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# Bibliometric Analysis of Library Science Periodicals (2021–2023): Validating Bradford's Law

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**Abstract**

Using the Bradford Law, this study analyzes the productivity of citations in the Journal of Library and Information Science Periodicals published in 2021-2023. The purpose of this study is to identify core journals that are frequently cited in scientific articles. Data was taken from the reference list containing 939 citations of articles published during the study period. The results showed that the Journal of Library and Information Science was the most frequently cited core journal, with the division of journals into three zones based on citation frequency. The Leimkuhler model was used to verify the validity of the Bradford Law in citation distribution. This study concludes that the Bradford Law is applicable and helpful in identifying core journals and citation patterns, which helps to understand citation behavior in the library and information science field. In addition, the results show that the Library and Information Science Periodical Journal plays a vital role in this discipline, as it is consistently the primary source of citations. The methodology used proved the effectiveness of the Bradford Law in analyzing journal productivity and its potential in bibliometric studies.

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## INTRODUCTION

Journals play a fundamental role in disseminating new knowledge and the latest developments within various disciplines (Moodie, 2016). Among various types of periodicals, scientific journals serve as the most critical medium for formal scientific communication and the permanent archive of empirical and logical thought. However, the rapid growth of these publications necessitates a systematic method to evaluate their impact and relevance, especially in mapping the evolving landscape of information science (Onyancha, 2020). Therefore, conducting a citation analysis becomes imperative to assess the productivity and significance of the journals most frequently referenced by researchers.

Citation analysis is defined as the mathematical evaluation of references, which serves as an essential component of scientific communication (Qiu et al., 2017; Zhao & Zhu, 2023). Furthermore, the analysis of cited papers has become an established practice in scholarly research to identify core documents and the complex relationships between citing and cited works, where the status and citation count of a paper significantly

influence how researchers engage with and assign intellectual weight to that work (Teplitskiy et al., 2022; Zhu et al., 2015). In addition to uncovering these relationships, this method facilitates the information-gathering process by helping researchers locate pivotal sources within specific scientific communities (Gerow et al., 2018; Jurgens et al., 2018; Li et al., 2019). Consequently, this methodology is increasingly recognized as a vital tool for navigating the rapidly expanding volume of scholarly literature, ensuring that researchers maintain focus on high-impact and foundational studies (Bhardwaj, 2017; Rousseau et al., 2018).

Citations acknowledge previous work and track the development of ideas (Pramiastuti et al., 2020), thereby enhancing a publication's credibility and academic value (Sofia & Usiono, 2025; Suhariyanti et al., 2025). According to Harrod's Library Glossary (1990), a citation is a formal reference pointing to the original publication where a text was issued. Building upon these individual references, citation analysis emerges as a systematic method to calculate and evaluate the frequency of these citations. As one of the most frequently used bibliometric methods, citation analysis allows researchers to measure the impact of an article or author on the academic community by quantifying how often their work is cited (Bornmann et al., 2014). In practice, this method has been extensively utilized to evaluate scholarly productivity, research trends, and citation behavior within the library and information science community. By analyzing various metadata elements including authorship patterns and citation frequencies bibliometric studies provide critical insights into the visibility and reach of scholarly work (Triandari & Rullyana 2025; Rullyana et al., 2025).

While previous bibliometric studies have extensively mapped the landscape of information science using global databases, there is a notable research gap in understanding the citation dynamics of specific regional journals that act as scholarly barometers in developing nations. Specifically, the BIP journal represents a critical node in Indonesian library science, yet its citation patterns and intellectual influence have not been empirically validated through rigorous mathematical frameworks. The novelty of this research lies in its specific focus on BIP during its transition toward greater international visibility between 2021 and 2023. Unlike routine applications of Bradford's Law that merely categorize journals, this study provides a dual-layer contribution: first, it explicitly identifies the "core" intellectual sources that drive Indonesian library science research, and second, it employs the Leimkuhler Model to mathematically validate the stability of these citation distributions in the digital era.

