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Assessment of Citations in Commerce Doctoral Theses, Manipur University: A Bibliometric Study

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ABSTRACT

This bibliometric study examines citation patterns in bibliographies from 63 awarded commerce doctoral theses (1989–2018), creating a comprehensive dataset of cited references analyzed via MS Excel. Citations were classified into 11 categories, books, book chapters, journal articles, conference papers, government publications, periodicals, web resources, reports, theses/dissertations, and miscellaneous, with journal articles comprising 25.41% (n=1903) across 586 journals. The citation half-life across all sources stands at 27 years, 10 months, and 23 days, reflecting gradual obsolescence in commerce scholarship. To identify core journals, Bradford's Law of Scattering was applied. An initial multiplier (n=5.2) produced a 2.10% error, rendering it unsuitable. However, Egghe's Modified Leimkuhler Model yielded a refined multiplier (k=5.45) with a negligible 0.07% error, enabling validation and delineation of three Bradford zones. This study identified 16 core journals, topped by *Economic and Political Weekly* (91 citations). The findings reveal scholars' source preferences, citation behaviors, and exchange dynamics, offering actionable insights for researchers, faculty, librarians, and institutions to optimize research strategies, enhance interdisciplinary collaboration, and guide collection development in academic libraries. (178 words)

Keywords: Bibliometrics, Obsolescence, Citation Half-Life, Bradford's Law of Scattering, Leimkuhler Model.

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1. INTRODUCTION

The prestige and reputation of an institution are often measured by its research output and its impact (Mahanta, 2025). Furthermore, bibliometric studies have become essential for assessing the flow of scholarly communication across various fields. Research that incorporates bibliometric analysis typically employs statistical techniques to evaluate the productivity of authors and journals, as well as their relationships with other cited sources relevant to their research areas (Moed, 2005). This study focuses on the research outputs in the field of Commerce at Manipur University. The primary reason for selecting this discipline is that, despite the university's contributions to research since its establishment in 1984, no similar studies have been reported in any publications. This study will cover the following aspects:

- Forms of cited sources;
- Obsolescence of cited literature; and
- Identification of core journals

to enable the visibility of scholarly communication practices followed by the Commerce Doctoral

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Scholars of the University. No studies in the previous publication cover the regional context, especially from Manipur University. This study will enhance the visibility of the regional findings and, hence, will also be useful for library collection development, research evaluation, and policy formulation.

Departmental Profile: Commerce, Manipur University

The Department of Commerce was established in 1984, expanding the scope of the applied social sciences at the University. At present, the department has 7 regular faculty members and approximately 40 scholars. It offers M.Com. M.Phil. (currently closed), and PhD programs in finance, marketing, entrepreneurship, and organizational studies. The department has awarded 68 theses from 1989 to 2018, with its first doctoral thesis awarded in 1989. However, the latest data, i.e., 16 more theses awarded between 2019 and 2025. The department is noted for industrial promotion, enterprise financial performance, and entrepreneurship development in Northeast India.

2. LITERATURE REVIEW

Some of the previous reviews are incorporated here, such as Borgohain et al. (2021), who presented a bibliometric study to validate Bradford's law of scattering and the Leimkuhler model in the Information Science literature by analysing 665 publications across 213 journals from the Scopus database spanning 2001-2020. The study identified 12 core journals with the highest number of articles in the Scientometrics (39), followed by the Bulletin of the Medical Library Association (33), and so on. The findings have practical implications for library journal subscriptions and research. Fatima (2018) conducted a bibliometric analysis of commerce literature based on 18,383 cited references from 391 articles published in three major journals between 2012 and 2014. The study used MS Excel and examined citation growth, information sources, authorship patterns, disciplinary breadth, and core journals using Bradford's Law. Ghai (2001) conducted a citation analysis of doctoral theses in Library and Information Science submitted to selected universities during 1975–1999. The study found that journals were the most cited form of literature, indicating their importance in scholarly communication. Mahajan and Kumar (2017) studied a citation analysis of doctoral theses in history at Panjab University. In their study, the researchers extracted citations, categorized them by type, and analyzed their frequency and chronological distribution. They also ranked the most highly cited journals. The findings indicated that books were the most frequently cited sources, which is typical for historical research.

