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Effectiveness of Web Footprints among the National Libraries in Asia – A study

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Abstract
The onset of the digital revolution has significantly transformed the role of national libraries in the dissemination of information. A well-structured and easily accessible website is crucial for libraries to provide their users with the best possible service. This study evaluated the digital presence of ten national library websites in a range of Asian countries, including Saudi Arabia, Qatar, Japan, China, Malaysia, Taiwan, India, Iran, and Russia, using the web analytics tool called as SimilarWeb. The primary focus is on website traffic, user interaction, device distribution, and key performance indicators like average visit time, bounce rate, and total visits. The findings provide insight on the effectiveness of national library websites and highlight the importance of user-friendly and digital accessibility in enhancing engagement. This study could serve as a standard for national libraries looking to improve their online visibility and align with global standards for digital content delivery.

Keywords: *National Library, Public Library, SimilarWeb, Webometrics, Website analysis*

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I. Introduction

In the digital age, national libraries are essential for preserving and sharing knowledge as well as influencing how people can access cultural and intellectual heritage online. The importance of national libraries has grown beyond their physical holdings to incorporate dynamic digital repositories and services due to the rapid development of information and communication technologies (ICT). A library's website serves as a virtual entrance to its extensive collection of materials, making its functionality, usability, user engagement and service quality. National libraries across Asia have a similar goal, but they vary greatly in how well they apply technology to reach their patrons. The differences in user engagement, usability, and digital visibility indicate different degrees of technological adoption and strategic concentration. More people are getting their information online, it is critical for these organizations to make sure that their websites are optimized for user pleasure, discoverability, and navigation. Libraries can boost accessibility, improve digital services, and better match with international information delivery standards by learning how users engage with these websites. The websites of national libraries among the selected Asian nations are analyzed in this study, and important performance metrics such device distribution, bounce rate, and total visitors are also validated. It highlights how important national libraries gather places for academics, researchers, and the general public, providing access to heritage collections, public information, and intellectual materials. The study compares and evaluates the online efficacy of national library websites using SimilarWeb, a top web analytics tool. The information gathered is intended to help national libraries to enhance their digital platforms and expand their reach to a greater extent.

Evaluation of Libraries

Understanding the digital performance, user engagement, and accessibility of national library websites is the main goal of the evaluation process. In order to determine how well libraries draw in and hold on to visitors, this study evaluates website traffic, user interaction, and device usage patterns (desktop vs. mobile).

Important indicators show the quality of the user experience and the relevance of the content include which bounce rate and session duration.

Accessibility features for a variety of users, linguistic support, and the freshness of the contents are further considerations. Enhancing user involvement also involves the inclusion of interactive features, search capabilities, and social media integration. Libraries with user-focused, responsive, and often updated websites have greater online presence and reach.

Related Work

Webometric analysis has emerged as a significant approach in evaluating the visibility, impact, and structure of university websites. This review of literature explores key studies to know how the web-based presence of universities using various webometric indicators. The literature on website evaluation covers various perspectives, from the influence of financial characteristics on web traffic to the classification of malicious webpages using machine learning. B. Ramesh Babu et al. (2010) conducted a webometric analysis of 40 central university websites in India. The study assessed multiple aspects of these websites, including domain systems, the number of web pages and link pages, and various web impact factors (simple, self-link, external-link, and revised web impact factor). The research also developed a network diagram to illustrate link structures between web nodes, highlighting the intricate connections within web-based university environments. A critical takeaway from this study is the caution against overgeneralizing the analogy between citation analysis and link analysis, emphasizing that web links may not always reflect the academic influence of an institution. Farashi et al. (2020) compared the web activity of top-ranked Iranian medical universities with globally top-ranked universities to evaluate the quality and quantity of their website presence. Using traffic data from "Similarweb," the study revealed significant differences in total traffic size, bounce rate, and backlinks from referrals and social networks. The research underscored that while website quality influenced visit duration and page visits, it did not significantly correlate with total traffic size. The study further identified search engine optimization (SEO) and social media linkages as critical factors contributing to the gap between Iranian medical universities and top global institutions. These findings suggest that Iranian universities need to enhance their SEO strategies and social media engagement to improve their web presence and global accessibility. Samir Kumar Jalal (2013) conducted a comparative weblink analysis among the top ten Indian, Asian, and world universities. The study examined the relationship between in-links and out-links among these universities. Findings indicated that top ten Indian universities (TTIU) generated 3.71% outlinks to top ten world universities (TTWU) but received only 0.67% inlinks from them. Similarly, inlinks and outlinks between top Asian and world universities were also limited. The study further showed that self-linking and inlinking percentages among Indian and Asian universities were found to be lower compared to top world universities. These results highlight the disparity in web connectivity and international visibility between Indian, Asian, and world-class institutions, emphasizing the need for improved networking and global digital engagement. Pineiro-Chousa (2021) examined the impact of financial characteristics and the country of origin on web traffic for B2B Initial Coin Offerings (ICOs). The study highlighted that token distribution and fundraising play key roles in web visibility, while minimum investment has a lesser impact. Additionally, the institutional efficiency and tax haven status of the country of origin can influence web traffic depending on other financial characteristics. Goltaji and Serati Shirazi (2012) studied the websites of top research centres in Islamic countries, revealing a low presence in webometric rankings. This finding underscores the need for more effective digital strategies to enhance academic visibility. Brahma and Verma (2022) evaluated the national library websites in Asia, considering the factors such as design, Web 2.0 tools, and global visibility. Their findings indicated that while most websites include graphics and contact details, few provide information on content updates, affecting their credibility and ranking. Nilazi and Aghaei Kamran (2020) compared university website evaluation models, highlighting that the UWEAC model is the most comprehensive. The study emphasizes the need to apply thorough evaluation criteria to maintain a positive institutional image and improve website usability. Zubiena et al. (2023) developed a HIWET tool to assess the quality of online information on neck pain. Results indicate that HIWET is reliable and valid, offering advantages in efficiency compared to other tools. Its application in clinical practice and education reinforces the importance of accessible and quick evaluation tools for online medical information. Liaquathali and Kadirvelu (2025) integrated the natural language processing and machine learning to identify malicious webpages. They analyzed the key HTML tags and employs machine learning models, achieving an accuracy of 93.46%. This demonstrates the feasibility of advanced approaches in web cybersecurity. Keshavarz and Rahimi (2018) investigate online image retrieval through indexing codes. Findings suggest that optimized image titles significantly improve search ranking, whereas Farsi descriptions yield the poor results. This study highlights the importance of effective tagging strategies to enhance image visibility in search engines. Verma and Brahma (2017) conducted a webometric study of national library websites in South Asia, ranking them based on the Web Impact Factor (WIF). The study found that the National Library of India had the highest WIF, followed by Sri Lanka and Bhutan. Shevchenko (2020) analyzed user behavior on library websites, identifying the browsing