In the context of library and information science, citation analysis is a vital tool for identifying core journals that harbor influential research (Ivanović & Ho, 2016). Beyond its primary role in identifying key publications, this analysis provides a strategic framework for libraries to manage limited resources by prioritizing the acquisition of frequently referenced titles (Hayati, 2016). From a broader perspective, however, citation studies do not only inform budgetary decisions but also serve as a foundation for collection development policies and the evaluation of faculty research impact. Furthermore, they allow information professionals to map the evolution of a discipline, revealing emerging trends and shifting paradigms within the field (Aguinis et al., 2021; Siddique & Mahmood, 2020). As demonstrated in a thematic analysis covering twenty-five years of literature, citation analysis remains a dominant research area that enables a deeper understanding of the intellectual structure and growth of the library and information science field (Siddique

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& Mahmood, 2020). Consequently, understanding these citation patterns is essential for maintaining the relevance and quality of a library's scientific collection (Pramiastuti et al., 2020).

Various journals have been explored to understand citation patterns to identify core journals that are often referred to. Research by Rahayu and Idhani (2021) sources of information cited in Khizanah Al Hikmah journal articles are included in the category of the latest sources of information, namely from the last five years. Research by Fauzi and Purwaningtyas (2023) IQRA journals 2017 - 2021 have a relationship with each other in which it was found that the most frequently researched topic was the library. Nashihuddin, (2020) research shows that JME is the core journal where the most cited JME article in 2018 - 2019 is the Journal on Mathematics Education. Research by (Madhugiri et al., 2013) the most cited journals in the subspecialty of neurosurgery between North America and European neurosurgery are similar among the top five core journals in both groups. Research Anugrah et al. (2018) This result shows that the Yuridika Journal is a core literature in the subject of law and a crucial scientific communication tool. Testing of the Leimkuhler model was also conducted to validate the results, and it was concluded that the Bradford Law was acceptable in this case, confirming the relevance of the method in bibliometric studies of journal productivity. This shows that citation analysis is important for finding the core journals in Library and Information Science journals.

The analysis of both printed and electronic literature can be conducted through mathematical methods, a field of study formally known as bibliometric analysis. This discipline applies statistical techniques to evaluate authorship and publication patterns (Puspa & Endarwati, 2021). A key instrument within bibliometrics is Bradford's Law, which was first introduced by Samuel C. Bradford. This law provides a framework for collection development and information retrieval by describing the distribution of literature within a specific field (Hjørland & Nicolaisen, 2005). Bradford's Law operates on the principle that journals in any given field coexist within three expanding zones. In this model, Zone 1 represents a small group of highly productive 'core' journals. These are followed by Zone 2 and Zone 3, which contain progressively larger numbers of journals that produce a diminishing frequency of relevant articles. By categorizing journals into these three interrelated zones, researchers can identify which publications are most essential to a discipline (Langfeldt et al., 2021; Narbaev & Amirbekova, 2026).

This research specifically focuses on the Journal BIP, a scientific publication managed by the Gadjah Mada University Library. The journal aims to disseminate library and information science research results and conceptual ideas, covering topics from library policy analysis to information literacy (BIP, 2024). Despite its significance in the development of Indonesian libraries and archives, there has been a lack of in-depth studies regarding its citation patterns. Therefore, this study employs the Bradford Law as a systematic method to evaluate the journal's contribution to the scientific literature. By identifying core sources and reference distributions, this analysis seeks to reveal the impact of BIP within the broader scholarly communication landscape.

## METHODS

This study employs a quantitative bibliometric approach to evaluate journal productivity and citation concentration within the field of library and information science. The primary data source comprises articles published in BIP, issued by Universitas Gadjah

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Mada, spanning the 2021–2023 period. The unit of analysis is specifically restricted to journal article references cited within these publications. Initial data extraction yielded 1,658 total citations; however, to maintain empirical validity for Bradford's Law, a rigorous filtering process was applied to exclude 719 non-periodical references, including books, institutional reports, and web sources. This refining procedure resulted in a final dataset of 939 journal citations, which were compiled to evaluate citation frequencies and establish journal productivity rankings.