Additionally, the study identified key journals that play a significant role in scholarly communication within the discipline. Bradford (1934) formulated Bradford's Law of Scattering, but it is not associated with any mathematical model. The law represents a quantitative association between journals and the papers published in them, helping identify core journals across disciplines. This concept, later elaborated in his 1948 book 'Documentation,' describes the distribution pattern using the formula $1:n:n^2$, where n is a multiplier. Sashikala and Raju (2008) reported in their study that books and journal articles dominate citations in economic theses, with a half-life of 14.5 years. In some studies, as reported by Sevukan and Sharma (2008), Bradford's Law did not always fit empirical data, underscoring the need for context-specific validation. Shukla and Bhatt (2025) reported in their study on the influences of global and institutional perspectives on research outputs, analyzing authorship trends, preferred document types, and core journals. Singh and Bobby (2025) studied a dataset of 3922 citations compiled from bibliographies and references in 31 PhD theses in Library and Information Science at Manipur University. The findings of their study highlighted 11 types of cited sources, with journal articles dominating the citations, and also identified 12 core journals in library and information science, with IASLIC Bulletin ranking in the top and being marked as a favourite journal. Meanwhile, some studies, such as Tonta and AI (2006), reported higher citation rates for monographs than for journals and identified a half-life of around 9 years. Mandal (2020) believed that journals have a great role in the academic field as the mother of knowledge publication, and Zingkhai

and Meera (2022) examined the applicability of Bradford's Law and alternative models, such as the Leimkuhler models, to assess varying levels of suitability across datasets.

From the above review, it is evident that some research gaps are observed and reported such as lack of localized studies like studies focusing on Commerce theses of Manipur University; limited addressing on rich citation data of doctoral theses; restricting presence of all indicators in a study, however studies often found single bibliometric aspect (authorship, citation or obsolescence); presence of various document forms and varied authorship patterns suggested the need for discipline specific analysis; and Bradford's Law and measuring obsolescence using citation half-life have not been adequately tested in the local context of commerce research.

3. OBJECTIVES OF THE STUDY

The main aims of this paper are to:

(i) Understand various forms of cited resources appended in the theses
(ii) Aanalyze the obsolescence of cited literature using citation half-life
(iii) Identify core journals of the commerce discipline.

4. SCOPE AND LIMITATIONS OF THE STUDY

The study included doctoral theses awarded by the Department of Commerce, Manipur University, from 1989 to 2018. The bibliographies or references appended to Commerce Doctoral Theses were identified and extracted for the analysis. It is noted that the department has awarded 68 theses from 1989 to 2018, with its first doctoral thesis awarded in 1989. However, the latest data, i.e., 16 more theses awarded between 2019 and 2025, were excluded from this study due to non-coverage during the research period. This study focused exclusively on doctoral theses available at the Manipur University Library. Out of 68 theses, only 63 were included in the analysis. The remaining five theses were excluded due to issues such as unreadable texts and the inability to trace two of them.

5. METHODOLOGY

The study includes data collection, extraction of citations, and certain data analysis techniques:

5.1 Data Collection

The references or bibliographies appended to the end of 63 PhD theses awarded in Commerce between 1989 and 2018 were manually extracted and compiled into a dataset comprising 7490 citations. These 7490 citations were extracted, cleaned, verified, and tabulated in MS Excel for further analysis.

5.2 Obsolescence of Literature

The obsolescence of the literature was determined from the age distribution of the cited literature using the Citation half-life.

$$\text{Citation Half-Life (Median Age)} = L + \frac{(\frac{N}{2} - C)}{f} \times h$$

where,

L = Lower limit of frequency distribution

N= Total no. of citations

h = height of the frequency class

C = Cumulative citations

f = frequency where 50% of cum. citations falls.

5.3 Application of Bradford's Law

Cited journal articles distributed across the journals were identified using Bradford's Law to identify the core journals.

Firstly, Bradford's Law of Scattering gives 1:n: n^2, where n is Bradford's Multiplier. The cumulative citations data were computed and divided into three Bradford zones, each containing approximately equal numbers of citations.

Secondly,

$$\text{Error \%} = \frac{\text{Tot.Cal.Value of Journals} - \text{Tot.Given Value of Journals}}{\text{Tot.Given Value of Journals}} \text{ x100}$$

Error (%) is calculated to test the validity of data in the respective Bradford's Zones.

Thirdly, Modified Leimkuhler's Model, introduced by Egghe, L (1990), is applied.

$k=(e^{\gamma}xYm)1/p$ Where,

$e^{\gamma}=1.781$ (Euler's constant; sometimes represented as e^{y} in texts)

Ym = number of citations in the most productive source

, p is the number of Bradford zones = 3

This value' k' is the new Bradford's Multiplier, which plays an important role in determining new Bradford's Zones.