patterns and areas for content improvement. The study emphasized the importance of tracking visitor actions to enhance digital library services. Shree Rekha and Radhakrishnan (2024) Analysed twelve public libraries websites using webometric measures such as Domain Authority, Page Authority, Internal-links, and External-links. Parliament Library has the highest SWIP and IWIP, while Thanjavur Maharaja Serfoji's Sarasvati Mahal Library has the lowest. And a well-organized checklist consisting of 28 criteria used to evaluate the web contents. The authors find out some measures which are not available on the websites, such as new arrivals, ICT infrastructure, book recommendations, and FAQs. Arandhara (2021) performed a comparative study of university library websites in Assam, evaluating their contents and digital reach. The study highlighted the significance of well-structured content and accessible web design in enhancing user engagement. Widiati et al. (2024) analyzed pharmaceutical websites using SimilarWeb, categorizing them based on traffic, engagement, and social media distribution. The study provided a framework for evaluating website performance, which is applicable to library website analysis. Conway et al. (2012) examined website accessibility in Australian national and state libraries. Their study assessed compliance with the Web Content Accessibility Guidelines (WCAG) and identified common usability barriers faced by users with disabilities. Libraries must optimize their websites for improved user interaction due to the growing dependence on digital resources. According to studies, libraries with mobile-friendly interfaces, structured information, and a greater domain authority draw more users and improve user experience. This study expands on previous research by assessing ten national libraries in Asia and offering suggestions for enhancement.

Objectives

1. To identify and list out the national library websites of selected Asian countries.
2. To compare website traffic and user engagement using SimilarWeb data.
3. To know the trends in user behavior and digital accessibility.
4. To evaluate the effectiveness of different libraries' online strategies.
5. To provide insights for improving website performance and reach.

II. Methodology

Ten national library websites in Asia were evaluated for their digital presence and user interaction through a quantitative webometric research technique. The methodology was designed to use actual data to systematically examine the key performance metrics pertaining to web traffic and online interaction.

Research Design

To evaluate the efficacy of the digital platforms of the chosen national libraries, a comparative webometric analysis was performed. Indicators like total visits, bounce rates, average session length, and device usage patterns were the main focus of the study.

Data Collection

The data for this study were gathered over a three-month period, from December 2024 to February 2025, to account for temporal variations in web traffic and user behavior. The primary tool used for data collection was Similarweb (https://www.similarweb.com/), an industry-standard web analytics platform that provides insights into website performance, including visitor demographics, traffic sources, and user engagement metrics. On March 9, 2025, data from Similarweb were retrieved to capture the most recent and comprehensive traffic analysis of each selected national library website. The collected data included key performance indicators (KPIs) that offer a detailed understanding of web engagement patterns.

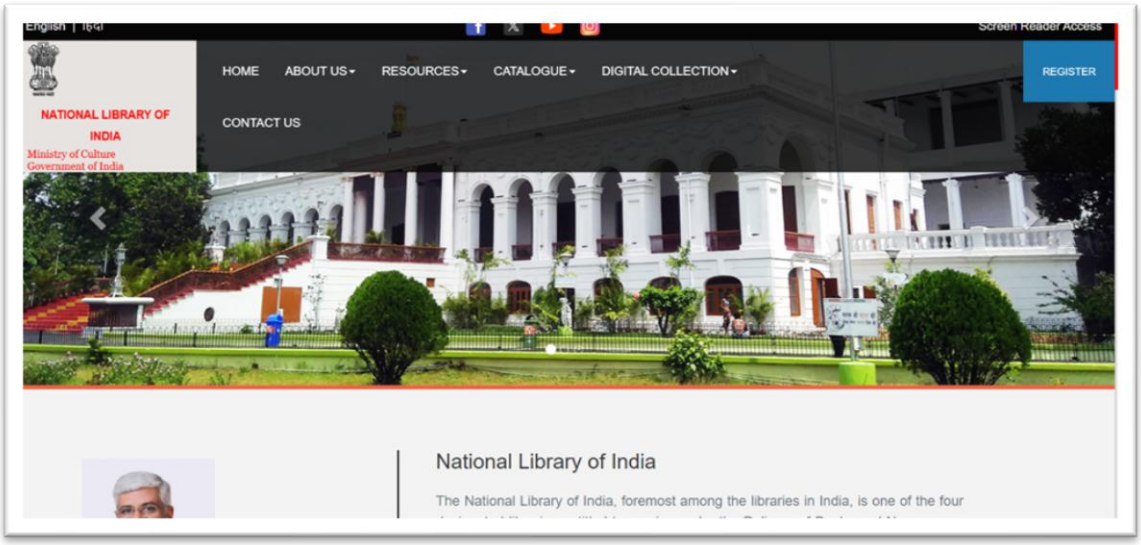
Testing of Metrics

The study focused on the following core web analytics metrics:

1. Total Visits – The total number of times users accessed each national library's website during the study period.
2. Average Visit Duration – The mean amount of time a user spends on the website per session, providing insight into engagement levels.
3. Bounce Rate – The percentage of visitors who leave the website after viewing only one page, indicating the extent of immediate disengagement.
4. Traffic Sources – The origins of web traffic categorized into direct visits, organic search, referral traffic, social media, and paid advertisements, helping to identify user acquisition trends.

Each metric was systematically analyzed to identify trends, patterns, and differences among the selected national libraries. The study aimed to highlight variations in user engagement across different regions and to explore potential factors influencing web traffic, such as digital accessibility, content richness, and promotional

efforts. Comparative analysis was conducted to understand which libraries attract higher engagement and the factors contributing to their online visibility.



By employing this structured methodology, the study provides valuable insights into the digital footprint of Asian national libraries, offering a data-driven perspective on their online reach and user interaction.

III. Materials and Methods

Ten National library websites were randomly chosen which are geographically situated in Asian continent. The sample population of the study is portrayed in Table 1. It depicts the name of the national library, its abbreviation, name of the country, and URL.

Table 1: List of National Library Websites

S. No.	Name of the Library	Abbreviation	Name of the Country	Website
1	National Library of India	NLI	India	https://www.nationallibrary.gov.in/
2	National Library and Archives of Islamic Republic	NLAIR	Iran	https://www.nlai.ir/
3	The National Library of Russia	NLR	Russia	https://nlr.ru/eng
4	National Diet Library	NDL	Japan	https://www.ndl.go.jp/en/
5	National Library of China	NLC	China	https://www.nlc.cn/web/index.shtml
6	National Library of Malaysia	NLM	Malaysia	https://www.u-library.gov.my/portal/pnm
7	National Central Library	NCL	Taiwan	https://enwww.ncl.edu.tw/
8	National Library of Korea	NLK	South Korea	https://www.nl.go.kr/EN/main/index.do
9	King Fahd National Library	KFNL	Saudi Arabia	https://kfnl.gov.sa/En/Pages/default.aspx
10	Qatar National Library	QNL	Qatar	https://www.qnl.qa/en

Overview of the National Libraries

Figure 1: Home Page of the National Library of India
Source: National Library of India Website https://www.nationallibrary.gov.in accessed on 31.01.2025

The National Library of India (NLI), located in Kolkata, West Bengal, is the largest library in India by volume and a premier institution for research and reference. It was established in 1836 as the Calcutta Public Library and later merged with the Imperial Library in 1903. After India's independence, it was renamed the National Library of India in 1948. The library holds over 2.2 million books and vast collections of manuscripts, newspapers, and periodicals in multiple languages. It serves as a repository of Indian literary heritage and is administered by the Ministry of Culture, Government of India. The National Library also plays a crucial role in preserving rare books and digitizing historical documents for future generations.