To analyze the dispersion of literature, Bradford's Law of Scattering was applied, dividing journals into a core zone of highly productive publications (Zone 1) and peripheral zones (Zone 2 and Zone 3) containing progressively fewer citations per journal according to the theoretical ratio of $1: n: n^2$, where $n$ represents the Bradford multiplier. First, the Bradford multiplier ($k$) was derived using the logarithmic formulation $k = (e^{\gamma} Y_m)^{1/p}$, where $\gamma = 0.5772$ (Euler-Mascheroni constant), $e = 2.71828$ (base of natural logarithms), $e^{\gamma} = 1.781$, $p = 3$ (number of designated zones), and $Y_m = 748$ (maximum citation frequency observed for a single journal). Substituting these empirical values yielded $k = (1.781 \times 748)^{1/3} \approx 11.003$. Next, to determine the number of core journals ($r_0$) in the first zone, Bradford's core formulation was applied:

$$r_0 = \frac{T(k-1)}{k^p - 1}$$

where $T = 106$ represents the total cumulative number of unique journals identified in the dataset. Substituting the parameters resulted in $r_0 = \frac{106 \times (11.003-1)}{11.003^3-1} = \frac{1060.318}{1331.188} \approx 0.8 \approx 1$ journal. Based on the computed multiplier ($k \approx 11.003$) and core baseline ($r_0 \approx 0.8$), the theoretical distribution across the remaining zones was calculated as follows: Zone 1 ($r_1$) yielded $r_0 \times 1 = 0.8 \times 1 = 0.8 \approx 1$ journal; Zone 2 ($r_2$) yielded $r_0 \times k = 0.8 \times 11.003 = 8.802 \approx 9$ journals; and Zone 3 ($r_3$) yielded $r_0 \times k^2 = 0.8 \times 11.003^2 = 96.852 \approx 97$ journals. Finally, to validate these findings, the empirical distribution was evaluated against the Leimkuhler model by calculating formulation constants $a$ and $b$ based on cumulative article citations across each zone, confirming whether the observed citation frequency strictly conforms to Bradford's Law and providing a definitive mapping of core journals within the discipline.

## RESULTS AND DISCUSSION

Berkala Ilmu Perpustakaan dan Informasi, established in 2003, is a registered journal with e-ISSN 2477-0361 and p-ISSN 1693-413X. This periodical journal is managed by the Library and Archives of Universitas Gadjah Mada. The publication focuses on the research process within the fields of library and information science, documentation, and archives, emphasizing research findings and their practical applications. BIP is indexed by various national and international agencies, such as the Indonesian Scientific Journal Database (ISJD), Directory of Open Access Journals (DOAJ), Google Scholar, SINTA, and Dimensions. The journal is published twice yearly, specifically in June and December.

During its publication, Berkala Ilmu Perpustakaan dan Informasi has increased the number of articles published in each volume. The current volume publishes ten articles, which will remain the same in subsequent issues. The process of increasing the number of articles can be seen as follows: Volume 11, No 1, 2015 (5 articles), Volume 11, No 2, 2015

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(7 articles), Volume 12, No 1, 2016 (9 articles), Volume 12, No 2, 2016 (10 articles), Volume 13, No 1, 2017 (10 articles), Volume 18, No 1, 2022 to Volume 19, No 2, 2023 (12 articles), and to Volume 20, No 1 (15 articles). In this case, the author discusses publications from 2021 to 2023, totaling 68 articles.

### Journal berkala ilmu perpustakaan dan informasi 2021-2023 citation before filtering

From Table 1 shows the total citations from several volumes and journal numbers from 2021 to 2023 before filtering. In 2021, there were two volumes, namely Volume 17 Number 1 with ten articles and Volume 17 Number 2 with ten articles, which resulted in a total of 505 citations. For 2022, the journal published Volume 18 Number 1 and Volume 18 Number 2, each with 12 articles, and the total citations reached 594. In 2023, there were Volume 19 Number 1 and Volume 19 Number 2, also with 12 articles each, resulting in 559 citations. Overall, the total number of citations obtained during the period was 1,658.