Fourthly, the following formula is derived from Bradford's Law of Scattering to determine the core journals:

ro = $\frac{T\,(k-1)}{(k^{p}-1)}$ where, T = Total Number of Journals, p= Number of Bradford's Zones, and

k = New Bradford's Multiplier

Lastly, the New Bradford's Zones are obtained with the formula given below:

ro: r1= ro *k: r2= ro *k2 Where,

ro = a proportional distribution of citations or relationship among the three successive levels of Bradford's Zones.

k = the new Bradford's Multiplier.

It is concluded that the first zone of Bradford's Law constitutes the core journals of the disciplines under study. The inclusion of parameters such as the forms of cited sources, the obsolescence of literature, and the identification of core journals falls under the purview of bibliometric research.

The analysis of different types of cited sources enables the identification of scholars' preferences for different types of information sources, the measurement of obsolescence of literature provides insight into the age distribution of cited literature, and the application of Bradford's Law facilitates the identification of core journals

6. DATA ANALYSIS & INTERPRETATION

6.1. Forms of cited sources

The analysis shows that different forms of cited sources are available in the theses and are classified under broader terms. To facilitate classification of cited sources other than books and journal articles, broader terminology was used to group similar sources, including: Book Chapters, Conference Publications, Government Publications, Institutional or Organizational Publications, Reports, Theses and Dissertations, Other Periodical Publications, Web Resources, and Miscellaneous. The data sources involved in the study are available at: https://tinyurl.com/ut47b4h2. There are 11 forms of cited sources, and their frequencies are presented in the following table and figure.

Table 1: Types of cited sources and number of citations

SN.	Types of cited sources	No. of Cit.	No. of Cit. (%)	Cum. No. of Cit.	Cum. Count (%)
1	Book Chapters	197	2.63	197	2.63
2	Books	2928	39.09	3125	41.72
3	Conference Publications	122	1.63	3247	43.35
4	Government Publications	701	9.36	3948	52.71
5	Instt. or Org. Publications	61	0.81	4009	53.52
6	Journal Articles	1903	25.41	5912	78.93
7	Miscellaneous	60	0.80	5972	79.73
8	Other Periodical Publications	469	6.26	6441	85.99
9	Reports	416	5.55	6857	91.55
10	Theses/ Dissertations	378	5.05	7235	96.60
11	Web Resources	255	3.40	7490	100
Cit. = Citation, Cum.=Cumulative					

Source: Author's own work.

Table 1 illustrated various types of cited sources consisting of books (2928) on the top followed by Journal Articles (1903), then Government Publications (701), Other periodical publications (469), Reports (416), Theses & Dissertations (378), Web Resources (255), Book Chapters (197), Conference Publications (122), Institutional or Organisational Publications (61) and Miscellaneous (60).

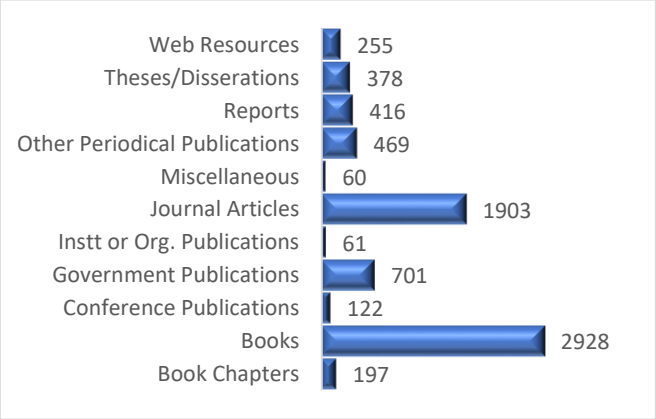

Figure 1 Various forms of Cited Sources

Source: Author's Own Work.

