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Impact of Working Capital Management on Profit and Return on Assets/Investments:A Bibliometric Evaluation

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Abstract

This study reports the first stage of a systematic bibliometric review of the literature related to working capital management (WCM) and its impact on profit and return on assets/investments (ROA/ROI), by employing Scopus as a data bank. The study hinges on the bibliometric approach for understanding the analysis of trends in publications, key papers, research frontiers and authors who have made the most innovative contributions. The study findings satiate the objectives by systematically identifying the gaps within the WCM study field and proposing possible future research directions. This study offers implications for both academia and practice, by not only mapping the WCM research field but underlying the need for further research in critical areas, thereby contributing to identifying arenas for effective management of the financial resources of an organization, thereby augmenting and enhancing the profitability and return on asset/investments.

Keywords: *Working capital management, Bibliometric Analysis, Return on Capital Employed, Publication trends,*

Introduction

Effective management of working capital, encompassing current assets and liabilities, is crucial for a company's financial health (1,2). Poor management in areas such as receivables, inventories, and payables can significantly impact profitability, liquidity, and overall financial performance (3,4). Additionally, working capital management (WCM) plays a vital role in enhancing shareholder value and maintaining competitive market positioning (5,6). The relationship between WCM and metrics like profit and return on assets or investments, has been extensively studied, providing insights for effective financial management (1,2)

Investigating the impact of working capital management (WCM) on profitability and asset returns is crucial for businesses to understand the effects of their short-term financial strategies and enhance operational efficiency (7,8). This analysis helps companies gauge resource utilization efficiency, devise strategies to boost financial health and ensure long-term viability (9,10). Furthermore, such research aids in risk management reduces capital costs, and strengthens market competitiveness (11,12).

This study encompasses the sage of a bibliometric analysis that aims to comprehensively review the existing literature on Working Capital Management (WCM) and its impact on profitability and asset returns. This approach enables the identification of seminal works, prevalent methodologies, and emerging trends, while also identifying prospective areas for investigation (13,14). The analysis in this paper provides insights into the evolution and current state of WCM research, facilitating the formulation of more effective financial strategies for businesses (15,16).

Review of Literature

Recent studies, however, confirm the major impact of WCM on the profitability and asset returns of the firm, being one of the primary duties to be done to maintain the well-being of the organization. For example, the recent meta-study, which aggregates the results of 43 scientific works for almost 62,000 firms in 35 countries, by Jaworski and Czerwonka (2024) confirms the generally negative relation between the profitability and the cash conversion cycle (CCC) (17). However, as the above authors state, 'the relationship in developed macroeconomics and institutional contexts is moderated, and the negative effect of CCC on profitability is much weaker for richer economies.' Moreover, they point out that the sound creditor and debtor institutional protection of rights means that firms can move fairly freely along the ITC1 ('back-loaded track) and still achieve more than adequate profitability.

In a second study, Aldubhawi et al. (2022) found that WCM by manufacturing companies listed on the Doha Stock Exchange (i.e., QSE) were linked to: 1. Shorter receivable collection periods and cash conversion cycles were associated with higher profitability. 2. Longer inventory turnover periods and accounts payable payment periods were associated with higher profitability (18).

Some studies also have highlighted that the relationships between WCM components and profitability are more complex (19), strong WCM linkages to profitability might have to do with the ability to minimize costs of doing business, rather than just with high liquidity. In other words, good WCM management involves a deep knowledge of the firm's competitive environment and sensitive strategic decisions about cases where the sacrifice of one WCM component yields a greater ROI than sacrificing a different one. Based on our examination of existing research, it appears that a one-size-fits-all approach to WCM may not be suitable, given the variations in economic and institutional environments across firms.

The expanding body of literature on Working Capital Management (WCM) underscores its critical role in influencing profitability and asset returns, emphasizing its importance in organizational financial health (20,21). Afrifa (2016) explored the impact of business owners' financial knowledge on WCM practices in UK SMEs, finding a significant link between effective WCM and enhanced earnings (22). The research titled "Effect of working capital policies on businesses' financial performance" indicates a negative correlation between the ratio of current assets to total assets and the financial performance of Malaysian manufacturing firms, while a conservative approach to working capital financing proves more beneficial than aggressive strategies (23–25).

(26) examined the impact of working capital management (WCM) elements on corporate performance in Kenyan public enterprises, finding that effective management of accounts receivable and inventory significantly boost profitability (27). Other studies (28) have highlighted the impact of working capital management (WCM) on the profitability and market performance of firms that constitute an Islamic market index (Karachi Meezan Index [KMI-30]) in Pakistan during 2002–2013. Another study "Determinants of working capital requirement in listed firms" focused on Ghanaian publicly traded companies, revealing that WCM is influenced by factors like profitability, company age, and operational cycles, while negatively impacted by GDP growth, sales growth, and leverage (29,30). This research underscores the importance of understanding these determinants for effective WCM in developing countries like Ghana (31).

Mathuva (2015) examined the impact of WCM elements on corporate performance in Kenyan public enterprises, finding that effective management of accounts receivable and inventory significantly boost profitability (26,27). The study "Determinants of working capital requirement in listed firms" focused on Ghanaian publicly traded companies, revealing that WCM is influenced by factors like profitability, company age, and operational cycles, while negatively impacted by GDP growth, sales growth, and leverage (29,30). This research underscores the importance of understanding these determinants for effective WCM in developing countries like Ghana (31), while other studies have delved into the profound impact of public health emergencies on corporate finance, with a specific lens on the COVID-19 pandemic's transformative effects (32).

The influence of WCM on profit and return on assets/investments has been the topic of several theories, models, and empirical discoveries in recent years. The following is a synopsis of the major findings, followed by a discussion of research needs and possible directions for the future.:

1. The prevalent operational cycle model in WCM emphasizes the cash conversion cycle (CCC) as a key efficiency metric (33). The importance of the CCC in determining a company's profitability and return on assets is supported by empirical evidence (34). However, additional research should investigate the effect of industry-specific variables on the ideal CCC and its relationship to financial performance.

2. Trade-off theory: This theory proposes that businesses assess the benefits of retaining cash, inventories, and receivables against expenses, aiming for the optimal level of working capital (28). The link between WCM and profitability has shown contradictory empirical findings, suggesting that the optimal balance may vary by industry, company size, and other contextual factors (35). Additional research is required to appreciate these circumstances and their effects on WCM procedures.

3. With the emergence of financial technology (FinTech), there is a growing desire to comprehend how these innovations influence WCM processes and their effect on profitability and return on assets (36). There is a paucity of research on this topic, and future studies might examine the implications of FinTech for WCM in other businesses and countries.

While significant progress has been made in comprehending the relationship between WCM and financial performance, research gaps remain. Future research could investigate industry-specific characteristics, the impact of contextual variables in establishing the appropriate mix of working capital components, and the implications of future financial technologies on WCM practises.

Research Gap:

Based on the available literature and the dynamic nature of WCM, it is possible to identify various research gaps and prospective research fields, as presented in Table 1, as follows:

Table 1: Summary of Research Gap

Research Gap	Description	Specific Needs
Industry-specific factors	More in-depth, industry-specific evaluations are required	Comprehend how traits and obstacles influence WCM strategies and their effect on profitability and return on assets/investments
Contextual variables	Need for additional research	Identify and investigate the significance of economic situations, cultural factors, and regulations in establishing ideal WCM practices
FinTech impact	As FinTech continues to revolutionise financial services	Determine how innovations alter WCM processes and their effect on profitability and return on assets/investments
Working capital management in SMEs	Due to restricted resources and financial access, SMEs face unique WCM challenges	Research how SMEs implement WCM techniques to maximise earnings and returns on assets and investments
ESG factors	As ESG issues become increasingly prevalent in business decision-making	Investigate how these factors influence WCM practices and their relationship to company success
Behavioral aspects of WCM	Limited research on the behavioral components of WCM	Understand the psychological variables that influence WCM decisions

Source: Author's compilation

These research gaps and future exploration areas provide opportunities for scholars to contribute to the understanding of WCM and its impact on profitability and return on assets/investments, thereby assisting businesses in optimizing their working capital strategies and achieving superior financial performance.

Research Objectives:

The principal aim of this study is to conduct a thorough bibliometric analysis of the extant literature about Working Capital Management (WCM) and its effects on profitability and Return on Assets/Investments (ROI). This goal is supported by multiple primary objectives that correspond to the selected bibliometric techniques:

Objective	Method	Purpose
Mapping the Research Landscape	Bibliometric methodologies	Note important writers, works, and publications in WCM
Understanding Collaboration Patterns	Examine co-authorship networks	Comprehend interconnectedness in WCM research
Evaluating Research Evolution and Trends	Thematic grouping and content analysis	Recognise new trends and changes in WCM research
Assessing the Impact of Publications	Analyse citation data	Shed light on frequently mentioned works in WCM
Identifying Gaps and Future Research Opportunities	Bibliometric analysis	Pinpoint research gaps and propose future investigation areas

By accomplishing these goals, the study hopes to give a thorough overview of the WCM area and provide insightful information for researchers in the future as well as practitioners and academics.

Methodology:

This research uses a thorough bibliometric analysis in conjunction with a methodical evaluation of the literature. The objective is to identify important research trends, highlight knowledge gaps, and critically evaluate the corpus of literature currently available on working capital management (WCM) and its effects on profitability and return on assets/investments (ROI).

Data Sources and Search Strategy

Category	Details
Data Source	Scopus database, known for its comprehensive coverage of peer-reviewed literature across multiple fields.
Search Strategy	Use of keywords and phrases related to WCM, profitability, and ROI, such as "working capital management," "profitability," "return on assets," "return on investments"; Application of time constraints and publication type filters like journal articles and conference papers.
Inclusion Criteria	Peer-reviewed articles and conference papers; Publications that explicitly discuss WCM and its correlation with profit and ROI; Articles published in English.
Exclusion Criteria	Non-peer-reviewed sources; Publications outside the scope of WCM and ROI; Articles not in English.
Data Extraction	Collection of bibliographic details including authors, publication year, source title, and number of citations.
Data Cleaning	Initial steps involve eliminating duplicate entries, correcting errors in author names and publication details, and standardizing terminology for consistency.
Bibliometric Techniques	Performance Analysis (publication and citation trends over time); Co-citation and Bibliographic Coupling (relationships between articles based on shared references); Content Analysis (thematic evolution via keyword frequency and clustering); Network Analysis (networks of authors, institutions, countries to understand collaboration patterns).
Data Visualization Tools	Graphical representation of bibliometric data using VOS viewer and the Bibliometrics R package for intuitive understanding of data patterns and relationships, including theme maps, co-authorship networks, and citation networks.
Data Interpretation Goal	Determine the most significant writers, publications, and journals in the WCM field; Conduct analyses on research trends in themes, methodology, and geographic distribution; Place results in the larger literary context to identify areas needing further investigation and suggest new research inquiries.
Rationale for Choosing Scopus	Scopus chosen for its comprehensive coverage of peer-reviewed literature, quality and reliability due to strict inclusion standards, advanced search features and analytical tools for bibliometric study, and global representation of articles from around the world for a worldwide perspective on WCM research.