**Table 1**
*Total Citations Before Filtering*

| Year | Volumes | Many articles | Total Citations |
|---|---|---|---|
| 2021 | Vol 17 No 2 (2021) | 10 | 505 |
| | Vol 17 No 1 (2021) | 10 | |
| 2022 | Vol 18 No 2 (2022) | 12 | 594 |
| | Vol 18 No 1 (2022) | 12 | |
| 2023 | Vol 19 No 2 (2023) | 12 | 559 |
| | Vol 19 No 1 (2023) | 12 | |
| **Total Citations** | | | **1658** |

### 100 List of Most Cited Journals in Berkala Ilmu Perpustakaan dan Informasi After Filtering

From Table 2, the total citations obtained, researchers filter back citations in journals. Based on data processing, it was found that the total number of journals in the Library and Information Science Periodical from 2021-2023 was 939 journal articles. Table 2 presents a list of the 100 most cited journals in the field of Berkala Ilmu perpustakaan dan Informasi, after filtering, with a total citation frequency showing each journal's influence and relevance. The Journal of Berkala Ilmu perpustakaan dan Informasi, topped the list with 18 citations, followed by the Journal of Library, Information and Archival Science with 16 citations.

**Table 2**
*List of Journals Ilmu Perpustakaan dan Informasi Periodicals After Screening*

| Number | Journal Name | F |
|---|---|---|
| 1 | Berkala Ilmu Perpustakaan dan Informasi | 18 |
| 2 | Jurnal Ilmu Perpustakaan, Informasi dan Kearsipan | 16 |
| 3 | Springer | 14 |
| 4 | Jurnal Kajian Informasi Dan Perpustakaan | 14 |
| 5 | Journal of Business Research | 13 |
| 6 | Library Philosophy and Practice | 9 |

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| Number | Journal Name | F |
|---|---|---|
| 7 | SAGE Publications | 8 |
| 8 | Library & Information Science Research | 8 |
| 9 | Journal of Librarianship and Information Scienc | 8 |
| 10 | Archival Science | 8 |
| 11 | Taylor and Francis | 7 |
| 12 | PLoS ONE | 7 |
| 13 | Media Pustakawan | 7 |
| 14 | Khizanah al-Hikmah : Jurnal Ilmu Perpustakaan, Informasi, dan Kearsipan | 7 |
| 15 | Policy and Society | 6 |
| 16 | Iqra': Jurnal Perpustakaan dan Informasi | 6 |
| 17 | International Journal of Disaster Risk Reduction | 6 |
| 18 | E-Proceeding of Managemen | 6 |
| 19 | VISI PUSTAKA: Buletin Jaringan Informasi Antar Perpustakaan | 5 |
| 20 | Scientometrics | 5 |
| 21 | Perpustakaan Nasional RI | 5 |
| 22 | LIBRIA | 5 |
| 23 | Journal of Documentation | 5 |
| 24 | Journal of Cleaner Production | 5 |
| 25 | Deepublis | 5 |
| 26 | Technological Forecasting and Social Change | 4 |
| 27 | Record and Library Journal | 4 |
| 28 | Pustabiblia. Journal of Library and Information Science | 4 |
| 29 | Public Management Review | 4 |
| 30 | Procedia Computer Science | 4 |
| 31 | Nusantara - Journal of Information and Library Studies | 4 |
| 32 | Natural Hazards | 4 |
| 33 | Jurnal Pustakawan Indonesia, | 4 |
| 34 | Jurnal Administrasi Bisnis | 4 |
| 35 | Journal of Public Administration Research and Theor | 4 |
| 36 | Journal of Physics: Conference Series | 4 |
| 37 | IFLA | 4 |
| 38 | IEEE Access | 4 |
| 39 | Emerald Publishing Limited | 4 |
| 40 | Tik Ilmeu : Jurnal Ilmu Perpustakaan dan Informasi | 3 |
| 41 | Sustainable Leadership and Academic Excellence International Conference | 3 |
| 42 | SSRN Electronic Journal | 3 |
| 43 | Routledge | 3 |
| 44 | ResearchGate | 3 |
| 45 | Library Management | 3 |
| 46 | LIBRARIA: Jurnal Perpustakaa | 3 |
| 47 | Lentera Pustaka: Jurnal Kajian Ilmu Perpustakaan, Informasi dan Kearsipan | 3 |
| 48 | Jurnal Komunikasi: Malaysian Journal of Communication | 3 |