Figure 1 highlights the number in the picture for more clarity. Some of the cited sources are unable to identify and are broadly categorized under the miscellaneous category, with 60 citations

6.2. Obsolescence of cited literature:

The ageing of all types of citations in Commerce PhD Theses is observed, and a total of 7490 citations is extracted. In the dataset, 6445 of 7490 citations have publication years and are included in the obsolescence analysis. The remaining citations (1045) with no publication years are excluded from the study. Some facts of the dataset:

- Citations are counted as zero if unavailable during the study period, in descending order.
- Citations with the latest publication year: 2016
- Citations with the oldest publication year: 1710
- Age range of the citations: 115 years

6.2.1 Calculation of Citation Half-Life:

The publication years of the citations are arranged in descending order from 2018 (**Appendix A**), and the age range is grouped into 12-decade-wise manners. The cumulative frequency and its percentage are also calculated and shown in the table below:

Table 2: Overall citations in Commerce in the grouped age range

Sl. No.	Age Range	No. of Citations	Cum. Citations	Cum. Citations (%)
1	0-9	533	533	8.27
2	10-19	1509	2042	31.68
3	20-29	1495	3537	54.88
4	30-39	1223	4760	73.86
5	40-49	944	5704	88.50
6	50-59	486	6190	96.04
7	60-69	149	6339	98.36
8	70-79	48	6387	99.10
9	80-89	24	6411	99.47
10	90-99	18	6429	99.75
11	100-109	11	6440	99.92
12	110+	5	6445	100

Source: Authors' Own Work

Table 2 shows the citation half-life for 6445 citations in a grouped age range, and the statistical formula for calculating the median is found to be applicable. For determining the rate of obsolescence, the following formula is applied:

Rate of Obsolescence (R)= L+(N/2-C) *h/f, Where,

Lower Limit (L) =20,

Total Citation with Publication Years(N)=6445; N/2=3222.5,

Cumulative Frequency (C)=2042; Width of the Year (h) =10, Frequency (f)=1495

Rate of Obsolescence (R) =27.89632107

The rate of obsolescence for overall citations is found to be 27 years, 10 months and 23 days.

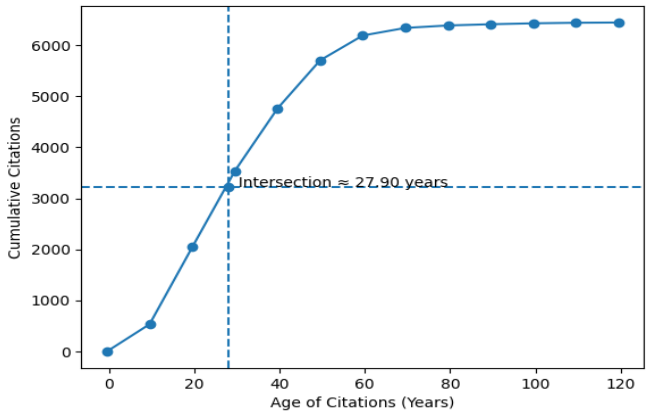

Figure 2 Citations half-life of Commerce

Source: Author's own data.

From the dataset in Appendix A, it is observed that half the cumulative frequencies exceeded 3222.5 in 1991. Fig. 2 shows the rate of obsolescence for overall citations in the commerce literature. Thus, the obsolescence rate is 27 years, 10 months, and 23 days. This finding suggested that 50% of the cited literature was published between 1991 and 2018, and the remaining 50% literature was published before 1991. The analysis revealed that the majority of citations fall within the age range of 10-19 years. This finding suggested that commerce research relies heavily on moderately recent literature while still valuing older, theoretically foundational work.

6.3. Application of Bradford's Law and Identification of Core Journals

The dataset consists of 1,903 journal articles sourced from 586 cited references, which account for 25.41% of the total. The frequency of journal citations in the dataset was analyzed using Microsoft Excel to sort and rank key journals. Although the dataset is relatively small, it is important to make careful observations. To identify the core journals in the dataset, bibliometric measures such as Bradford's Law of Scattering and the Leimkuhler Model were used to validate the findings using the available data.

The journals were arranged in order of decreasing citation frequency of the cited articles. The cumulative citations were computed and divided into three Bradford Zones, each containing approximately 634 citations or journal articles (one-third of 1,903). This means 18 journals contain 634 articles, 85 journals contain 634 articles, and 483 journals contain 635 articles.

Table 3: Core journals and calculated value of Bradford's Multiplier (n)

Zone	No. of Journals	No. of Citations	Bradford Multiplier (n)
1	18	634	
2	85	634	4.72
3	483	635	5.68
	586	1903	5.2

Source: Author's own work.