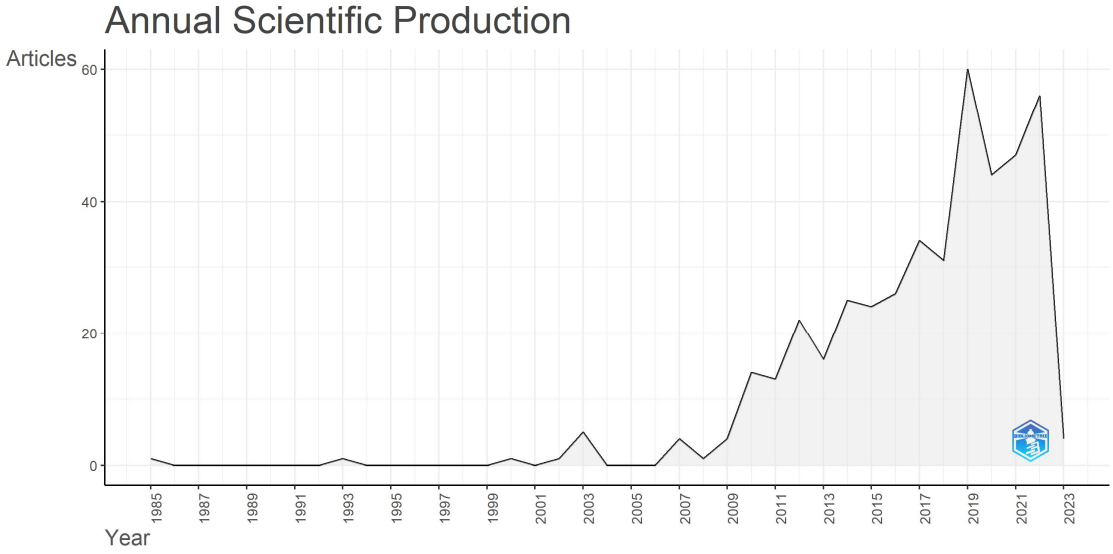
Main Information

Figure 1: Data Summary

Note. Figure created based on data obtained from Scopus Database, analysed using the Bibliometrics package in R by Author

The chart in **Figure 1** depicts a summary of research papers on Working Capital Management and its effects on profit and return on invested capital, as extracted from the Scopus database. Between 1985 and 2023, 434 documents from various sources (journals, books, etc.) were published. The collection is expanding at a pace of 3.6% every year on average. The average age of the documents is 5.91 years, with an average of 15.91 citations per document. There are 248 Keywords Plus (ID) and 884 Author's Keywords in the texts (DE). 857 authors contributed to the documents, with 75 single author works. The average number of co-authors per publication is 2.52, and 14.75 percent of co-authorships are foreign. The majority of the items are articles (409), then conference papers (15) and book chapters (10). There are 16,311 references in the papers.

Figure 2: Annual Scientific Production from 1985 to 2023



Note. Figure created based on data obtained from Scopus Database, analysed using the Bibliometrics package in R by Author

From 1985 to 2023, figure 2 depicts the annual number of publications discussing the relationship between working capital management and financial results such as ROI and profit. Between 1985 and 1993. To comprehensively understand the evolution of Working Capital Management (WCM) research, the gathered literature is segmented chronologically into three distinct periods: 1985-2000, 2001-2010, and 2011-2023. This division is based on significant shifts in economic environments, financial regulations, and business practices, which have likely influenced WCM research trends.

Observations Across Periods

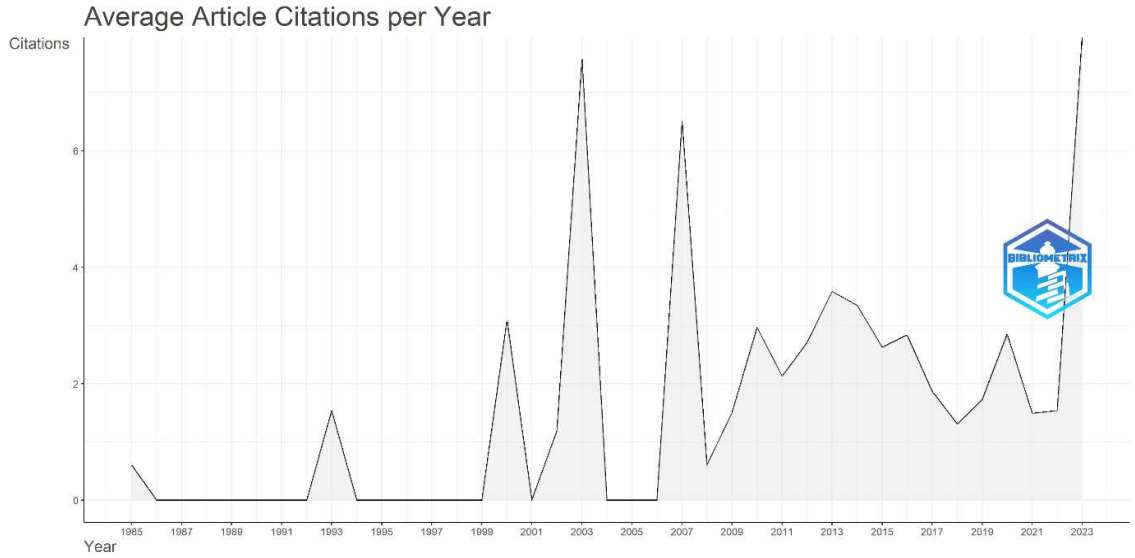
1. **1985-2000**: This period marks the early stages of WCM research. The focus was predominantly on foundational concepts of working capital and its impacts on firms' liquidity and short-term financial

health. Methodologies were primarily qualitative, with numerous case studies and theoretical models. Key themes included basic cash management strategies, inventory control, and receivables management (Ammons & Gosman, 2012).

2. **2001-2010**: This decade witnessed a shift towards a more nuanced understanding of WCM. Research began exploring the relationships between WCM and broader financial performance indicators, such as profitability and ROI. The dot-com bubble, the 2008 financial crisis, and subsequent economic shifts played a crucial role in steering research towards understanding the resilience of WCM strategies under varying economic conditions. Quantitative methods, including regression analysis and econometric modelling, became more prominent (Purnomosidi, Siregar, & Dzulkirom, n.d.; Rolle, Herani, & Javed, 2020).

3. **2011-2023**: The most recent period in WCM research is characterized by a diverse range of themes and methodologies. The advent of big data and advanced analytics tools has allowed for more sophisticated analyses. Topics expanded to include the impact of globalization, technological advancements in financial management, and the role of WCM in sustainable business practices. There is a noticeable trend towards empirical research using large data sets, and the exploration of WCM in different industries and varying market conditions (Kumar, n.d.).

Figure 3: Annual Average Citation for publication published between 1985 and 2023



Note. Figure created based on data obtained from Scopus Database, analysed using the Bibliometrics package in R by Author

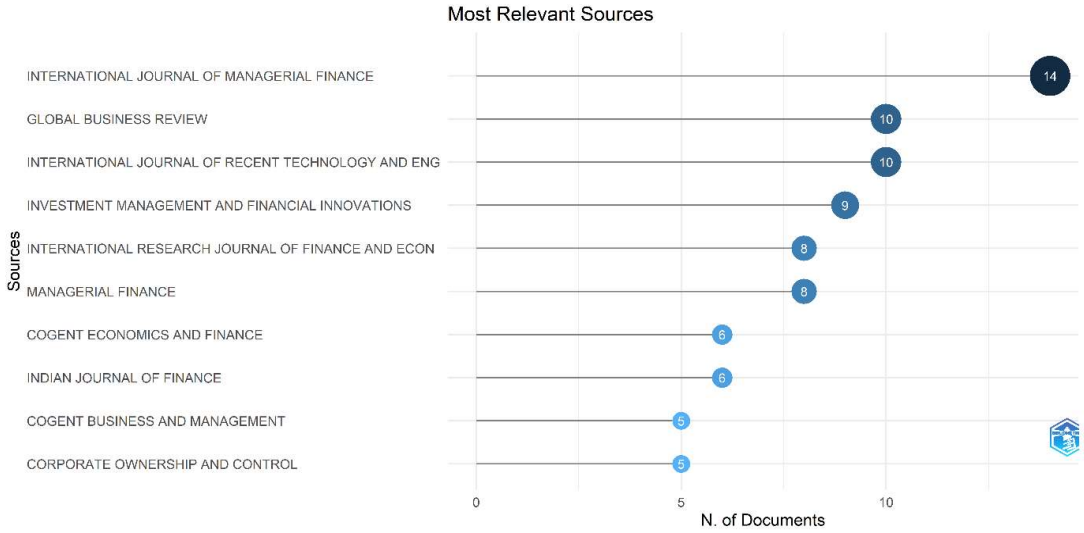
Figure 3 depicts the average number of citations per year for articles published between 1985 and 2023 that examine the relationship between working capital management and financial outcomes, such as profit and return on capital employed.

In the subsequent 38 years, one essay published in 1985 received an average of 23 citations per year. One article was published in 1993, garnering an average of 46 citations each year for the next 30 years. Since 2000, the number of papers published annually has risen, reaching a peak of 60 in 2019.

The average number of citations per year for articles published in each year varied, with some years including no articles and others displaying various citation rates. For the five papers published that year, 2003 had the highest average yearly citation count at 7.57. The year 2023 had the lowest average citations, with 0.25 citations per year on average for the four papers published that year. However, the data only extends to February 26, 2023, so additional citations will likely be added throughout the year.

Working capital management and its implications on profit and return on capital employed have been the subject of an increasing number of academic articles, with a peak in 2002. In contrast, the annual citation rate has varied greatly over time, with some years having extraordinarily high citation rates and others having relatively low citation rates for these articles.

Figure 4: Ten most relevant journal names in terms of articles published on WCM



Note. Figure created based on data obtained from Scopus Database, analyzed using the Bibliometrics package in R by Author

In terms of the number of publications published on working capital management and its implications on profit and return on capital employed, **Figure 4** depicts the most significant sources. The information is presented as a list of sources and the number of published articles for each source.

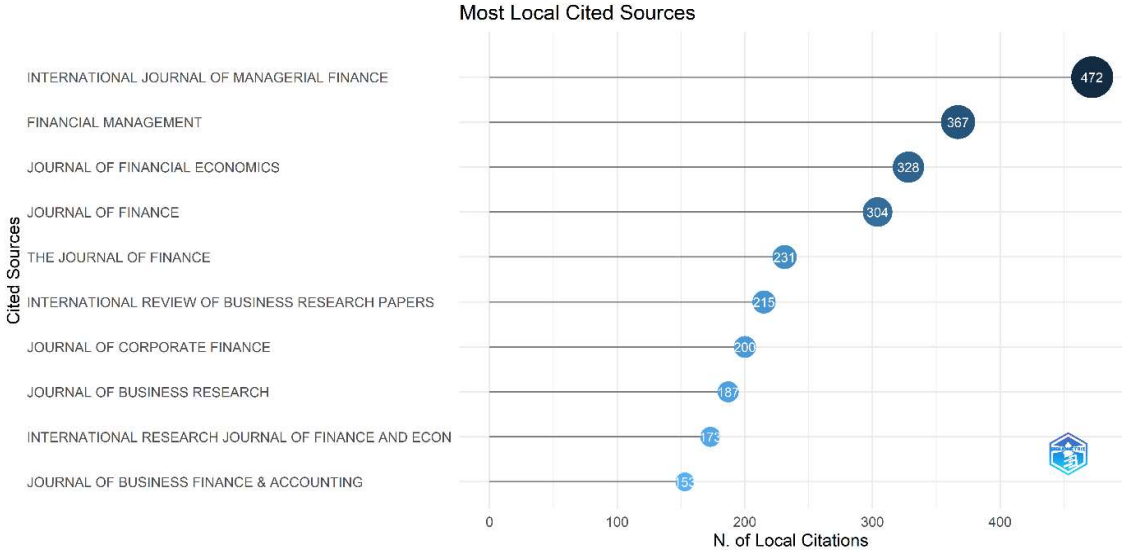
With 14 citations, the International Journal of Managerial Finance is the most cited publication on this topic. Ten papers are subsequently published in both the Global Business Review and the International Journal of Emerging Technologies and Engineering.

Other noteworthy sources are Investment Management and Financial Innovations, the International Research Journal of Finance and Economics, and Managerial Finance, which published nine, eight, and eight papers, respectively.