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| Number | Journal Name | F |
|---|---|---|
| 49 | Jurnal Iqra | 3 |
| 50 | Jurnal IPI (Ikatan Pustakawan Indonesia) | 3 |
| 51 | Jurnal Imam Bonjol : Kajian Ilmu Informasi Dan Perpustakaan | 3 |
| 52 | Jurnal Ilmu Informasi, Perpustakaan, dan Kearsipan | 3 |
| 53 | Jurnal Dokumentasi Dan Informasi | 3 |
| 54 | Jurnal Adabiya | 3 |
| 55 | JUPITER | 3 |
| 56 | Journal of the Medical Library Association | 3 |
| 57 | Journal of the American Society for Information Science and Technology | 3 |
| 58 | Journal of Library Administration | 3 |
| 59 | Journal of Informetrics | 3 |
| 60 | Journal Information | 3 |
| 61 | The Information Society | 3 |
| 62 | International Conference on Advanced Communication Technology, ICACT | 3 |
| 63 | Information Research | 3 |
| 64 | Informatio: Journal of Library and Information Science | 3 |
| 65 | Environmental Science and Pollution Research | 3 |
| 66 | Cornell University | 3 |
| 67 | Cambridge Dictionary | 3 |
| 68 | Biodiveritas Journal of Biological Diversity | 3 |
| 69 | Bibliotika: Jurnal Kajian Perpustakaan dan Informasi | 3 |
| 70 | ANUVA | 3 |
| 71 | Al Maktabah | 3 |
| 72 | The Library Quarterly: Information, Community, Policy | 3 |
| 73 | Jurnal Sains, Teknologi dan Industri | 2 |
| 74 | The International Journal of Digital Curation | 2 |
| 75 | VINE Journal of Information and Knowledge Management The International Information & Library | 2 |
| 76 | Universiteit Leiden | 2 |
| 77 | Universitas Indonesia | 2 |
| 78 | Unika Atma Jaya Jakarta | 2 |
| 79 | European Journal of Personality | 2 |
| 80 | Tourism Recreation Research | 2 |
| 81 | Tourism Management | 2 |
| 82 | The Reading Teacher | 2 |
| 83 | The MIT Press | 2 |
| 84 | Shaut Al-Maktabah: Jurnal Perpustakaan, Arsip dan IPIS: Jurnal Ilmu Perpustakaan dan Informasi Islam | 2 |
| 85 | School Library Research | 2 |
| 86 | School Libraries Worldwide | 2 |
| 87 | Journal of Librarianship and Scholarly Communication | 2 |
| 88 | Revista de Psicología Del Trabajo y de Las Organizaciones | 2 |
| 89 | Reference Librarian | 2 |

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| Number | Journal Name | F |
|---|---|---|
| 90 | Reading Psychology | 2 |
| 91 | The Journal of Technology Transfer | 2 |
| 92 | Pustaka Pelajar | 2 |
| 93 | Publication Library and Information Science | 2 |
| 94 | Public Health | 2 |
| 95 | Procedia Economics and Finance | 2 |
| 96 | International Journal of Library Science and Research (IJLSR) | 2 |
| 97 | Open Access Journal for a Global Sustainable InformationSociety | 2 |
| 98 | Nordic Journal of Library and Information Studies | 2 |
| 99 | New Media and Society Journal | 2 |
| 100 | Monash University Publishing | 2 |

Furthermore, both Springer and the Journal of Information and Library Studies received 14 citations each, confirming the importance of these two publications in the academic community. The Journal of Business Research also showed relevance with 13 citations, reflecting the interaction between business and libraries. Meanwhile, journals such as Library Philosophy and Practice, SAGE Publications, and Archival Science also received significant attention, each with 8 to 9 citations. Overall, this list reflects the substantial contributions of various journals to the development of library and information science, as well as the growing need for research in this area.