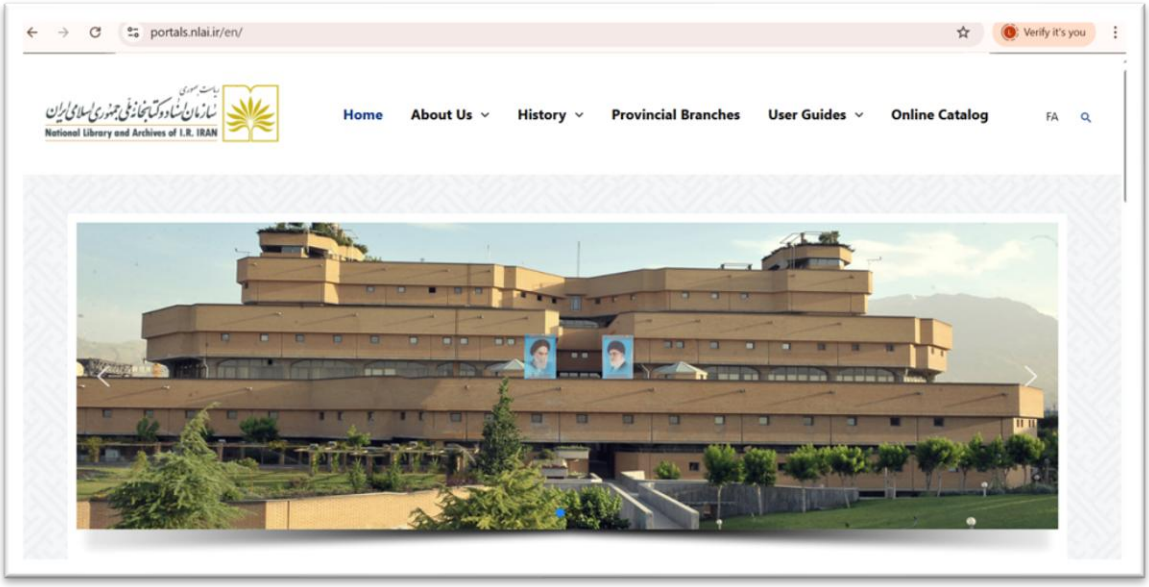


Figure 2: Home page of the National Library and Archives of Iran
Source: National Library and Archives of Iran Website https://www.nlai.ir/ accessed on 31.01.2025

The National Library and Archives of Iran (NLAI), located in Tehran, is the central repository for Iran's literary and historical heritage. It was officially established in 1937, although its origins trace back to earlier efforts in preserving Persian manuscripts and cultural records.

The library houses millions of books, manuscripts, periodicals, and historical documents in Persian and other languages. It also serves as a research hub, supporting scholars and preserving Iran's cultural legacy through digitization and archival projects. The NLAI operates under the Ministry of Culture and Islamic Guidance and plays a key role in Iran's intellectual and academic development.

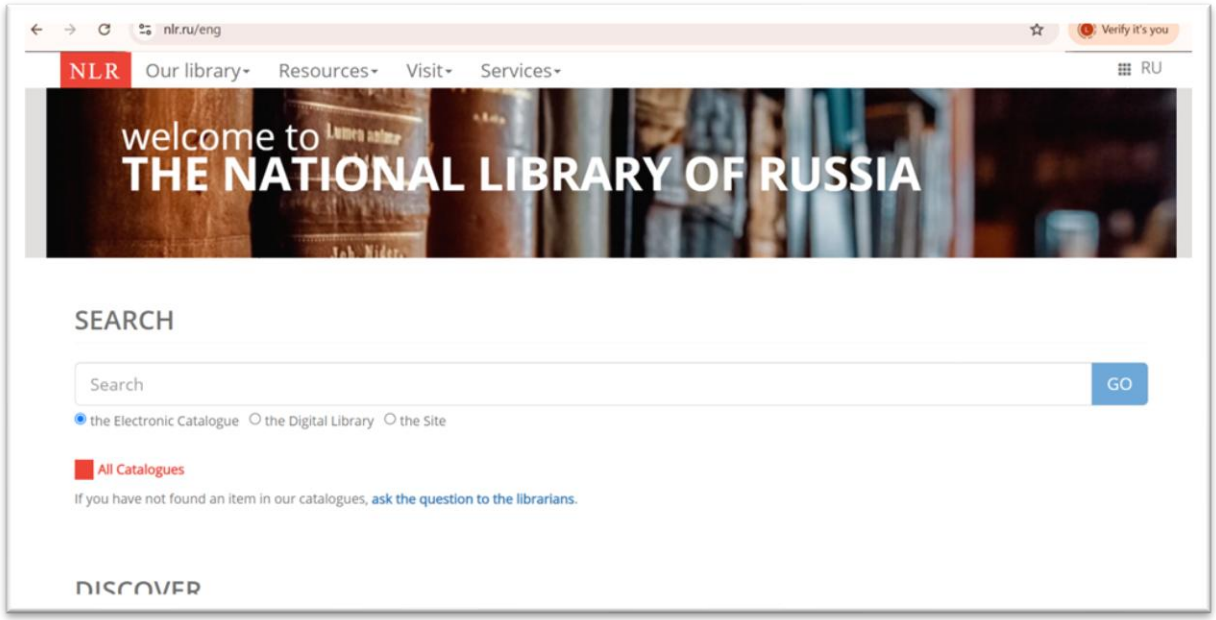


Figure 3: Home Page of the National Library of Russia
Source National Library of Russia website https://nlr.ru/eng accessed on 31.01.2025

The National Library of Russia (NLR), located in Saint Petersburg, is one of the largest and oldest libraries in the country. It was founded in 1795 by Catherine the Great as the Imperial Public Library. The library holds over 37 million items, including rare manuscripts, books, periodicals, and maps in multiple languages. It serves as a major research and reference center, preserving Russia's literary and historical heritage.

The NLR is a key institution for scholars and is actively involved in digitization projects to make its vast collections accessible worldwide.

Figure 4: Home page of the National Diet Library of Japan
Source National Diet Library of Japan website https://www.ndl.go.jp/en/ accessed on 31.03.2025

The National Diet Library (NDL) of Japan, located in Tokyo and Kyoto, is the country's largest library and serves as the national parliamentary library. It was established in 1948 to assist lawmakers by providing research materials and preserving Japan's cultural and historical records. The NDL holds millions of books, manuscripts, periodicals, and official documents, including rare historical texts and foreign publications. It plays a crucial role in academic research, digital archiving, and ensuring public access to Japan's intellectual heritage.