Each of the remaining sources, including Cogent Economics and Finance, the Indian Journal of Finance, Cogent Business and Management, and Corporate Ownership and Control, contains between five and six articles.

Based on the data, it appears that the International Journal of Managerial Finance, the Global Business Review, and the International Journal of Recent Technology and Engineering are the top three journals for articles discussing the relationship between working capital management and financial outcomes like profit and return on capital.

Figure 5: Ten most frequently cited local sources



Note. Figure created based on data obtained from Scopus Database, analysed using the Bibliometric package in R by Author

Figure 5 depicts the most often mentioned local sources (in reference lists) for papers on working capital management and its impact on profit and return on capital employed. The information is presented as a list of sources, together with the number of times each source was cited in the bibliographies of papers on this topic.

The International Journal of Managerial Finance has been cited by 472 local articles. Financial Management (367 citations) follows the Journal of Financial Economics (3 citations) as the most-cited academic journal (328).

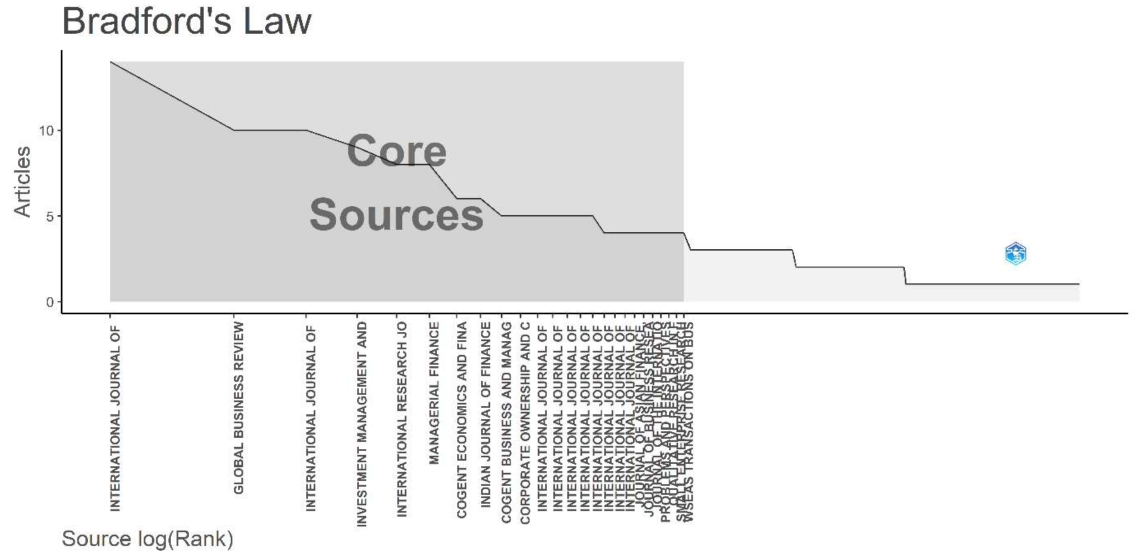
The Journal of Finance (mentioned in 231) and the Journal of Finance (cited in 304) are two more prominent publications. Also receiving between 153 and 215 citations frequently are the Journal of Business Research, the International Research Journal of Finance and Economics, the Journal of Corporate Finance, and the Journal of Business Finance & Accounting.

According to the available data, the three most-cited domestic sources for articles on working capital management and its impact on profit and return on capital employed are the International Journal of Managerial Finance, Financial Management, and the Journal of Financial Economics. The prominence of these sources is shown by the number of times other authors cite them in their own works.

Bradford's Law-based source clustering

Bradford's Law-based source clustering is a popular technique for determining the most productive sources in a certain field of research (37,38). This strategy is based on the premise that a small number of sources account for the majority of publications in an area, while the remaining sources contribute less frequently. Researchers can discover the most influential sources in an area with the aid of source clustering and Bradford's Law, so prioritising their research efforts (39).

Figure 6: Bradford's Law based source clustering



Note. Figure created based on data obtained from Scopus Database, analysed using the Bibliometrics package in R by Author

Using Bradford's Law-based source clustering, as shown in **Figure 6**, we discover that the International Journal of Managerial Finance is the most prolific source on working capital management and its impact on profit and return on capital employed. This result is consistent with studies that utilised Bradford's Law to identify the most productive resources in various industries. When researchers applied Bradford's Law to the data, they discovered that the Journal of Documentation was the most prolific source in the field of library and information science.

In conclusion, source clustering based on Bradford's Law is an effective technique for selecting the most productive sources in a particular field of research. This strategy can assist researchers in focusing their efforts on the most influential sources, thereby improving the quality and relevance of their work.

Using Bradford's Law, the bibliographic data in **Figure 6** illustrates the concentration of sources on working capital management and its impact on profit and return on capital employed. The International Journal of Managerial Finance is the most productive source on this topic, with a frequency of 14 and a CumFreq of 14. The sources are separated into two zones, with the top 15 sources in the first zone and the remainder sources in the second zone. The data reveals that research in this topic is concentrated in a small number of highly productive sources, with a long tail of less productive sources. To locate the most relevant and influential research, researchers in this discipline may benefit by concentrating on the top-ranked sources.

Table 1: Top ten journals different indexes score

"Element"	"h_ index"	"g_ index"	"m_ index"	"TC"	"NP"	"PY_ start"
"INTERNATIONAL JOURNAL OF MANAGERIAL FINANCE"	"12"	"14"	"0.706"	"863"	"14"	"2007"
"INTERNATIONAL RESEARCH JOURNAL OF FINANCE AND ECONOMICS"	"6"	"8"	"0.429"	"205"	"8"	"2010"
"GLOBAL BUSINESS REVIEW"	"5"	"10"	"0.294"	"223"	"10"	"2007"
"INTERNATIONAL JOURNAL OF ECONOMICS AND FINANCIAL ISSUES"	"4"	"5"	"0.333"	"70"	"5"	"2012"
"INTERNATIONAL JOURNAL OF MANAGERIAL AND FINANCIAL ACCOUNTING"	"4"	"5"	"0.286"	"44"	"5"	"2010"
"INTERNATIONAL JOURNAL OF PRODUCTIVITY AND PERFORMANCE MANAGEMENT"	"4"	"4"	"0.400"	"48"	"4"	"2014"

"INTERNATIONAL JOURNAL OF SERVICES AND OPERATIONS MANAGEMENT"	"4"	"5"	"0.308"	"77"	"5"	"2011"
"INVESTMENT MANAGEMENT AND FINANCIAL INNOVATIONS"	"4"	"5"	"0.235"	"34"	"9"	"2007"
"JOURNAL OF BUSINESS RESEARCH"	"4"	"4"	"0.400"	"374"	"4"	"2014"
"MANAGERIAL FINANCE"	"4"	"8"	"0.286"	"95"	"8"	"2010"

Source: Data is extracted from the Scopus Database

The h-index was introduced by physicist Jorge E. Hirsch in 2005 to measure the impact and productivity of a researcher's publications (40). The g-index was proposed by Leo Egghe in 2006 as an improvement over the h-index to give more weight to highly-cited articles (41).

Using metrics such as the h-index, g-index, and m-index as given in the **Table 1**, the production and effect of journals can be evaluated. There are h journal articles that have been cited at least h times, and g journal articles that have been cited at least g2 times, therefore these two measures are complementary. The m-index represents the frequency with which a specific paper has been cited by other publications.

The number of articles published in a journal is indicated in the NP column, while the total number of times those articles were cited is indicated in the TC column. The journal's publication year is mentioned in the PY start column.

The International Journal of Managerial Finance has the greatest h-index (12) and g-index (14) among the publications on the list, according to the data. This signifies that the journal has published a substantial number of widely referenced papers.

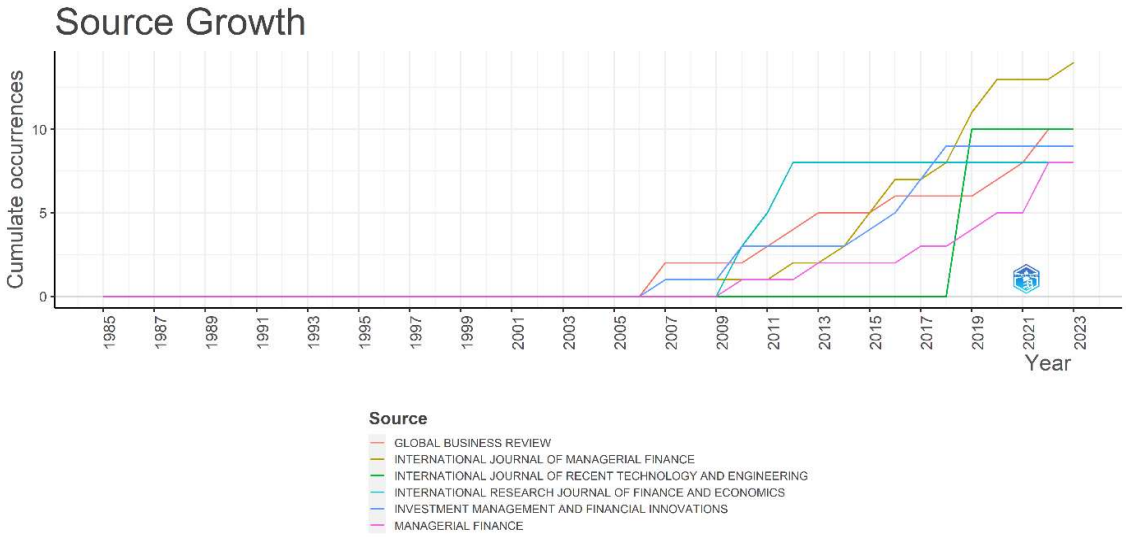
The International Research Journal of Finance and Economics has a greater average number of citations per publication than any other journal on this list, as measured by its m-index of 0.429.

The Journal of Business, with 374 articles, appears to be the most prolific place for publishing research in this field. However, its h-index and g-index are extremely low when compared to other journals on the list.

According to bibliometric data, the two most influential journals in the field are the International Research Journal of Finance and Economics and the International Journal of Managerial Finance. While bibliometric information is useful, it should not be the sole criterion used to evaluate the trustworthiness of a study. The significance and originality of the research are two more factors to evaluate.

Source Dynamics

Figure 7: Trend in journal coverage of working capital management and its effect on ROIC



Note. Figure created based on data obtained from Scopus Database, analysed using the Bibliometrix package in R by Author

Sample journal coverage of working capital management and its effect on return on investment capital is shown in **Figure 7**. Scopus presents the total number of articles published on this subject in each journal between 1985 and 2023. Data shows that since 2007, the International Journal of Managerial Finance has regularly published

articles on this subject, and the frequency with which they have been published has increased. The Global Business Review has produced a steady stream of articles on this subject since the first one appeared in 2007. There are no relevant articles in the International Journal of Emerging Technologies and Engineering. Investment Management and Financial Innovations have published a small but increasing number of articles on this subject since 2007. There have also been occasional pieces published on this subject in the International Research Journal of Finance and Economics and Managerial Finance.

According to the data, both the International Journal of Managerial Finance and the Global Business Review often publish articles on the topic of how properly managing working capital may increase both profits and ROI. This information emphasises the value of monitoring the publication habits of journals in many disciplines to determine the most productive publishing environments for research.