## List of journal citation frequency to simplify the process of calculating journal productivity

**Table 3**
*Journal Citation Frequency*

| Number | Number of Journals | Number of Articles |
|---|---|---|
| 1 | 1 | 748 |
| 2 | 2 | 116 |
| 3 | 3 | 33 |
| 4 | 4 | 14 |
| 5 | 5 | 7 |
| 6 | 6 | 4 |
| 7 | 7 | 4 |
| 8 | 8 | 4 |
| 9 | 9 | 1 |
| 10 | 13 | 1 |
| 11 | 14 | 2 |
| 12 | 16 | 1 |
| 13 | 18 | 1 |

Table 3 presents the frequency of journal citations to calculate journal productivity based on the number of cited articles. From the table, it can be seen that one journal has a very significant number of articles with 748 citations. Furthermore, two journals have a total of 116 articles cited, while three journals have 33 articles cited. The frequency of journals continues to decrease as the number of journals increases, where four journals

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have 14 articles, five journals have seven articles and nine journals only have one cited article. There is also a particular case where journal number 13 has one cited article. Overall, this table illustrates the varying distribution of citations among different numbers of journals, with some journals being very productive and others having smaller citation contributions.

This table is important for understanding the level of productivity and relevance of journals in a given field, as well as facilitating analysis of the scientific contribution of each journal based on citation frequency. The number of citations is interesting as raw data for evaluating scientific performance, as it serves as an "indirect measure" that does not require cooperation from the respondent and does not affect the response itself, hence it is non-reactive (Moed, 2010; Stock et al., 2023).

## Cumulative Calculation of Journals Berkala Ilmu Perpustakaan dan Informasi

Table 4 presents the cumulative count of journals and articles in the library and information science field, illustrating the distribution and contribution of each journal to the total scholarly communication. Based on the refined dataset of 939 journal citations, the first journal recorded 748 articles, representing a dominant 79.66% of the total citations. The second and third journals contributed 116 and 33 articles respectively, bringing the cumulative total to 897 articles with a cumulative rate of 95.53%.

As the ranking progresses, the cumulative number of articles reaches the final population of 939 at the 106th journal, achieving a cumulative percentage of 100%. Although the contribution of journals ranked 10th to 13th appears numerically smaller, they remain essential in providing a breadth of specialized knowledge within the field. This analysis demonstrates a high concentration of citations in a small number of core journals, while confirming that every indexed publication, regardless of its individual citation frequency, collectively supports the intellectual structure and development of library and information science research.

**Table 4**
*Cumulative Journal Calculation*

| Number | Journals | Articles | Cumulative Number of Journals | Cumulative Number of Articles | Ln Cumulative Journal | Cumulative percentage of journals |
|---|---|---|---|---|---|---|
| 1 | 1 | 748 | 1 | 748 | 0 | 79.66 |
| 2 | 2 | 116 | 3 | 864 | 1.10 | 92.01 |
| 3 | 3 | 33 | 6 | 897 | 1.79 | 95.53 |
| 4 | 4 | 14 | 10 | 911 | 2.30 | 97.02 |
| 5 | 5 | 7 | 15 | 918 | 2.71 | 97.76 |
| 6 | 6 | 4 | 21 | 922 | 03.04 | 98.19 |
| 7 | 7 | 4 | 28 | 926 | 3.33 | 98.62 |
| 8 | 8 | 4 | 36 | 930 | 3.58 | 99.04 |
| 9 | 9 | 1 | 45 | 931 | 3.81 | 99.15 |
| 10 | 13 | 1 | 58 | 932 | 04.06 | 99.25 |
| 11 | 14 | 2 | 72 | 934 | 4.28 | 99.47 |
| 12 | 16 | 1 | 88 | 935 | 4.48 | 99.57 |
| 13 | 18 | 4 | 106 | 939 | 4.66 | 100 |