Figure 5: Home Page of the National Library of China
Source: National Library of China website https://www.nlc.cn/web/index.shtml accessed on 31.01.2025

The National Library of China (NLC), located in Beijing, is the largest library in Asia and one of the largest in the world. It was founded in 1909 as the Imperial Library of Peking and later renamed in 1928. The NLC holds over 40 million items, including ancient Chinese manuscripts, rare books, historical records, and

digital resources. It serves as a major research and preservation center, safeguarding China's literary and cultural heritage. The library also plays a key role in digitization and international academic exchanges.

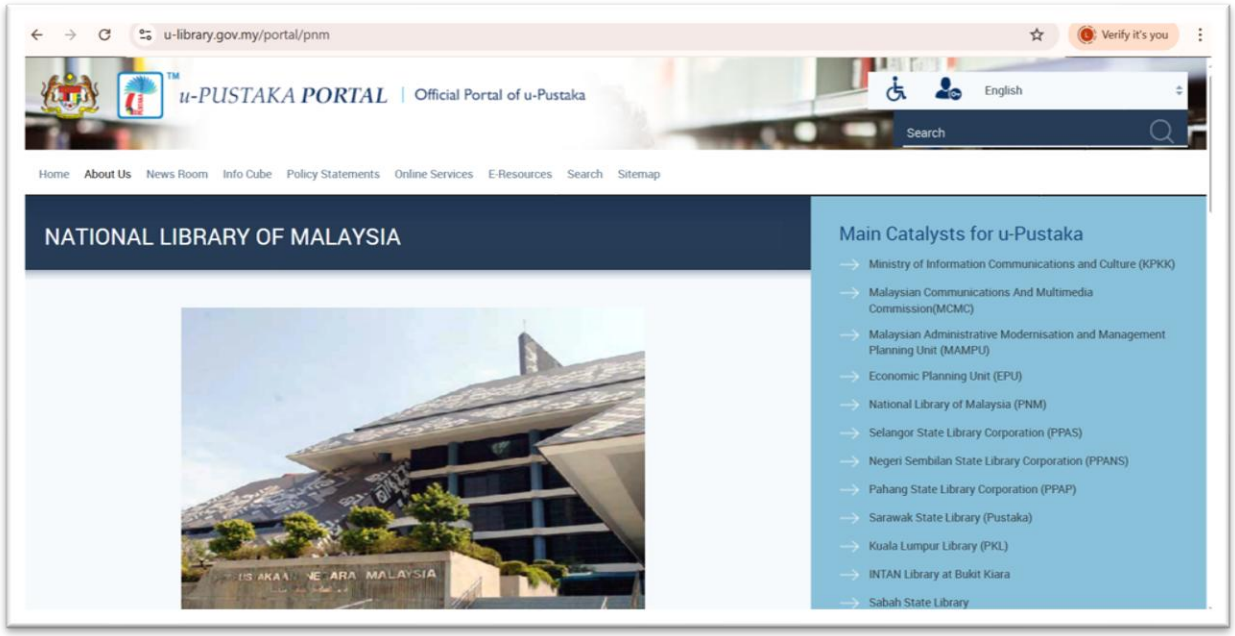


Figure 6: Home Page of the National Library of Malaysia
Source: National Library of Malaysia website https://www.u-library.gov.my/portal/pnm accessed on 31.01.205

The National Library of Malaysia (Perpustakaan Negara Malaysia - PNM), located in Kuala Lumpur, is the country's main repository of knowledge and heritage. It was officially established in 1966 to preserve Malaysia's literary and cultural resources. PNM holds a vast collection of books, manuscripts, periodicals, and digital archives, with a special focus on Malay literature and history. It also promotes reading, research, and lifelong learning through various programs and digital initiatives. The library plays a significant role in preserving Malaysia's intellectual heritage and supporting national education to a greater extent.

Figure 7: Home page of the National Central Library, Taiwan
Source: National Central Library website https://enwww.ncl.edu.tw/ accessed on 31.01.2025

The National Central Library (NCL) of Taiwan is located in Taipei. It was established in 1933 in Nanjing, China, and later relocated to Taiwan in 1949. The NCL serves as the main research and reference library, preserving millions of books, manuscripts, periodicals, and digital archives, with a strong focus on Chinese literature and culture. It also coordinates Taiwan's public libraries, promotes academic research, and engages in international library exchanges. Its role in preserving and digitizing Taiwan's literary heritage is inevitable.

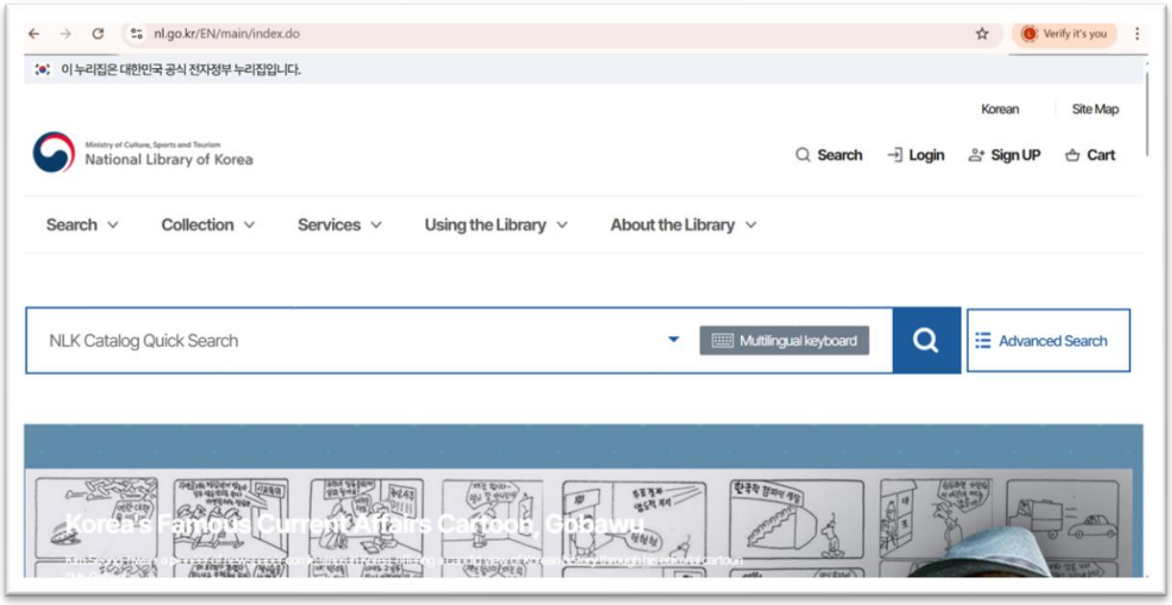


Figure 8: Home Page of the National Library of Korea
Source: National Library of Korea website https://www.nl.go.kr/EN/main/index.do accessed on 31.01.2025

The National Library of Korea (NLK), located in Seoul, is the country's largest and most important library. It was established in 1945 and is known as a central repository for preserving Korea's literary, historical, and cultural heritage. The NLK houses over 13 million items, including books, manuscripts, government documents, and digital archives. It plays a key role in academic research, digital preservation, and public access to knowledge. The library also operates the National Digital Library, providing online access to vast resources for researchers and the public.

