and Innovative Research 6(10),38-45(2017).
5. A. Pal, S. Kar, and S. Sardar: Webometric analysis of ICSSR sponsored research institutions in India. Library Philosophy and Practice, pp. 1-23(2020).
6. S. Ge,X. Yang: Research on the Influence of Global University Rankings based on Web Metrics. Higher Education Exploration, no. 1, pp. 28-37(2018).
7. F. F. Abdulloh, R. F. A. Aziza, C. Sentiaji, A. Aminuddin, and M. Rahardi: Accessibility Analysis of Higher Education Rankings on Webometrics Using WCAG 2.0. in 2024 7th International Conference on Informatics and Computational Sciences (ICICoS), pp. 342-346(2024).
8. S. S. Macakolu, S. Peker, and h. T. Medeni: Accessibility, usability, and security evaluation of universities' prospective student web pages: a comparative study of Europe, North America, and Oceania.Universal Access in the Information Society 22(2), 671 - 683(2023)
9. Lense and Indicators of QS World University Rankings, {HYPERLINK "https://support.qs.com/hc/en-gb/sections/360005689220-Our-Methods"},last accessed 2025/3/25.
10. J. Dsouza et al.: A Review of Overall Scores and Key Statistics of the Top Five Ranked Universities of Times Higher Education World University Rankings for the Years 2020-2023. in 2023 International Conference on Integration of Computational Intelligent System (ICICIS), pp. 1-8(2023).
11. H. Huang and J. Sun: Study on Website Evaluation based on Link Analysis:A Case Study of the Four Portals. Journal of Intelligence 30(1), 74-77(2011).
12. S. Al-Hagree et al.:A Comparison Study of Prominent International University Ranking Systems: Exploring the Potential of Yemeni Universities for Rankings. in 2024 1st Inter-

- national Conference on Emerging Technologies for Dependable Internet of Things (ICETI), pp. 1-13(2024).
13. K. Sellamuthu, S. R. K. K., and S. G.: On Page SEO Techniques for Better Ranking in Search Engines. in 2022 8th International Conference on Smart Structures and Systems (ICSSS), pp. 01-06(2022).
 14. Y. Wang: Research on Python Crawler Search System Based on Computer Big Data. in 2023 IEEE 3rd International Conference on Power, Electronics and Computer Applications (ICPECA), pp. 1179-1183(2023).
 15. I. Nurkasanah et al.: Exploring Backlinks Profile in Defining Metrics for Enhancing University Websites Visibility Ranking. in 2022 International Conference on Computer Engineering, Network, and Intelligent Multimedia (CENIM), pp. 283-289(2022).
 16. Z. Wei, N. Wang, Z. Zhang, J. Chen, Y. Li, and X. Qi: Research on Complexity Evaluation Method for Dispatch Automatic Generation Control Software Based on GRA. in 2025 IEEE 8th Information Technology and Mechatronics Engineering Conference (ITOEC), vol. 8, pp. 1367-1372(2025).

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