Most Relevant Author

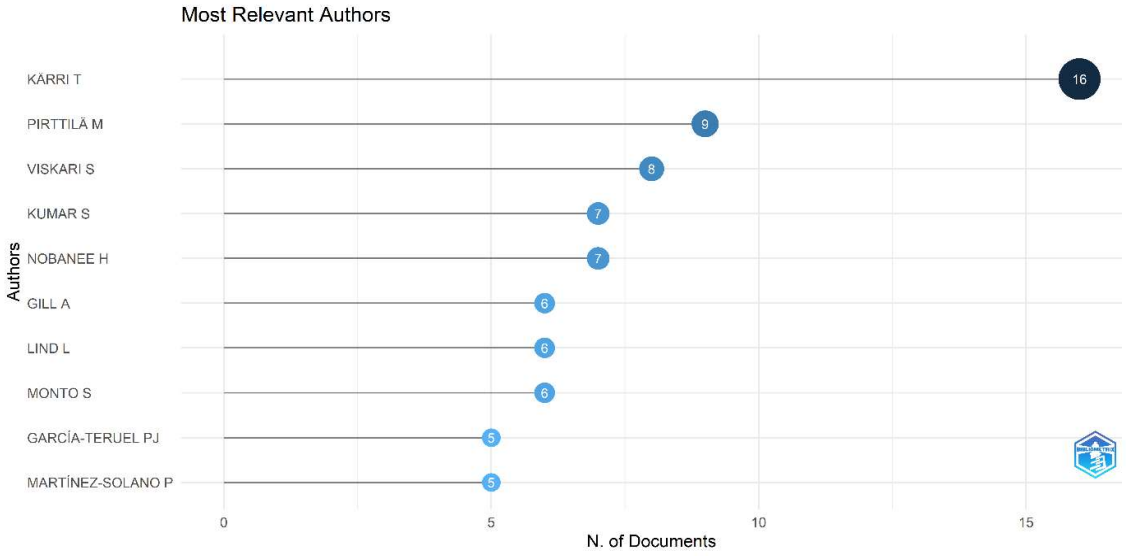
Figure 8 shows the leading scholars who have studied the relationship between effective working capital management and financial outcomes like increased profits and ROIC. Information from Scopus shows how many articles each author has written on the topic.

Karri T., who has produced sixteen articles on the subject, is the most prominent writer in the field. M. Pirttila and S. Viskari come in second and third, with 9 and 8 papers published, respectively. Kumar S., Nobanee H., Gill A., Lind L., Monto S., Garca-Teruel PJ, and Martnez-Solano P. are all highly regarded authors with 5–7 publications each.

When many writers contributed to a single publication, the total number of papers published by each author is displayed in the "Papers Fractionalized" column. Individual-authored articles can have a greater impact than those written by a group, making this crucial.

Based on the number of published articles, the data reveals that Karri T, Pirttila M, and Viskari S are the most influential authors in this field as shown in the **Figure 8**. When analysing an author's relevance in a certain field, it is vital to also examine other variables, such as research quality and effect.

Figure 8: Ten most relevant author on WCM and its effect on ROCI and Profit



Note. Figure created based on data obtained from Scopus Database, analysed using the Bibliometrix package in R by Author

Most Locally Cited Author

Working capital management and its impact on ROI and profit are the subject of the following locally authored works. The Scopus database lists the number of times each author has been cited in regional publications as shown in the **Figure 9**.

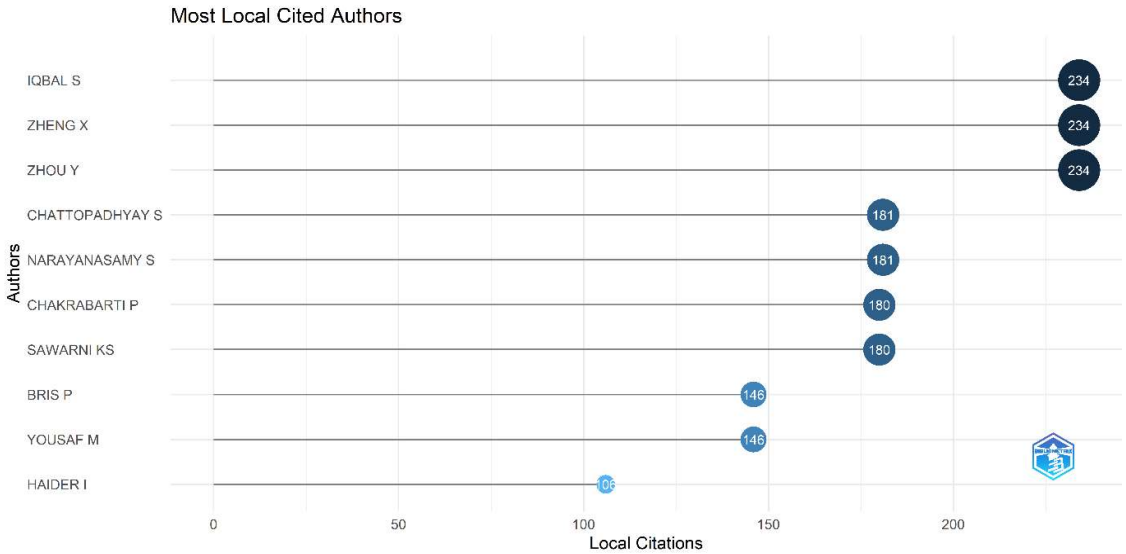
Iqbal S, Zheng X, and Zhou Y are the most referenced local writers in this subject, each receiving 234 local citations, according to the statistics. Chattopadhyay S and Narayanasamy S are also among the most referenced local authors, both with 181 local citations. Chakrabarti P and Sawarni KS each have 180 local

citations.

Bris P and Yousaf M, each with 146 local citations, are also among the most referenced local authors. Additionally, Haider has received 106 local citations.

Iqbal S, Zheng X, and Zhou Y have received the most citations in China, making them the most influential authors in this field. Thus, the significance of their work in the field of working capital management and its impact on profit and return on capital employed are emphasised.

Figure 9: Ten most locally cited author on WCM and its effect on ROCI and profit



Note. Figure created based on data obtained from Scopus Database, analysed using the Bibliometrix package in R by Author

Authors' Production over Time

Base on the Scopus data base following Table 3 shows the summary of the author influence through examining the influence of authors based on their total citations (TC) and citations per year (TCpY) over the time period.

Table 3: Author Influence Summary

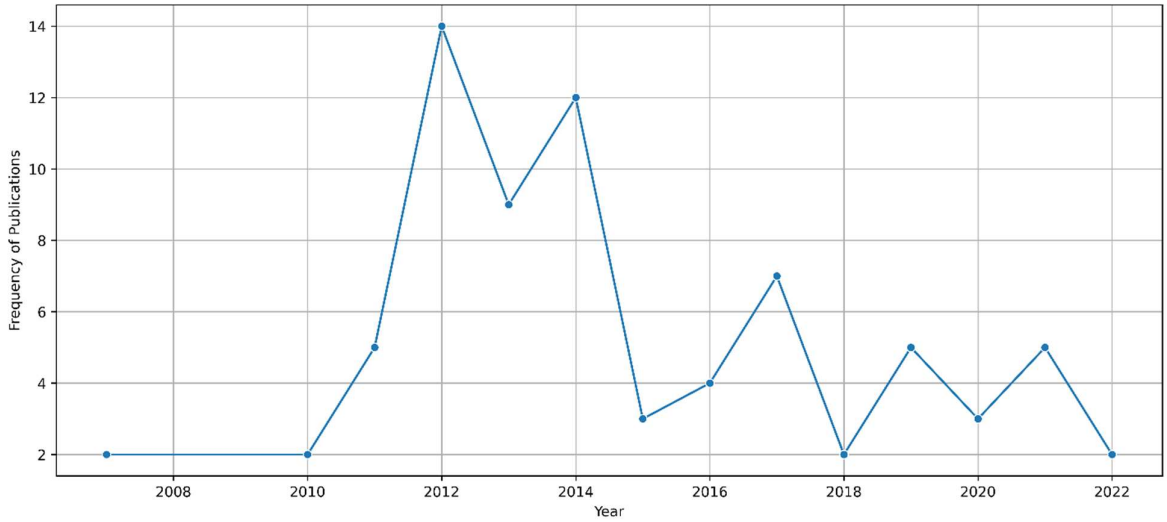
Author	Freq	Total(TC)	Mean(TCpY)
GARCÍA-TERUEL PJ	5	943	14.472800
MARTÍNEZ-SOLANO P	5	943	14.472800
KUMAR S	7	237	4.932400
KÄRRI T	16	189	2.361556
PIRTTILÄ M	9	141	2.824667
VISKARI S	8	113	2.386750
LIND L	6	95	2.426600
NOBANEE H	7	95	2.072800
MONTO S	6	52	1.132800
GILL A	6	23	0.492500

Source: Data is extracted from the Scopus Database

- GARCÍA-TERUEL PJ and MARTÍNEZ-SOLANO P have the highest influence, with 943 total citations each. They also have a similar average citations per year (14.47).
- KUMAR S follows with 237 total citations and an average of 4.93 citations per year.
- KÄRRI T and PIRTTILÄ M have less total citations but have a significant number of publications, suggesting they are active researchers in the field.

Next, the trends in research publications over the years will be examined. This will help in understanding how the focus on the topic "Working Capital Management" combined with "profit" or "return" has evolved over time.

Figure 10: Research Trends Over the Years



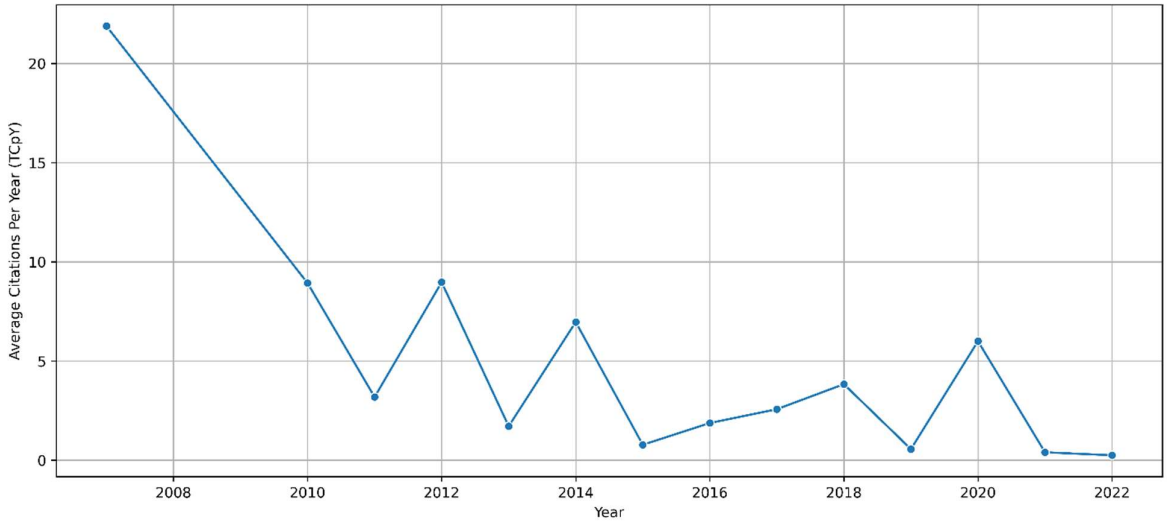
Note. *Figure created by the author using Python programming language based on data obtained from Scopus Database*

Summary of Research Trends:

Fluctuations in the frequency of publications over the years have been observed as shown in **Figure 10**. While a consistent upward or downward trend is not evident from the data, peaks can be noticed, such as between 2012 and 2017.

Last, the impact of the research will be examined, with a focus on citations per publication (TCpY) over the years. This will allow for an understanding of the average influence of articles each year.

Figure 11: Research Impact Over the Years



Note. *Figure created by the author using Python programming language based on data obtained from Scopus Database*

Summary of Research Impact as Shown in the **Figure 11** Above:

Fluctuations in research impact, as measured by average citations per year (TCpY), are evident over the years. Peaks around 2007, 2010, and 2014 indicate that papers published in those years had a higher average impact.

In conclusion, this bibliometric analysis reveals the prominent authors in the field of "Working Capital Management" combined with "profit" or "return", depicts the trends in research focus over time, and provides insights into the average impact of the research.