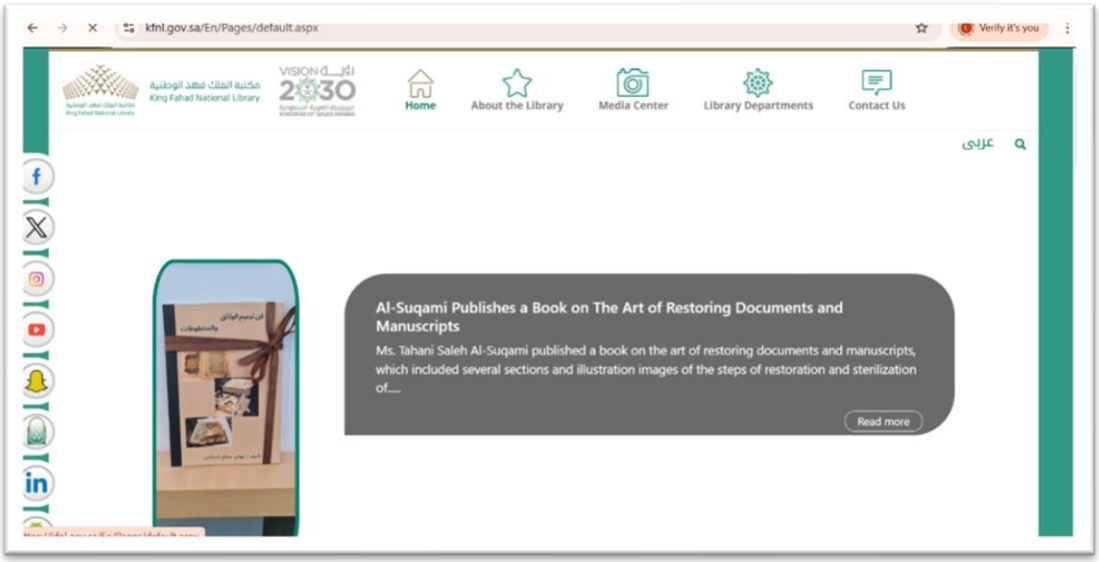


Figure 9: Home Page of the National Library of Saudi Arabia
Source: National Library of Saudi Arabia website https://kfnl.gov.sa/En/Pages/default.aspx accessed on 31.01.2025

The King Fahd National Library (KFNL) of Saudi Arabia is located in Riyadh and established in 1990. It serves as the country's main institution for preserving Saudi Arabia's literary and cultural heritage. The library holds millions of books, manuscripts, periodicals, and official documents, with a special focus on Arabic and Islamic studies. It also plays a key role in research, digitization, and archiving Saudi Arabia's intellectual contributions. KFNL supports scholars, researchers, and the public by providing access to valuable historical and academic resources.

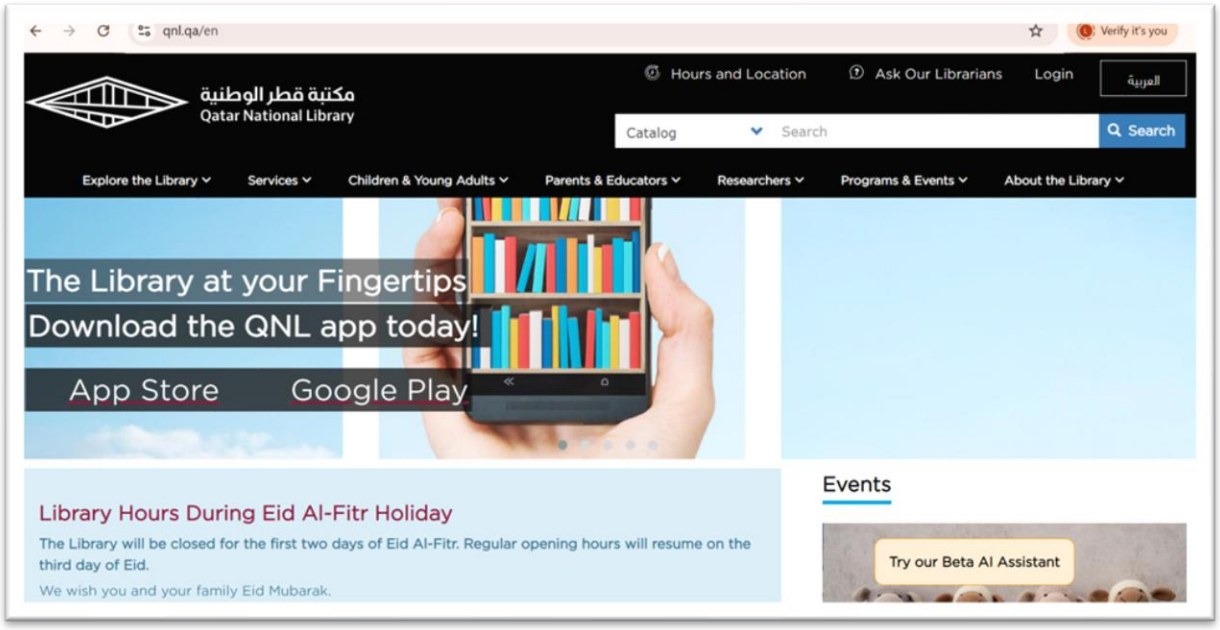


Figure 10: Home Page of Qatar National Library
Source: Qatar National Library website https://www.qnl.qa/en accessed on 31.01.2025

The Qatar National Library (QNL), located in Doha, is a world-class library and cultural center. It was officially opened in 2018 as part of Qatar Foundation's efforts to promote knowledge and research. QNL holds over one million books, rare manuscripts, periodicals, and digital archives, with a focus on Arabic and Islamic heritage. It serves as a national library, a public library, and a research library, offering modern facilities and digital resources.

Analysis and Discussion

The analysis of ten national library website Data were collected
from SimilarWeb (https://www.similarweb.com/) from December 2024 to February 2025. Key performance indicators analyzed include:

- Total visits (overall website traffic)
- Global and country ranking
- Average visit duration (time spent on the website)
- Bounce rate (percentage of users who leave without interacting)
- Device distribution (desktop vs. mobile usage)