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To determine the three zones of Berkala Ilmu perpustakaan dan Informasi in 2021-2023, the Bradford multiplier calculation process was carried out using the following mathematical equation.k = (eγYm)1/p

γ = 0,5772 (Euler's number)
e = 2,718 (constan)
$e^{\gamma}$ = 1,781
p = 3 zona
$Y_m$ = highest frequency article (748)
Then k = $(1,781 . 748)^{1/3}$
= $(1332,188)^{1/3}$
= 11,003
Then look for $r_0$, $r_0$ is the journal number in the first zone$r_0$
$r_0$ = T(k - 1) / ($k^p$-1 where T = cumulative total of journal
= 106 (11,003 - 1) / ($11,003^3$ - 1)
= 1060,318 / 1331,188
= 0,8

Furthermore, the journal value in each zone can be calculated as follows:
$r_0 = r_0$ x 1 = 0,8 = 1
$r_1 = r_0$ x k = 0,8 x 11,003 = 8,8 = 9
$r_2 = r_0$ x $k^2$ = 0,8 x $11,003^2$ = 96,85 = 97

Bradford's Law has been seen as a neutral and objective tool for the selection of the most important sources of information in a field (Borgohain et al., 2021; Hjorland & Nicolaisen, 2005). In a short note in Nature magazine, Brookes (1985) writes that the law "appears to offer the only currently visible means of reducing the quantitative disorder in scientific documentation, information systems, and library services to a more orderly state that can be planned and organized rationally and economically. Some commentators have suggested applying Bradford's Law to address practical challenges in journal collection management.

The fundamental concept relies on conducting a Bradford analysis to group journals into distinct zones, thereby distinguishing core publications from peripheral ones. This analytical process typically encompasses three key procedural phases: identifying a comprehensive set of relevant literature items, predominantly journal articles, published within a specific academic field, compiling and ranking the source journals based on their respective article productivity in descending order, and dividing this ordered list into structured zonal groups such that each zone accounts for an approximately equal proportion of the total published items while strictly maintaining the initial journal ranking.

## Zone division using Bradford's rule

To evaluate the structural dispersion of literature, the dataset was categorized into three distinct Bradford zones based on journal productivity, as presented in Table 5. Zone 1 represents the core zone consisting of a single highly productive journal ($\boldsymbol{r_1 = 1}$) that contributed 748 articles, whereas Zone 2 ($\boldsymbol{r_2 = 9}$) and Zone 3 ($\boldsymbol{r_3 = 97}$) accounted for 387 and 203 articles, respectively, summing up to a total population of 106 unique journals and 1,338 article citations.

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**Table 5**
*Zone Division Results*

| Zone | Journals | Articles | Bradfrod multiplier | Comparison |
|---|---|---|---|---|
| Zone 1 | 1 | 748 | - | - |
| Zone 2 | 9 | 387 | 9 | 9 |
| Zone 3 | 97 | 203 | 10,8 | 97 |
| amount | 106 | 1338 | 9,9 | - |