Author Productivity through Lotka's Law

The **Figure 12** depicts author productivity using Lotka's Law, a mathematical model describing the distribution of production in a specific field. The rule predicts that a small number of authors will create the majority of articles, whereas a large number of authors would only produce a few (42).

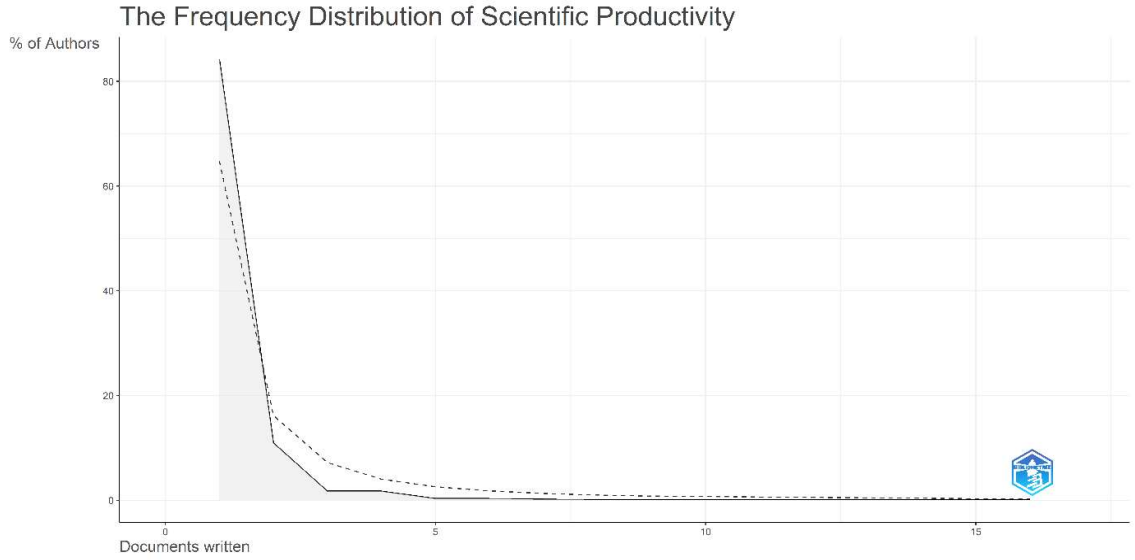
In terms of working capital management and its effect on profit and return on capital employed, the table shows that the vast majority of authors (84.2% of all authors) have only published a single paper. This suggests that many authors have contributed to the issue in a singular way, but that their overall impact has been rather minor.

Even fewer authors (0.018%) have published three or more documents on the topic. This suggests that only a few number of authors have made substantial contributions to the discipline by publishing many works.

In addition, the data indicates that a negligible number of authors (between 0.004% and 0.001%) have published five or more documents on the subject. As they have made substantial contributions to the corpus of knowledge on the subject, these authors are arguably the most prolific and influential in their profession.

The statistics corroborate Lotka's Law, which predicts that a small number of authors will create the majority of articles, whereas a big number will produce only a few. However, it is vital to emphasise that the quality and impact of publications are not necessarily proportional to the quantity of publications; criteria such as research quality and relevance must also be considered.

Figure 12: Frequency distribution of scientific production on WCM and its effect on ROCI and profit

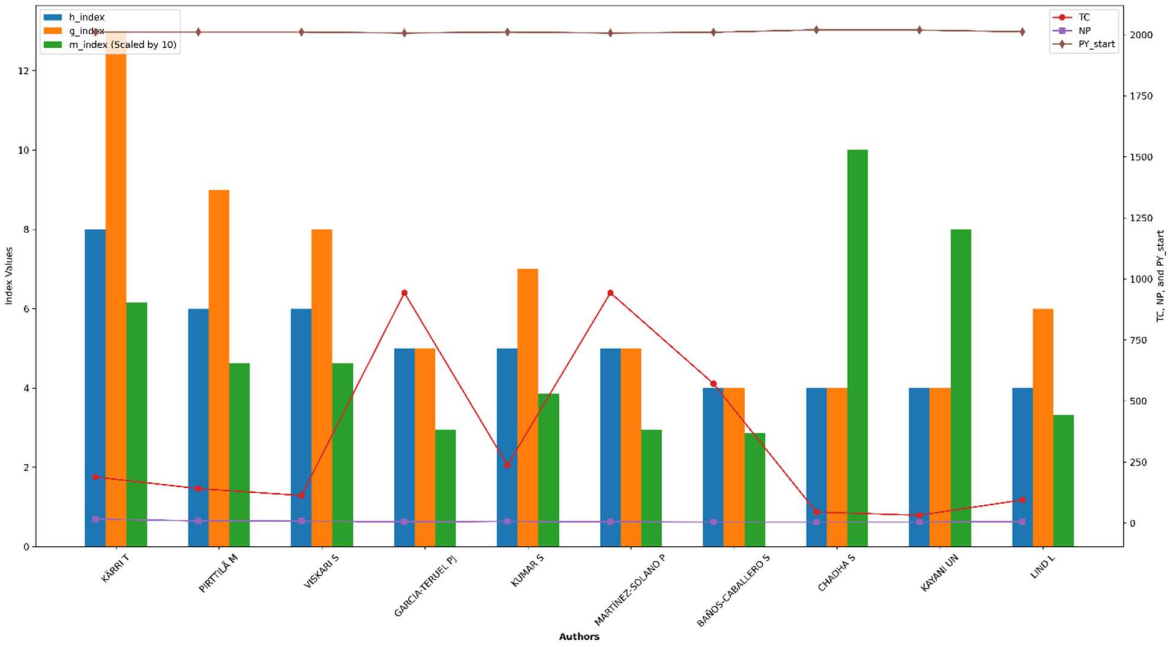


Note. *Figure created based on data obtained from Scopus Database, analysed using the Bibliometrix package in R by Author*

Author Local Impact

The **Figure 13** illustrates the regional influence of authors on our knowledge of the relationship between working capital management and financial results such as ROI and NPV. Several indices, including h-index, g-index, m-index, total citations (TC), publication count (NP), and first publishing year (PY start), are used to evaluate local influence.

Figure 13: Top ten authors impacts base on their different indexes score



Note. *Figure created by the author using Python programming language based on data obtained from Scopus Database*

The h-index measures the productivity and influence of an author based on the number of their publications and citations. A bigger h-index indicates increased influence. The g-index is comparable to the h-index, except it gives greater weight to highly cited papers. A higher g-index implies a larger influence from highly cited literature. The m-index assesses an author's productivity and influence by considering both the number of publications and the median number of citations per article.

KRRI T, PIRTTIL M, and VISKARI S have the highest h-indices, g-indices, and m-indices, indicating that their publications have had a greater impact on the field. Comparatively, GARCA-TERUEL PJ, KUMAR S, and MARTNEZ-SOLANO P have lower impact metrics but a greater number of publications and total citations.

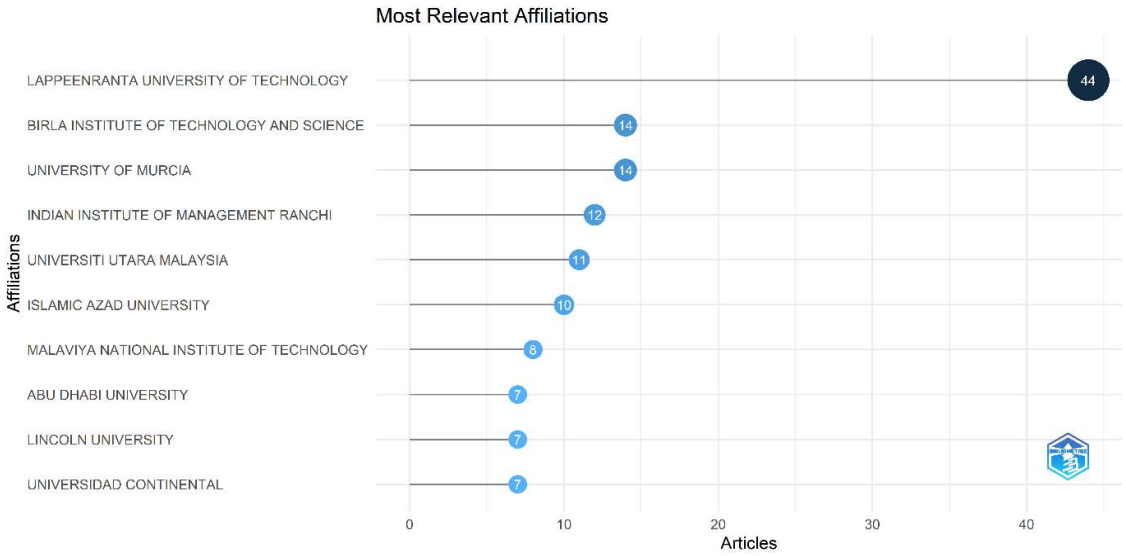
In addition, BAOS-CABALLERO S, CHADHA S, KAYANI UN, and LIND L exhibit various degrees of impact metrics, indicating that their contributions to the field are relatively less than those of the other authors.

As seen by their high impact metrics, a few authors have made substantial contributions to the study of working capital management and the effects of this study's conclusions on profitability and returns on capital employed. However, the total number of publications and citations is not the only indicator of influence; other variables, such as the quality of the study and its relevance to the subject, should also be taken into account.

Most Relevant Affiliation

In **Figure 14**, we see which organisations have written the most about the relationship between working capital management and financial outcomes, like ROI and profit. The data was compiled from the website Scopus, which houses a bibliographic database of scholarly works.

Figure 14: Ten most relevant affiliations in terms of article count published on WCM and its effect on ROCI and profit



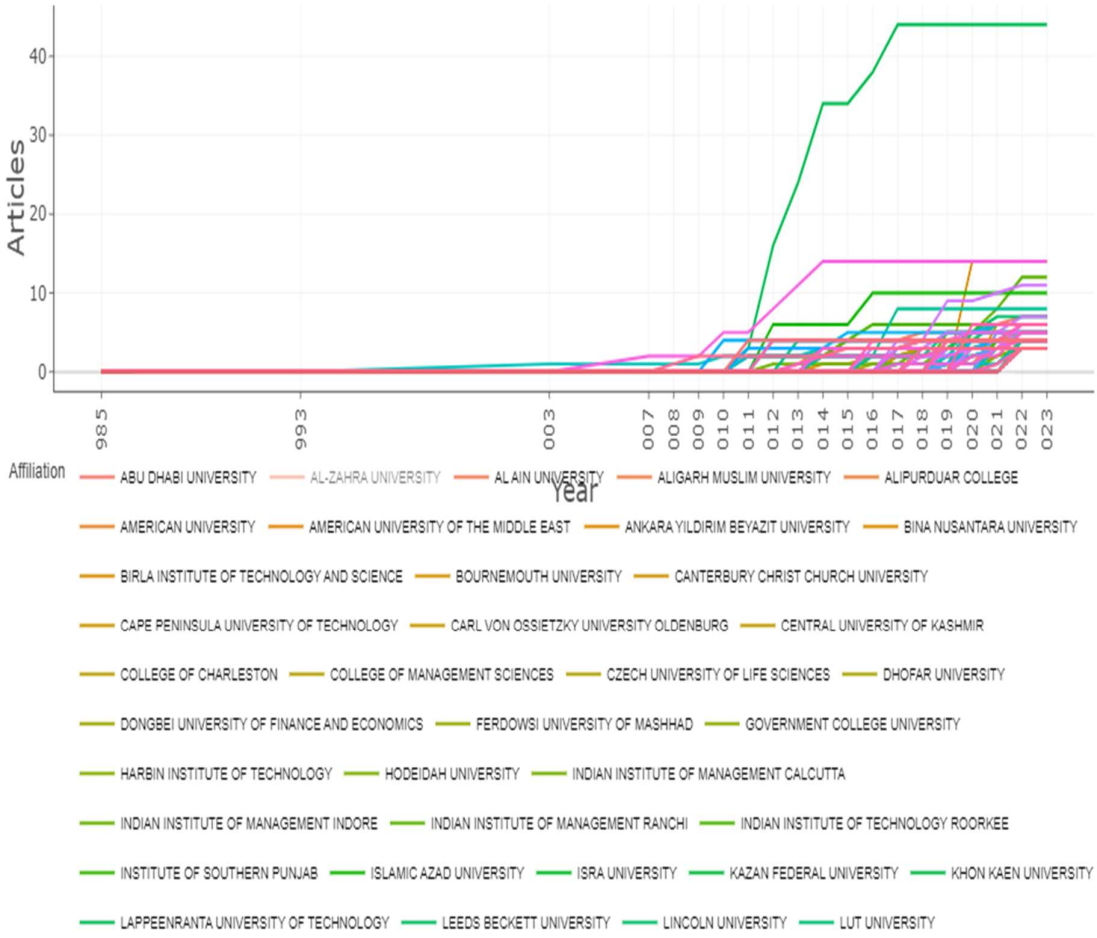
Note. *Figure created based on data obtained from Scopus Database, analysed using the Bibliometrix package in R by Author*

Lappeenranta University of Technology has the best research programme and the highest knowledge in the discipline, as evidenced by its 44 articles published on the topic. There are 14 more works from both the University of Murcia and the Birla Institute of Technology and Science. The Indian Institute of Management Ranchi has strong relations to the following universities: Universiti Utara Malaysia; Islamic Azad University; Malaviya National Institute of Technology; Abu Dhabi University; Lincoln University; and Universidad Continental.