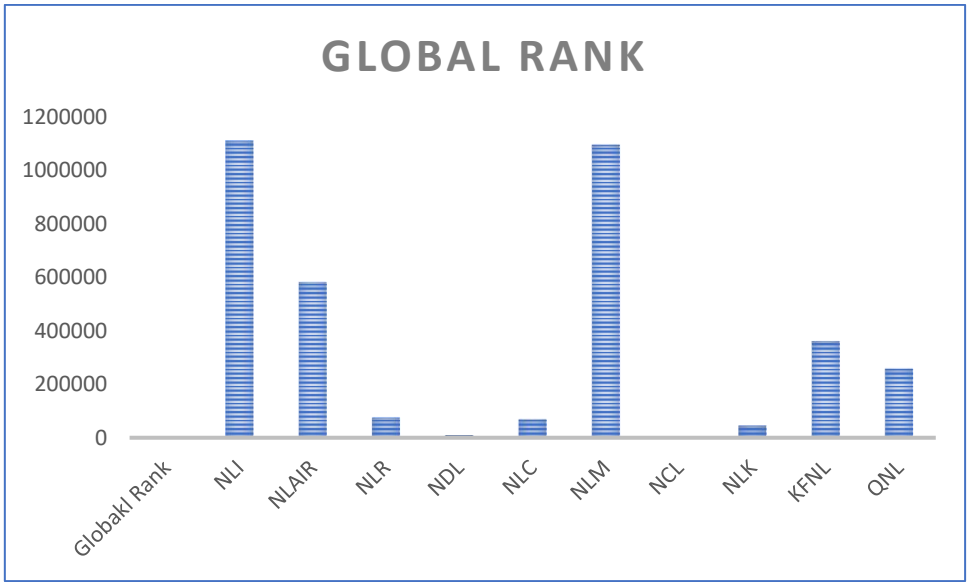


Figure 11: Global Rank of the Ten Asian continent National Libraries

This figure presents the global ranking of national libraries in Asia based on web traffic and online engagement. Higher-ranked libraries attract more visitors and have stronger digital visibility. The ranking reflects the popularity of online resources, digital archives, and services offered by these libraries. National libraries in technologically advanced countries tend to have higher global ranks. Libraries with lower rankings might need to improve their digital presence. The ranking is influenced by the accessibility of e-books, research papers, and public outreach programs. It highlights competition among libraries to maintain a strong online presence. Libraries with a well-developed digital infrastructure led to rank higher. The figure may also indicate the trends in library usage across different regions of Asia. Continuous improvement in digital services can enhance a library's global standing. The National Library of China (NLC) had the highest total visits (1.6 million), followed by Russia (1.55 million) and South Korea (2.54 million). Libraries with higher total visits also had longer average session durations, indicating better engagement.

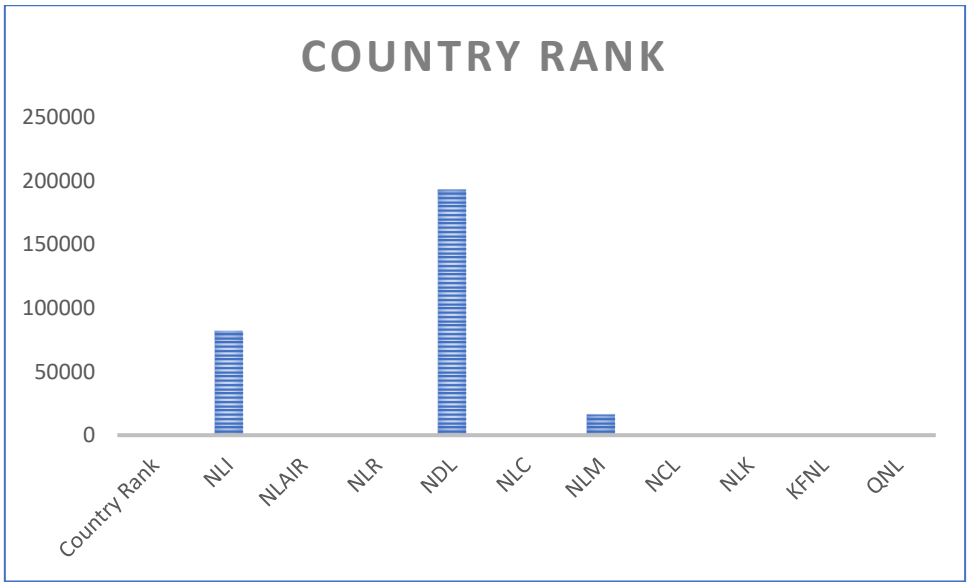


Figure 12: Country Rank of the Ten Asian continent National Libraries

This figure compares national libraries within their respective countries. A library with a high-country rank has a significant national presence and strong local user engagement. The ranking is determined by factors such as online visits, digital collections, and research accessibility. Libraries that integrate digital transformation effectively often rank higher. The country rank suggests the need for enhanced outreach and technological advancements due to its lowest rank. Popularity at the national level indicates a strong connection with the

country's academic and research institutions. Government policies supporting digital libraries may influence such rankings. User preferences and digital literacy levels within a country also play a crucial role. The figure can guide libraries in strategizing their digital expansion. It serves as a benchmark for national libraries to improve their online services.

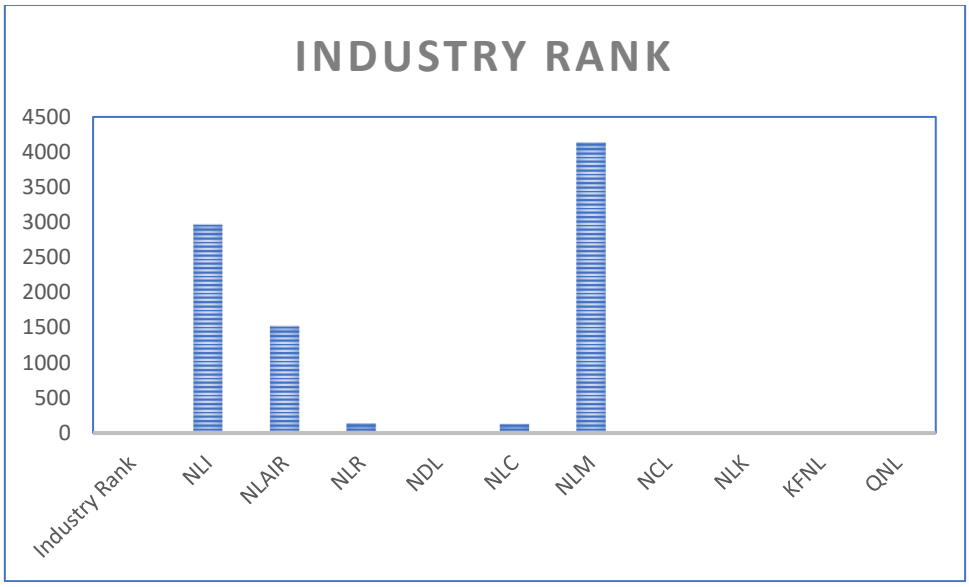


Figure 13: Industry Rank of the Ten Asian continent National Libraries

This figure compares national libraries with other organizations in the information industry. It reflects how well libraries perform in the broader sense and research sector. A high industry rank suggests that a library competes effectively with academic institutions, archives, and research organizations. This ranking has impact by digital services, publication access, and technological innovations. Libraries with a low industry rank may need to improve user engagement and resource availability. Partnerships with universities and open-access initiatives can enhance rankings. Increased funding for digital transformation can improve industry rankings. The figure highlights the need for continuous innovation in library services. It underscores the role of libraries in the digital information ecosystem. Libraries with high industry rankings are key players in the knowledge economy.