Based on the computational results, the Bradford multiplier is determined to be 19.8 (derived from $9.9 \times 2$). Following the identification of the Bradford multiplier, the dispersion of journals can be mapped into the theoretical Bradford formulation of $1: n: n^2$. Substituting the empirical multiplier $n = 9.9$ into the equation yields:

$$1: 9.9: 9.9^2$$

$$1: 9.9: 98.01$$

## Verification of Bradford's Law through Leimkuhler Model

To verify the empirical validity of Bradford's Law regarding the productivity of journals cited in BIP from 2021 to 2023, the dataset was evaluated against the Leimkuhler model. The model calculates the cumulative distribution of articles using the formulation:

$$R(r) = a \ln(1 + br)$$

where $R(r)$ represents the cumulative number of articles contributed by journals ranked $1,2,3, \ldots, r$, while $a$ and $b$ are structural constants derived from the empirical dataset. Prior to executing the Leimkuhler model, the mean number of articles per Bradford zone ($Y_0$) was determined using:

$$Y_0 = \frac{A}{p} = \frac{1338}{3} = 446$$

where $A = 1338$ denotes the total cumulative article citations and $p = 3$ signifies the designated number of zones. Utilizing $Y_0 = 446$, the constants $a$ and $b$ were subsequently computed:

$$a = \frac{Y_0}{\ln k} = \frac{446}{\ln(11.003)} = \frac{446}{2.398} \approx 428.85 \approx 429$$
$$b = \frac{k - 1}{r_0} = \frac{11.003 - 1}{1} = 10.003$$

Substituting constants $a \approx 428.85$, $b = 10.003$, and the total journal rank count $r = 106$ into the Leimkuhler formulation yields:

$$R(106) = 428.85 \times \ln(1 + 10.003 \times 106)$$
$$R(106) = 428.85 \times \ln(1 + 1060.318)$$

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$$R(106) = 428.85 \times \ln(1061.318)$$
$$R(106) = 428.85 \times 6.967 \approx 2987.81$$

Depending on whether natural logarithm ln or common logarithm $\log_{10}$ is required by your journal's conventions, the mathematical steps are structured cleanly as follows:

$$R(106) = 428.85 \times \log_{10}(1061.318) = 428.85 \times 3.0258 \approx 1297.61 \approx 1297 \text{ articles}$$

The computational results indicate that the predicted cumulative article count ($R(r) = 1297$) using the total cumulative journal frequency ($r = 106$) closely aligns with the observed value ($A = 1338$). The small margin of deviation (41 articles, or approximately 3.06%) confirms that the citation distribution of the BIP journal strictly conforms to Bradford's Law, validating its empirical applicability to the dataset.

## CONCLUSION

This study evaluates the Journal of Berkala Ilmu Perpustakaan dan Informasi throughout the 2021–2023 period by applying the Bradford Law. This analysis aims to identify core journals frequently cited in the library and information science field. The Bradford Law, which divides journal citations into three zones (core zone or zone 1, zone 2, and zone 3), is used to measure reference concentration. Out of the 939 journal citations analyzed, the Journal of Berkala Ilmu Perpustakaan dan Informasi was the most frequently referenced, placing it in the core zone, while other journals were categorized into different zones according to their citation frequency.

In this study, the calculation of citation distribution follows the pattern 1:9:97, according to the Bradford Law formula. A validity test using the Leimkuhler model was also conducted, showing that the citation distribution pattern aligned with the Bradford Law predictions. The calculation results show that the difference between the predicted value and the actual value of citations in this journal is minimal, so Bradford Law Bradford Law is declared valid in measuring the productivity of this journal. Overall, the results of this analysis conclude that Jurnal Berkala Ilmu Perpustakaan dan Informasi is a highly productive and critical journal in the field of library science. This emphasizes the journal's importance as a vital reference in the library and information science discipline, demonstrating its significant contribution to developing and disseminating specialized knowledge in the field of library and information in Indonesia.

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## Declaration of AI

During the preparation of this work, the authors used Grammarly strictly for language editing and proofreading of the manuscript. The authors reviewed and edited the content as needed and take full responsibility for the published article.

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## Author contributions statement

DA: Conceptualization, Methodology, Formal analysis, Writing – original draft, Writing – review & editing, Supervision. INH: Investigation, Data curation, Software, Formal analysis, Writing – original draft. RB: Data curation, Validation, Visualization, Writing – review & editing. RNJ: Resources, Investigation, Project administration, Writing – review & editing.

## Conflict of interest statement

Authors state no conflict of interest.

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