Overall, the results show that working capital management and its impacts on profit and return on invested capital are the subject of extensive study. The work of the aforementioned think tanks may be of use to businesses and investors that want to better manage their working capital.

Affiliations' Production over Time

Figure 15: Affiliation production over the time on WCM and its effect on ROCI and profit



Note. *Figure created based on data obtained from Scopus Database, analysed using the Bibliometrix package in R by Author*

Figure 15 shows how the management of a company's working capital affects its profit and return on capital used at various stages of a product's production lifecycle. The data comes from Scopus, a bibliographic collection of scientific articles available online.

From 2007 onward, publication rates at the University of Murcia progressively rose, until levelling off at about 14 papers per year between 2014 and 2023. Following a similar growing trend, the annual number of publications at the Lappeenranta University of Technology will level off at 44 in 2023. These tendencies point to the continuation of research at these establishments on this subject.

While the number of publications from the University of Murcia was modest prior to 2007, it has steadily increased since then, peaking between 2014 and 2023 at 14 articles annually. This trend will also be followed by Lappeenranta University of Technology, which, between 2017 and 2023, will publish 44 publications annually, on average. These tendencies show that these academic centres continue to be interested in studying this issue.

There were no articles published by Birla Institute of Technology and Science until 2020, after which there was a dramatic increase in the number of publications, with 14 articles produced annually from 2020 to 2023. This suggests that the institution only recently developed a research interest in the area and rapidly emerged as a major contributor.

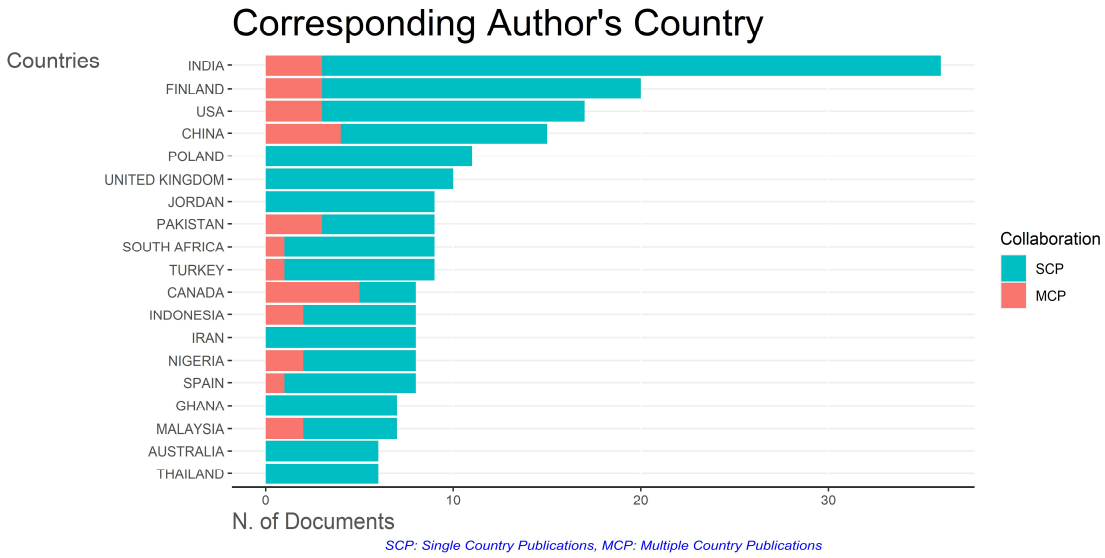
In conclusion, the trends reflect an ongoing interest in researching working capital management and its effects on profit and return on capital employed. Some institutions have established research programmes in

this field, whereas others have only lately started research interests. These articles may be beneficial for firms and investors seeking to maximise their working capital management techniques.

Corresponding Author's Country

Figure 16 provides data regarding the number of publications focused on working capital management and its effects on profit and return on capital employed. The publications are categorized based on the country of the corresponding author. The statistics presented in Figure 16 were extracted from the online bibliographic database of scholarly publications, Scopus.

Figure 16: Twenty most relevant corresponding author's country on WCM and its effect on ROCI and profit



Note. *Figure created based on data obtained from Scopus Database, analysed using the Bibliometrix package in R by Author*

There have been a total of 162 articles published. The number of publications published by authors from India is the largest at 36, followed by Finland (20), the United States (17), and China (15), in descending order.

In addition to these indicators, the data also provides Single Country Publications (SCP) and Multiple Country Publications (MCP) ratios. SCP represents the percentage of publications published by authors from a single nation, whereas MCP represents the percentage of articles published by authors from several countries.

India leads with 36 articles on this topic, followed by Finland, the United States, and China. Additionally, authors from Poland, the United Kingdom, Jordan, Pakistan, South Africa, and Turkey have produced a substantial number of works on this topic.

The SCP ratio for the total number of articles is 0.373%, which indicates that 37.3% of the articles were written by authors from a single country. The MCP ratio is 0.136, which indicates that 13.6% of articles were written by authors from various countries.

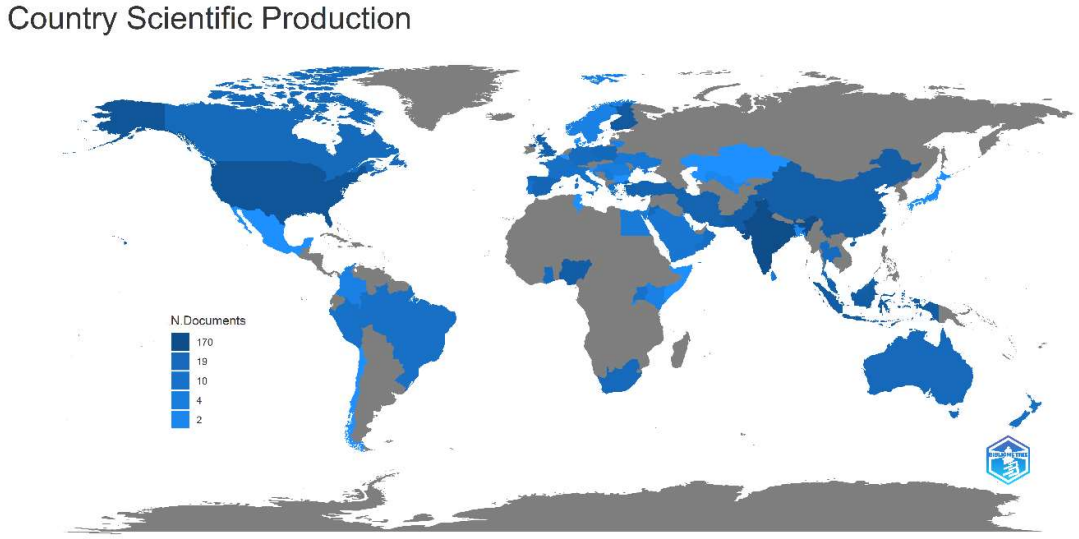
Canada has the highest MCP ratio at 0.625%, followed by Uganda at 0.667% and China at 0.267. This indicates that authors from these nations are more likely to work with authors from other nations when publishing on this topic.

In conclusion, the data shows that working capital management and its impacts on profit and return on capital employed are the subject of intensive study and attention across the world. Researchers, companies, and investors who are interested in learning more about this topic may benefit from these insights.

Country Scientific Production

The **Figure 17** depicts the amount of articles published on working capital management and its implications for profit and return on capital employed in various countries. Scopus, an online bibliographic database of scholarly papers, provided the information.

Figure 17: Country's publication on WCM and its effect on ROCI and profit



Note. *Figure created based on data obtained from Scopus Database, analysed using the Bibliometrix package in R by Author*

With 170 publications published on the subject, India ranks first in research production. Finland ranks second with 65 articles, followed by the United States with 86 articles. Other countries with significant research production include Malaysia, Indonesia, Nigeria, Pakistan, and China.

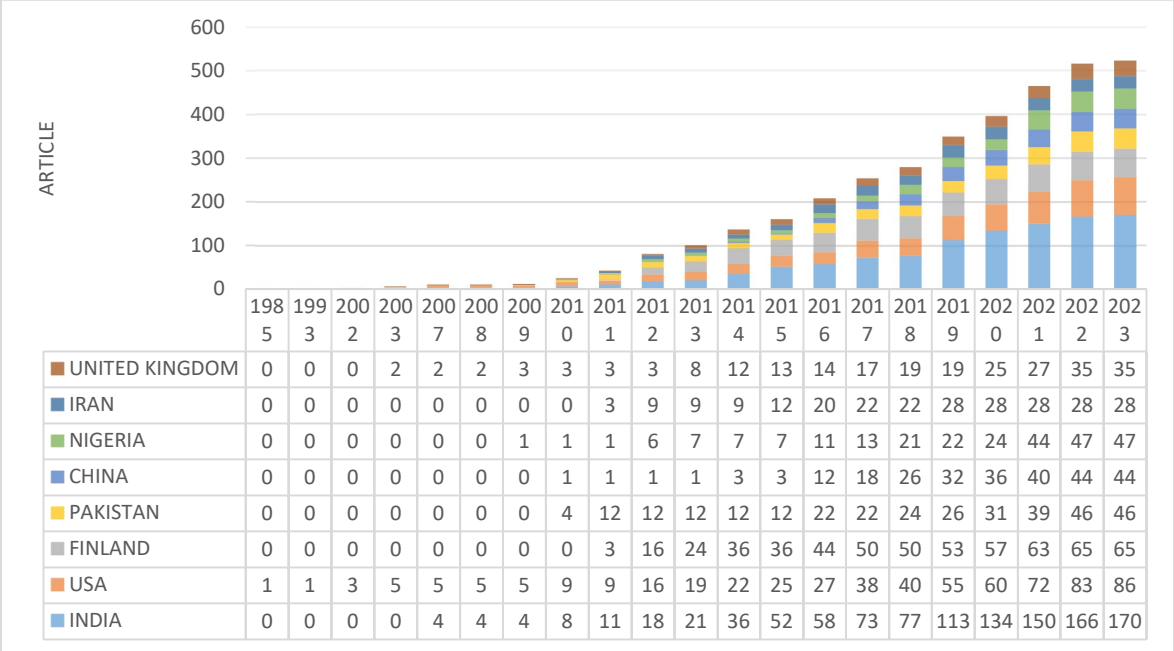
It is essential to recognise that a country's research output is not necessarily indicative of the quality or significance of its research discoveries. Nonetheless, it serves as a measure of the research activity and interest surrounding the topic.