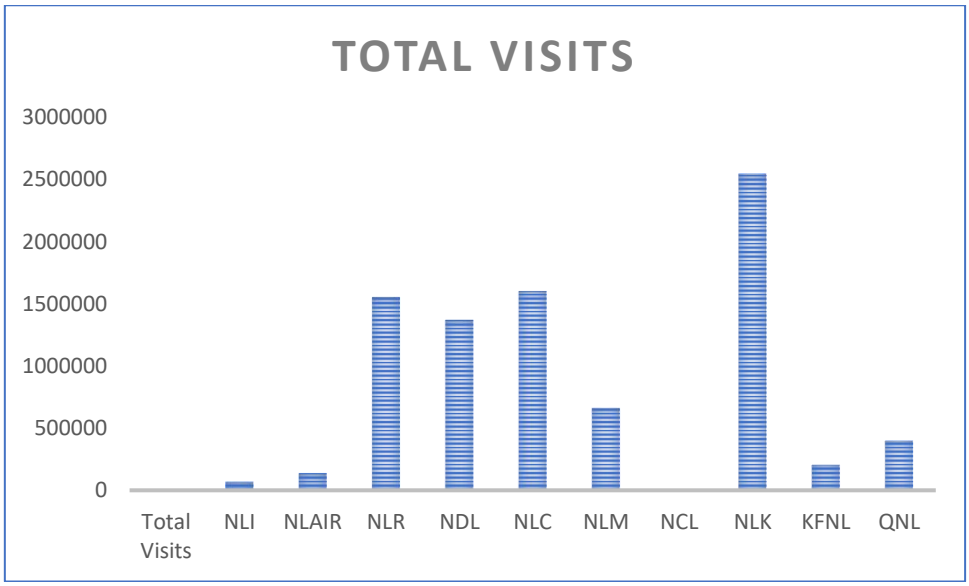


Figure 14: Total Visits of the Ten Asian continent National Libraries

This figure presents the number of online visits how each national library receives. Higher visits indicate strong digital engagement and widespread usage. Libraries with vast digital collections often attract

more visitors. Total visits can be influenced by research accessibility, online events, and educational programs. A lower number of visits suggests the need for improved user outreach. Marketing and social media strategies can help increase library visits. Seasonal trends may affect library traffic, with peaks during academic semesters. The figure highlights the importance of intuitive website design for user retention. Popular libraries often provide multilingual support and user-friendly interfaces. Monitoring total visits helps libraries to assess and enhance their online services. National Library of Russia (NLR) recorded the highest average visit duration (5.03 minutes), suggesting well-structured and engaging content. High bounce rates (>50%) were observed in some libraries, which indicate the potential usability issues.

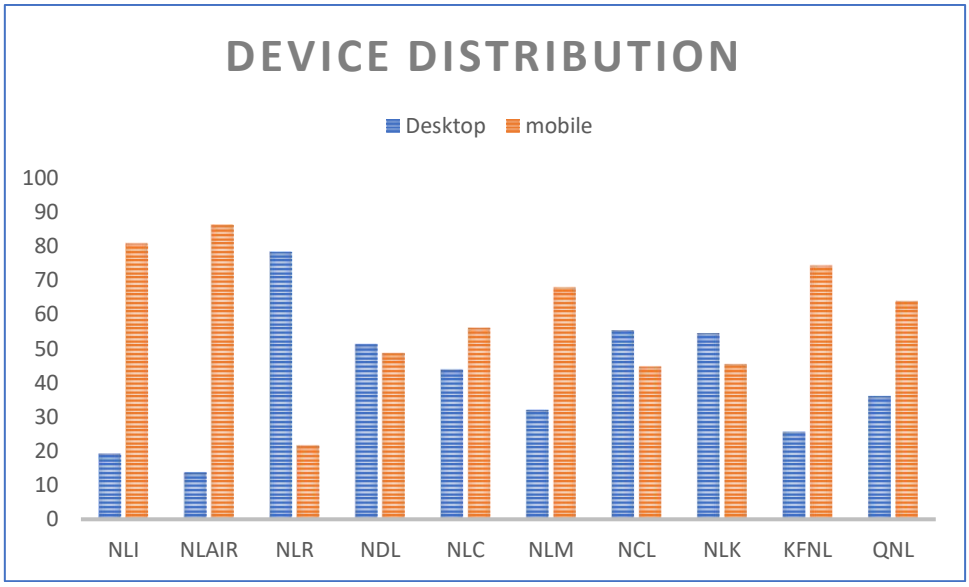


Figure 15: Device Distribution of the Ten Asian continent National Libraries

This figure illustrates how users access national library websites through different devices. It categorizes traffic from desktops, mobile phones, and tablets. A high percentage of mobile users suggests a need for mobile-friendly interfaces. Libraries with a mobile-responsive design improve accessibility for a broader audience. Desktop users may indicate academic and research-related visits. Tablet usage is generally lower and be significant for certain variables. The distribution helps libraries to optimize their digital platforms for different devices. Mobile accessibility is crucial for users in countries with high smartphone penetration. Understanding device distribution aids in website development and digital marketing strategies. Enhancing user experience across devices increases overall library engagement. Mobile access dominated across most national library websites, with over 60% of traffic coming from mobile devices for India, Iran, and Saudi Arabia. Russia and Japan had higher desktop usage, indicating a more research-oriented user grants.

Table 2: Bounce Rate of the Ten Asian continent National Libraries

Name of the Library	Monthly Visits	Monthly Unique Visits	Visits/Unique Visitor	Pages per Visit	Bounce Visit	Page Views	Visit Duration
NLI	22715	14074	1.61	4.32	56.49	98.222	00.01.52
NLAIR	45999	19399	2.37	5.40	40.98	248.521	00.03.15
NLR	519130	284063	1.83	6.57	30.81	3410M	00.05.03
NDL	4571	2762M	1.65	5.09	55.49	23.24M	00.04.03
NLC	534254	250248	2.13	6.36	42.88	3.395M	00.02.51
NLM	22106	14672	1.51	2.75	61.94	60.871	00.01.47
NCL	1768	1450	1.22	1.20	34.38	2.120	00.00.27
NLK	849473	340018	2.50	8.00	30.56	6.799M	00.05.37
KFNL	68360	42863	1.59	3.62	33.12	247.758	00.01.08
QNL	134061	55128	2.43	5.15	41.82	690059	00.01.54