Table 3 illustrates the distribution of journals, articles, and citations by zone. Core Zone consists of 18 journals, Second Zone with 85 Journals, and Third Zone with 483 Journals. The calculated mean value of Bradford's Multiplier is n=5.2

Mathematically,

Bradford's Law of Scattering are arranged in the geometrical series, 1: n: n^2 ------- (1)

Error-Percentage (%) = $\frac{\text{Tot.Cal.Value of Jr.} - \text{Tot.Given Value of Jr.}}{\text{Tot.Given Value of Jr.}} \mathbf{x100}$ **---(2)**

[Tot. = Total; and Jr. = Journal]

Bradford's Multiplier Value, n=5.2, is applied in equation (3) above,

Then, 1: n: n^2:: 18: (18x 5.2): [18x $(5.2)^2$]

Therefore, the total value of journals derived is = 18+93.6+486.72=598.32 -- **(3)**

Putting the derived value of journals, i.e. 598.32, from (3) in equation (2),

Error Percentage (%) = $\frac{598.32 - 586}{586}$ x 100 **[**Total Given Value of Journals =586]

= 2.10 %

Since the Error percentage (%) is quite high, the dataset does not fit into Bradford's Law of Scattering.

6.3.1. Application of Modified Leimkuhler Model

Using the value from the dataset and putting it into equation (1) above,

New Bradford's Multiplier 'k' = $(1.781 \times 91)^{1/3} \approx 5.45$ ----- (4)

Mathematically, the number of journals in the nucleus zone of Bradford is calculated using the formula given in equation (2)

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

where, T = Total Number of Journals

$= \frac{586\,(5.45-1)}{(5.45^3-1)} = \frac{2607.7}{160.08} \approx 16.21$ --- (5)

Then the value in the subsequent new zones is calculated as given below:

$r_1 = r_o * k = 16.21 \times 5.45 = 88.37$ ----(6)

$r_2 = r_o * k^2 = 16.21 \times (5.45)^2 = 481.83$ ---(7)

Now, putting the values of (4), (5), (6), and (7) in Bradford New Zones of Scattering

, i.e. $r_o : r_1 : r_2$

16.21: 16.21x 5.45: 16.21x $(5.45)^2$

16.21:88.37:481.83

Therefore, the value becomes =586.4 --(8)

Then, Error Percentage (%) = $\frac{586.4-586}{586} x\ 100$

= $\frac{0.4}{586} x\ 100$ = 0.07%

Therefore, the percentage error is very small and can be neglected. Hence, Bradford's law of scattering fits very well to the present dataset with the New Bradford multiplier k = 5.45.

Table 4: New Bradford's zones with New Bradford's Multiplier (k) value

Zone	No. of Journals	No. of Citations	% of Citations	New Bradford Multiplier (k)
1	16.21	593	31.161	
2	88.38	611	32.107	5.45
3	481.83	699	28.032	5.45
Total	586.42	1903	100	5.45

Source: Author's own work.

Table 4 highlights zone-wise journals and the distribution of articles or citations. Nucleus Zone consists of 16 journals, Second Zone with 88 Journals, and Third Zone with 481 Journals. The calculated mean value of Bradford's Multiplier is n=5.45

After calculating the error percentage, the result is 0.07%, which is negligible, and the values after the decimal are adjusted. Hence, the Bradford zones derived from Bradford's Multiplier' k' fit the present dataset. The final journals included in each Bradford Zone are listed in Table 5.

Table 5: Identified core journals in Commerce PhD Theses

Zone (s)	No. of Journals	Citations	Pattern
1	~16 (approx.)	593	Core journals
2	~88 (approx.)	611	Secondary journals
3	~482 (approx.)	699	Peripheral journals

Source: Author's own work.

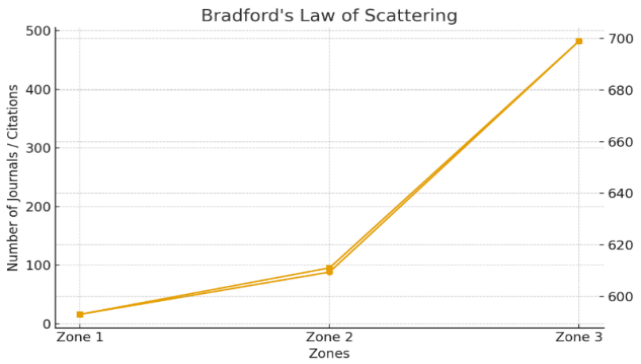

Figure 3: Bradford's Law of Scattering in Commerce Journals

Source: Author's own work.

Table 5 and Figure 3 of the above show the distributed citations and the number of journals in the respective zones. The components of each zone are as follows: Zone 1 contains 16 journals with 593 citations; Zone 2 contains 88 journals with 611 citations; and Zone 3 contains 482 journals with 699 citations.