The research showed that working capital management and its effects on profitability and ROI were of widespread interest around the world. To achieve their financial goals, businesses and bankers all over the world recognise the importance of prudently managing their working capital.

Countries' Production over Time

This Figure 18 exhibits data from the Scopus website on the number of articles published regarding working capital management and its impact on profit and return on capital employed in various countries over the years.

Figure 18: Top country's production over the time on the topic of WCM and it effect on ROCI and profit



	1985	1993	2002	2003	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
UNITED KINGDOM	0	0	0	2	2	2	3	3	3	3	8	12	13	14	17	19	19	25	27	35	35
IRAN	0	0	0	0	0	0	0	0	3	9	9	9	12	20	22	22	28	28	28	28	28
NIGERIA	0	0	0	0	0	0	1	1	1	6	7	7	7	11	13	21	22	24	44	47	47
CHINA	0	0	0	0	0	0	0	1	1	1	1	3	3	12	18	26	32	36	40	44	44
PAKISTAN	0	0	0	0	0	0	0	4	12	12	12	12	12	22	22	24	26	31	39	46	46
FINLAND	0	0	0	0	0	0	0	0	3	16	24	36	36	44	50	50	53	57	63	65	65
USA	1	1	3	5	5	5	5	9	9	16	19	22	25	27	38	40	55	60	72	83	86
INDIA	0	0	0	0	4	4	4	8	11	18	21	36	52	58	73	77	113	134	150	166	170

Note. *Figure created based on data obtained from Scopus Database, analysed using the Microsoft Excel 365*

The data indicates that the majority of articles published between 1985 and 2023 were written by Indian researchers, with a total of 1099 papers. Australia (175), the United States (586), and Finland also have a significant number of publications (562).

Beginning with a single paper in 1985 and reaching a total of 6534 publications by 2023, the number of papers published on this topic has steadily increased over time. The majority of papers were published in the preceding decade, with 865 papers published in 2019 and 1002 papers published in 2020.

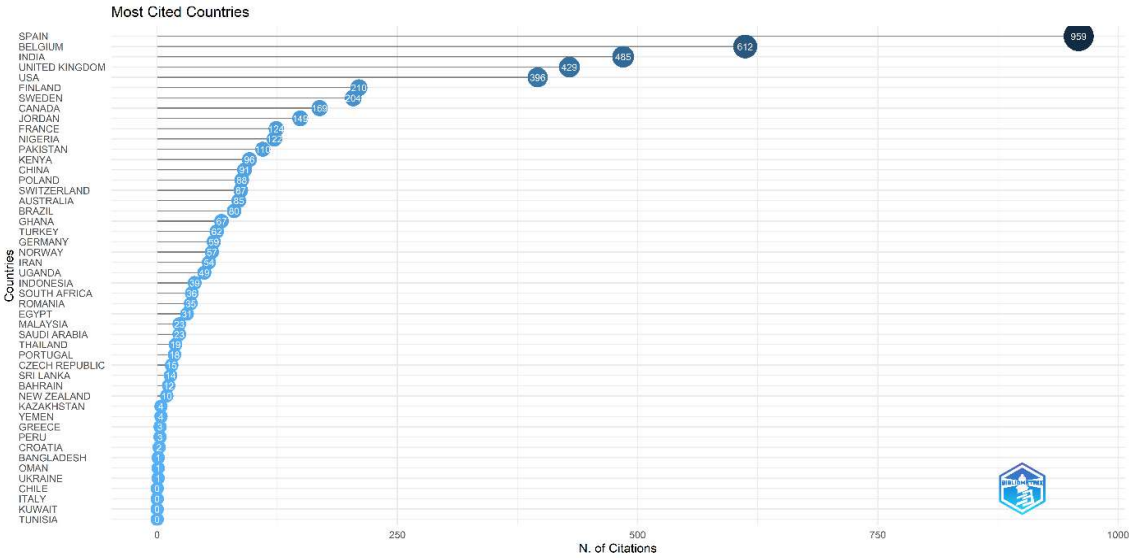
In light of these results, governments in nations like India, Australia, the United States, and Finland are giving working capital management a higher priority. There appears to be a growing body of literature on the topic, which may indicate that it is receiving more attention in academic and professional circles of finance and accounting.

Most Cited Countries

Working capital management and its implications on profit and return on capital employed is the subject of many academic papers, and the figure below ranks the top-cited nations by total citations (TC).

Most Cited Countries

Figure 19: Ranks of top-cited nations by total citations on WCM and its effect on ROCI and profit



Note. *Figure created based on data obtained from Scopus Database, analysed using the Bibliometrix package in R by Author*

Figure 19 shows that Spain has the highest average number of citations per article, at 119.88, and the highest overall number of citations, at 959. Close behind is Belgium, whose experts' work is influential given that it has received a total of 612 citations and an average of 612.00 citations per piece.

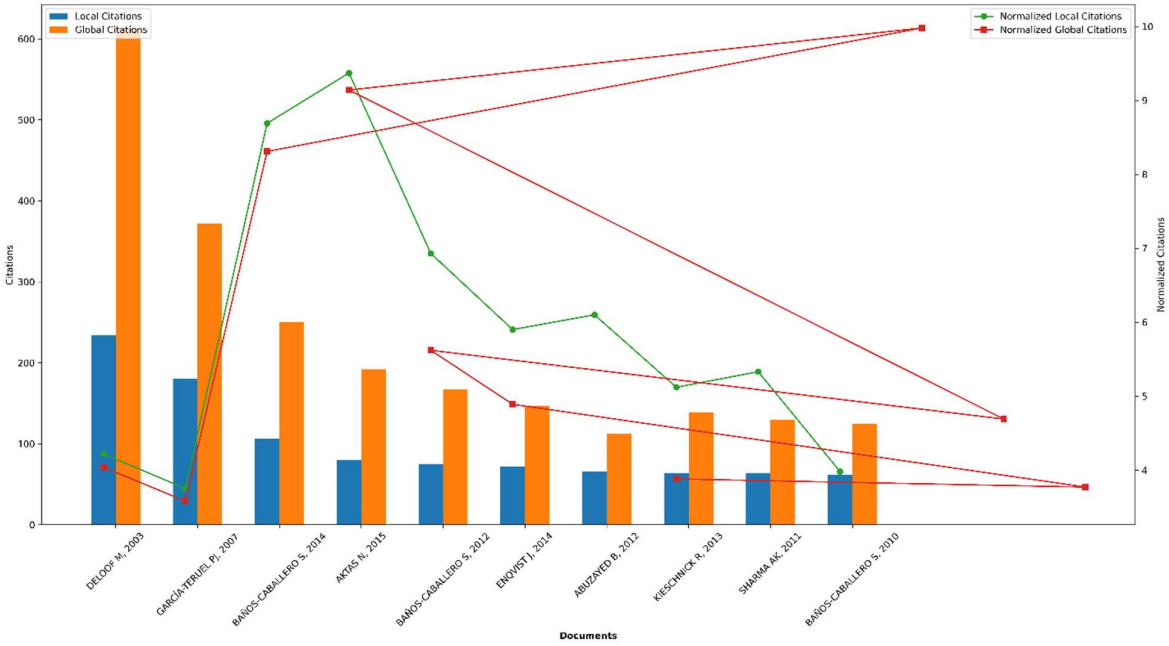
India, which had the highest number of publications in the previous table, ranks third in terms of citations, with a total of 485 citations and an average of 13.47 citations per article. This suggests that research papers from Indian researchers may not have the same level of impact as those from other nations.

The United Kingdom and the United States round out the top five most cited countries, with 429 and 396 total citations, respectively. Other countries with notable citation counts include Sweden (204), Canada (169), and Jordan (149). Interestingly, countries like Australia and Finland, which had a large number of publications in the preceding table, have relatively fewer total citations.

In conclusion, Spain and Belgium emerge as the most cited countries in the field of working capital management and its effects on profit and return on capital employed. This indicates the high quality and influence of research published by scholars

Document Citation

Figure 20: Most Cited Documents: Local vs Global



Note. *Figure created by the author using Python programming language based on data obtained from Scopus Database*

The **Figure 20** titled "Most Cited Documents: Local vs Global" provides a comprehensive overview of the citation impact of various documents. It can be interpreted as follows:

Key Observations:

- The paper titled "DELOOF M, 2003" has the highest number of both local and global citations, indicating its significant impact. It also has high normalized citation scores.
- Another influential paper is "GARCÍA-TERUEL PJ, 2007," which has a substantial impact in both local and global contexts, although it falls slightly short compared to "DELOOF M, 2003."
- The name "BAÑOS-CABALLERO S" appears multiple times in the list of most cited documents, highlighting the impact of this author's contributions.
- Despite being relatively newer, the papers "AKTAS N, 2015" and "BAÑOS-CABALLERO S, 2014" show high normalized citation

Most Local Cited References

Using data obtained from the Scopus website, the most commonly cited regional references on working capital management and its effect on profit and return on capital employed are displayed in the **Table 3**. The Table 3 also displays the total number of Google Scholar citations for each reference.

Table 3: Most local cited reference

Google Scholar	Cited References	Citations
link	LAZARIDIS, I., TRYFONIDIS, D., RELATIONSHIP BETWEEN WORKING CAPITAL MANAGEMENT AND PROFITABILITY OF LISTED COMPANIES IN THE ATHENS STOCK EXCHANGE (2006) JOURNAL OF FINANCIAL MANAGEMENT AND ANALYSIS, 19 (1), PP. 26-35	60
link	RICHARDS, V.D., LAUGHLIN, E.J., A CASH CONVERSION CYCLE APPROACH TO LIQUIDITY ANALYSIS (1980) FINANCIAL MANAGEMENT, 9 (1), PP. 32-38	37
link	GARCÍA-TERUEL, P.J., MARTÍNEZ-SOLANO, P., EFFECTS OF WORKING CAPITAL MANAGEMENT ON SME PROFITABILITY (2007) INTERNATIONAL JOURNAL OF MANAGERIAL FINANCE, 3 (2), PP. 164-177	34

link	AKTAS, N., CROCI, E., PETMEZAS, D., IS WORKING CAPITAL MANAGEMENT VALUE-ENHANCING? EVIDENCE FROM FIRM PERFORMANCE AND INVESTMENTS (2015) JOURNAL OF CORPORATE FINANCE, 30, PP. 98-113	31
link	BAÑOS-CABALLERO, S., GARCÍA-TERUEL, P.J., MARTÍNEZ-SOLANO, P., WORKING CAPITAL MANAGEMENT, CORPORATE PERFORMANCE, AND FINANCIAL CONSTRAINTS (2014) JOURNAL OF BUSINESS RESEARCH, 67 (3), PP. 332-338	28

Source: Data extracted from the Scopus database

Academics are eager to study more about the relationship between working capital management and profitability, according to the findings. The most frequently cited source is a 2006 study by Lazaridis and Tryfonidis that examines the relationship between good management of working capital and the profitability of enterprises trading on the Athens Stock Exchange. Sixty citations demonstrate the widespread recognition of this work (27).

Studies that also study the effect of working capital management on corporate profitability include those by Richards and Laughlin (1980) (43),Garca-Teruel and Martnez-Solano (2007) (31), Akts et al.(2015) (44), and Baos-Caballero et al(2014) (45).

According to the figures, study on this topic has been undertaken in a variety of countries, including the United States, Portugal, Spain, the United Kingdom, Mauritius, Norway, and Portugal. This suggests that researchers from all over the world are interested in the relationship between working capital management and profitability. The results of the bibliometric analysis reveal that working capital management is a promising area of finance research. The data could be utilised by policymakers and practitioners to better comprehend the relationship between working capital management and corporate success.