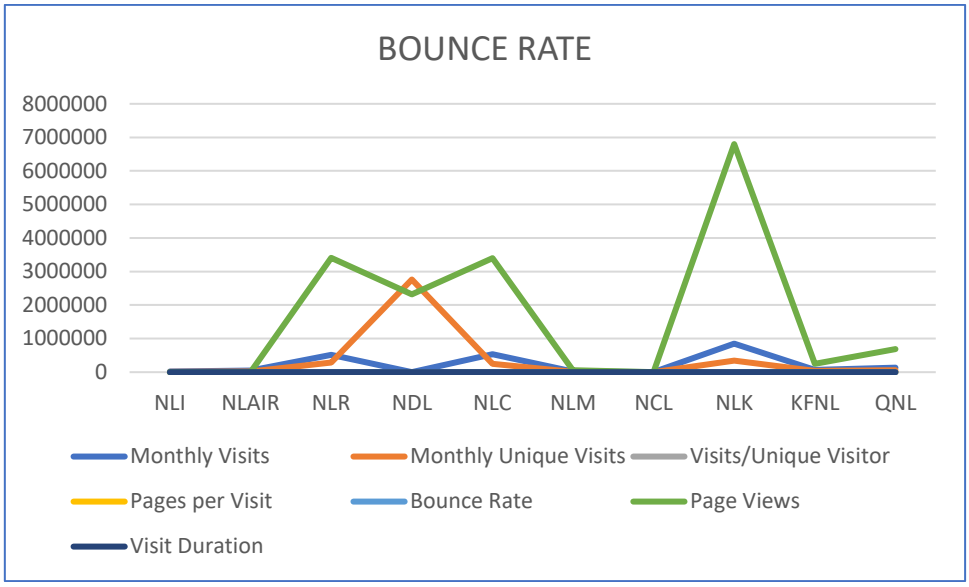


Figure 16: Bounce Rate of the Ten Asian continent National Libraries

This figure shows the percentage of users who leave the library website after viewing only one page. A high bounce rate suggests that users do not find relevant contents or face usability issues. Lower bounce rates indicate engaging content and a well-structured website. Libraries with comprehensive search functions tend to retain visitors longer. A high bounce rate may highlight the need for better navigation and improved content organization. Enhancing digital resources, interactive features, and user engagement strategies which can reduce bounce rates. Mobile users often contribute to higher bounce rates due to browsing habits. Slow website speed can also negatively impact bounce rates. Understanding user behaviour through bounce rate analysis helps to improve digital services. Libraries can optimize their websites to encourage effective engagement and exploration. Libraries with higher bounce rates (above 50%) indicated usability issues or less engaging contents. The National Library of Russia had the longest average session duration (5.03 minutes), suggesting better content engagement.

IV. Findings

1. The National Library of China (NLC) witnessed one of the most visits overall (more than 1.6 million), demonstrating a high level of digital engagement due to its extensive online resources and bilingual materials.
2. The longest average session length (5.03 minutes) was recorded by the National Library of Russia (NLR), bringing well-structured contents that successfully holds users' attention.
3. With 2.54 million visits overall, the National Library of Korea (NLK) had the most, revealing effective outreach and platform use.
4. The Qatar National Library (QNL) and the National Library of Iran (NLAIR) demonstrated successful user engagement with average visit lengths exceeding three minutes.
5. The comparatively higher bounce rates (>50%) of the King Fahd National Library (KFNL), the National Library of Malaysia (NLM), and the National Library of India (NLI) suggested less interesting or usable information.
6. India (NLI), Iran (NLAIR), and Saudi Arabia (KFNL) all have mobile access dominance, with over 60% of traffic originating from mobile devices. This suggests that more mobile optimization is required.
7. More desktop users visited Russia's National Diet Library (NLR) and Japan's NDL, suggesting that their audience is mostly research-oriented.

V. Suggestions

Improved navigation, frequently asked questions, and interactive elements are ways that NLI (India), NLM (Malaysia), and KFNL (Saudi Arabia) can lower their bounce rates.
2. NDL (Japan) and NCL (Taiwan) might gain by improving their mobile responsiveness in order to better serve the expanding mobile user groups.
3. Given the prevalence of mobile traffic, all libraries should improve their mobile optimization, but NLI, NLAIR, and KFNL in particular.
4. NLAIR, NCL, and QNL should prioritize the visibility of key resources such as digital archives, new arrivals, and book recommendations, as well as the clarity of their contents.

5. To increase discoverability, SEO and social media tactics should be improved for all libraries, but particularly for those with lower global rankings, such NCL (Taiwan) and NLM (Malaysia).
6. All libraries should implement accessibility upgrades in accordance with WCAG requirements to guarantee inclusivity for patrons with impairments.

Recommendations for Improvement:

- Enhanced mobile device responsiveness

As a significant portion of visitors access national library websites via mobile devices, ensure that all of them are fully responsive. Responsive design should allow for smooth screen size adjustments.

- Improve Website Structure and Navigation

Redesign website layouts to ensure that navigation is easy to use. Highlight important features on the homepage, such as digital archives, new arrivals, book recommendations, and research tools.

- Reduce Bounce Rates with Interactive Features

Offer user-friendly features like live chat support, recommendation engines, FAQs, and interactive content to encourage deeper involvement and reduce early exits.

- Make Digital Accessibility Better

Make websites accessible to people with impairments by following the Web Content Accessibility Guidelines (WCAG). Standard features should include keyboard navigation, readable typefaces, and alt-text.

- Make Use of Social Media and SEO

Use effective SEO techniques, such as keyword-rich content and metadata optimization. Increase traffic and visibility by actively promoting digital collections, events, and services on social media networks.

- Update Content Frequently and Track Performance

Keep your material current, and utilize tools like SimilarWeb to monitor user behavior on a frequent basis. Make data-driven changes by utilizing analytics insights.

VI. Discussion

This study's main goal was to use web analytics to evaluate and compare the digital efficacy of national library websites among the chosen Asian nations. It specifically sought to assess, using SimilarWeb metrics, user engagement, website traffic, device usage, bounce rates, and accessibility. Despite their shared goal of preserving and sharing knowledge in the digital age, national libraries' differing levels of online visibility and usability were the main focus of the study.

The results show significant variations in digital performance. Longer average visit durations and reduced bounce rates were indicators of better involvement for libraries like the National Library of Russia and the National Library of South Korea. On the other hand, some libraries experienced significant bounce rates and shorter session lengths, especially those with out-of-date interfaces or little content, which may indicate a lack of interesting or easily accessible digital infrastructure. These results are consistent with previous research by Brahma and Verma (2022), who found that a large number of national libraries in Asia lack digital features and up-to-date information, which affects their online exposure and user confidence.

It is concluded that websites with better navigation and content structure demonstrated longer session durations and repeat visits echoes Shevchenko's (2020) emphasis on the necessity of tracking user behavior to improve digital services. Furthermore, the findings support the outcome of Farashi et al. (2020), who highlighted the direct relationship between engagement and website quality, including SEO and social media integration. Libraries with maximized content and social connectivity, such as those in South Korea and China, scored higher domestically and internationally in this survey. The improved performance of libraries with dynamic and mobile-friendly websites is evidence of the importance of web impact elements like link structure and update frequency in online presence, according to Verma and Brahma's (2017) webometric study.

This study demonstrates how important the digital strategy determines the efficacy and visibility of national library websites. Even while there has been improvement, particularly in nations with robust ICT infrastructure, many libraries still need to integrate user-centric features, update information often, and adopt responsive designs in order to remain relevant and accessible in the digital world.

VII. Conclusion

The digital presence of national libraries varies significantly, with some excelling in user engagement while others struggle with accessibility and visibility. This study highlights the variations in digital engagement across national libraries in Asia. While some libraries excel in attracting visitors and maintaining engagement, others face challenges related to usability, accessibility, and retention. To enhance their digital presence, national libraries must prioritize mobile optimization, accessibility, and interactive content. Implementing best practices in website design and user engagement will enable libraries to serve a broader audience effectively. Future

research can expand this study by incorporating AI-driven web analytics and user feedback mechanisms to further refine digital strategies for national libraries.

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