6.3.2. Identification of core journals in commerce:

The study identified the top 16 journals in the core zone of Bradford's Law of Scattering, which account for approximately 593 citations, or about one-third of all citations. The journals in the core zone exhibited significantly higher citation frequencies than the long tail, which had lower frequencies of 1 or 2 citations. Table 6, displayed below, lists the core journals preferred by commerce scholars.

Table 6: Core journal Citations preferred by Commerce Scholars

Sl No	Core Journal List (N=593)	No. of Citations	(%) of Citations
1	Economic and Political Weekly	91	15.35
2	Indian Journal of Commerce	68	11.47
3	Banking and Finance	53	8.94
4	Bank Marketing	37	6.24
5	University News	37	6.24
6	Indian Silk	34	5.73
7	Indian Management	31	5.23
8	Journal of Marketing	30	5.06
9	Prajnan	30	5.06
10	SEDME	30	5.06
11	Academy of Management Journal	29	4.89
12	The Banker	29	4.89
13	Harvard Business Review	27	4.55
14	The Management Accountant	23	3.88
15	Vikalpa	23	3.88
16	Decision	21	3.54

Source: Author's own work.

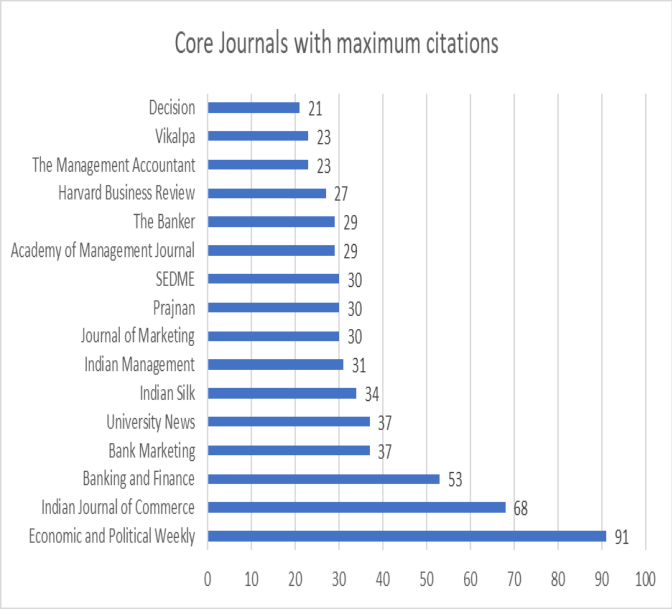

Figure 4: Identified 16 core journals, Commerce, Manipur University

Source: Author's own work.

Table 6 and Figure 4 above, displayed 16 core journals preferred by most scholars, with Economic and Political Weekly cited 91 times on the top followed by Indian Journal of Commerce (68), Banking and Finance(53), Bank Marketing (37), University News (37), Indian Silk (34), Indian Management (31), Journal of Marketing (30), Prajnan (30), SEDME(30), Academy of Management Journal (29), The Banker (29), Harvard Business Review (27), The Management Accountant (23), Vikalpa (23) and Decision (21).

5 FINDINGS OF THE STUDY

The study reported that the top-cited sources are books (39.09%), followed by journal articles (25.41%) and government publications (9.36%), indicating a strong reliance on foundational literature with a significant preference for citations in core journals. The analysis also examined the obsolescence of the cited literature and found a half-life of 27 years, 10 months, and 23 days, indicating that 50% of the cited literature was published between 1991 and 2018. Besides, this study also identified 16 core journals, with Economics and Political Weekly emerging as the top-cited source. The outcomes of these patterns may suggest engagement with foundational and policy-related literature; however, no direct thematic analysis of the theses was conducted; therefore, conclusions regarding the specific nature of the research areas remain beyond the scope of the study.

6 CONCLUSION

This study adopts a bibliometric approach to represent doctoral theses in Commerce from Manipur University since its inception in 1984. The analysis of 7490 cited references revealed the nature of scholarly communication among doctoral scholars. The findings provide insights into the most preferred cited sources, understand the ageing of citations, core journals, and other academic exchanges among scholars, thereby helping researchers and faculty members improve research strategies and appropriate directions. However, the study is limited to quantitative citation analysis and does not examine the thematic or subject-specific orientation of the theses. It also helps librarians and information professionals make informed decisions based on evidence and includes identified core journals in the subscription list, strengthening the backbone of the University's research support system. The findings of

this study may serve as a reference for future studies in other disciplines within or outside the institutions. Further studies may be conducted to identify research trends based on the themes from the theses.

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