References Spectroscopy

The table displays the total number of citations, the publication year, and the median change in citations for spectroscopy-related references during the past five years. The data contain references dating back to 1776, indicating that spectroscopy has been studied for quite some time. The number of citations for spectroscopy-related references has increased significantly over the past few years, reaching a peak of 1144 in 2012. Since then, however, the number of citations has decreased, decreasing by 234 in 2015 and 222 in 2016.

The median difference in citations over the past five years has followed a similar pattern, rising to 371 in 2003 and then declining to 250 in 2021. This indicates that spectroscopy's popularity has decreased in recent years.

Notable are the years in which the number of citations and the difference in median citations over the previous five years are both 0 or negative. This could be owing to the fact that there were no noteworthy improvements or breakthroughs in the industry during those years.

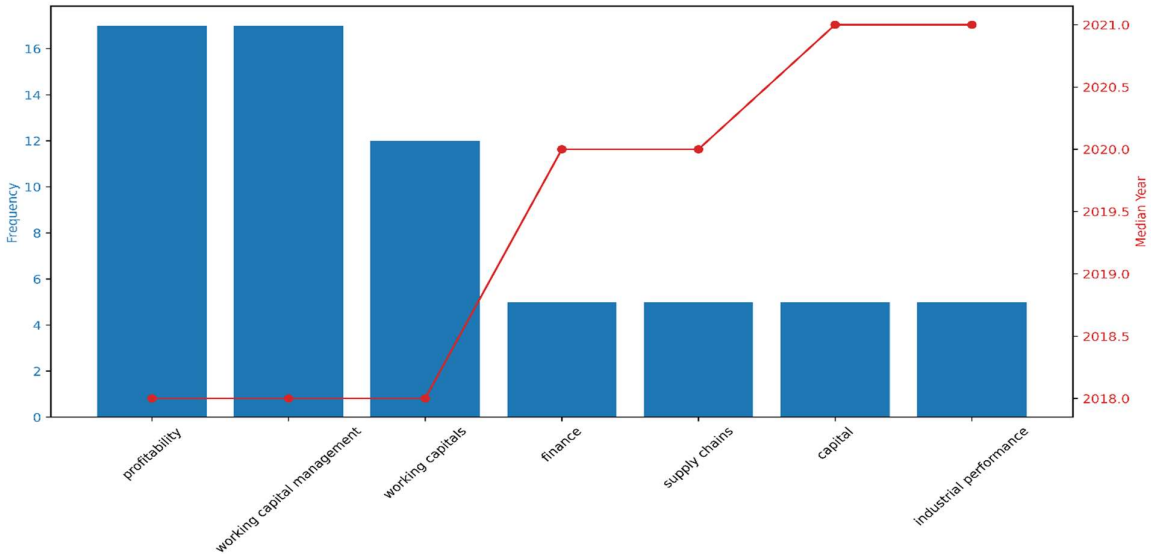
While spectroscopy has been researched for a long time and has had a considerable increase in citations in recent years, there has been a fall in interest in the area in recent years, according to the statistics. Future interest and citation growth might necessitate additional field-specific research and development.

Most Frequent Words

According to the statistics, working capital management and its impact on profitability and return on capital employed appear to be the most researched topic. Researchers are also interested in how successfully a company manages its current assets and liabilities, hence the frequent use of the term "working capital." The time it takes a company to convert its investments in inventory and accounts receivable into cash is measured by the "cash conversion cycle," another frequently investigated key indicator.

Most Relevant Words

Figure 21: Trend Topics: Frequency and Median Year



Note. *Figure created by the author using Python programming language based on data obtained from Scopus Database*

The frequency of a topic appearing in the dataset is represented by blue bars.

The median year of publication for articles on these topics is indicated by a red line.

Observations:

Topics such as "profitability" and "working capital management" exhibit high frequency and a broader range of median years, suggested their sustained relevance.

"Industrial performance" shows lower frequency but a more recent median year, implying it could be an emerging topic.

Interpretation:

The literature emphasizes topics like "profitability" and "working capital management" as dominant themes.

There is a trend towards newer topics such as "capital" and "industrial performance" as indicated by their more recent median publication years.

Clustering by Coupling

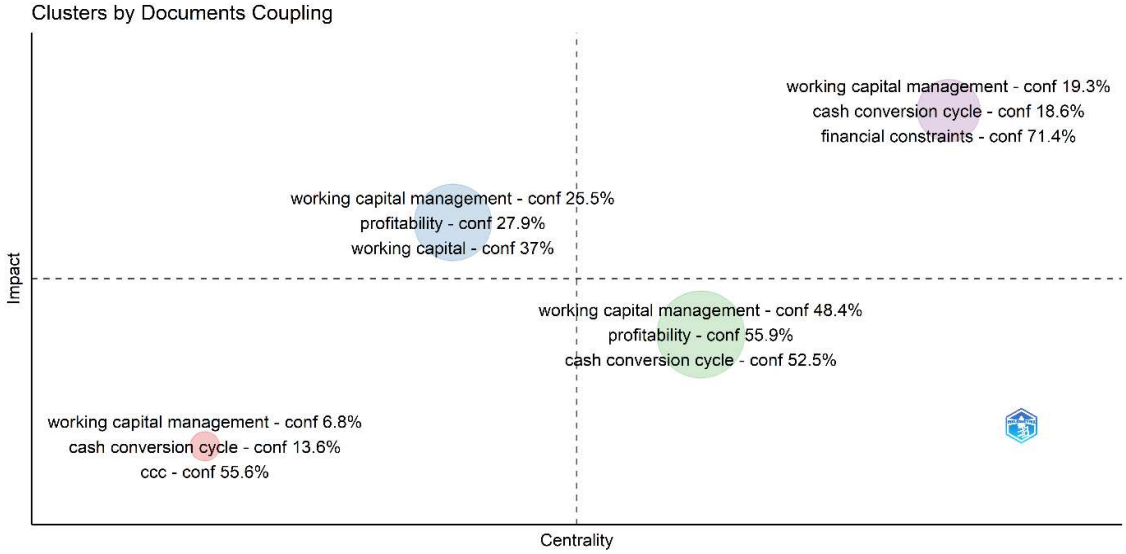
Clustering in bibliometric analysis generally refers to the grouping of articles, authors, or keywords that are closely related to each other. This is often done through co-citation analysis, where articles that are cited together frequently are considered to be closely related (46).

Coupling analysis is another method used to identify the relationship between different research papers. It is based on the principle that if two papers cite a common set of papers, they are likely to be related in some way. This is often used to identify research streams or to find connections between different fields of study (47).

"Clustering by Coupling," the concept combines both clustering and coupling analysis to provide a more nuanced understanding of the relationships between different research topics or papers. This can help in identifying overarching themes or gaps in the existing literature.

The **Figure 22** depicts clustering analysis results, in which frequently occurring terms in papers are grouped according to the strength of their connections. The "label" column displays clustered terms, the "group" column gives numbers to each group, and the "freq" column indicates the frequency with which publications mention the terms in each group. The "centrality" column reflects the intensity of the connections between terms, the "impact" column provides the average citation impact of papers that include group terms, and the "colour" column gives colours to each group.

Figure 22: Clustering analysis of frequently occurring terms in papers are grouped based on their connection strength



Note. Figure created based on data obtained from Scopus Database, analysed using the Bibliometrix package in R by Author

Group 1 consists of terms related to "cash conversion cycle," which is closely related to "working capital management." This cluster appears infrequently, but its centrality and influence are large, indicating that articles citing these terms are highly referenced and have a substantial impact.

Group 2 includes terms associated with "working capital management", "profitability", and "working capital". This is the largest cluster, with significant occurrence frequency and moderate centrality and influence.

Group 3 consists of terms linked with "working capital management" and "profitability" as well as "cash conversion cycle" This cluster has a high occurrence rate and moderate influence, however it is less central than group 2.

Group 4 consists of terms related to "financial restrictions" and "working capital management," which are strongly related to "cash conversion cycle." This cluster occurs less frequently, but has a high centrality and impact, indicating that the publications that reference these phrases are quite influential.

Overall, clustering analysis reveals several term groups frequently referenced together in publications on working capital management and its impact on firm performance. The term coupling strength and their citation impact shed light on the most influential topics and their connections.

Co-occurrence Network

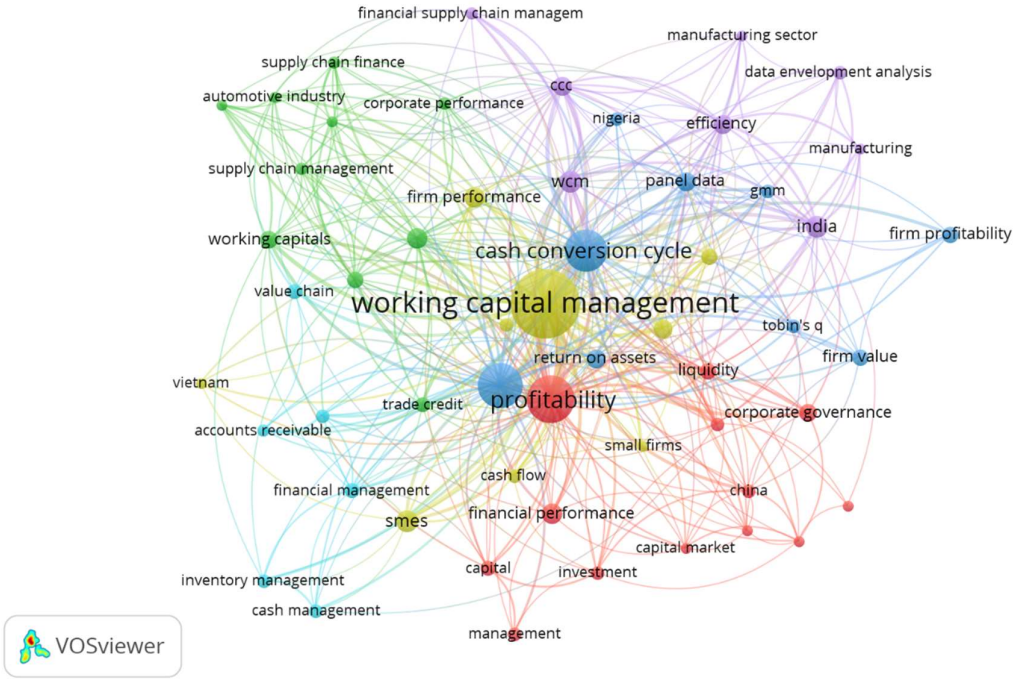
A Co-occurrence Network in bibliometric analysis is a graphical representation that shows the relationships between different bibliographic items such as keywords, authors, or journals. This network is often used to identify the most effective research topics, emerging trends, and the interconnections between various research areas.

For example, Misra et al. (2023) used a Co-occurrence Network-based bibliometric analysis to visualize research trends in wearable medical devices. They applied VOSviewer software to the Scopus database and analyzed the co-citation of cited authors and the co-occurrence of keywords. The study revealed that the research domain primarily focuses on topics like the Internet of Things, machine learning, wearable sensors, and mobile health (48).

Similarly, Muneeb et al. (2023) implemented bibliometric analysis coupled with co-occurrence network visualization to examine the landscape of supply chain finance and corporate strategies in the industrial context. The study utilized various bibliometric indicators and network visualization tools to explore key insights, including publication patterns, prevalent author keywords, esteemed journals, and influential institutions (49).

The table provides more information on the co-occurrence network of working capital management research-related keywords. The network illustrates keyword associations based on their co-occurrence in scholarly literature. The network is created based on the measures such as cluster, betweenness, proximity, and PageRank, which provide insight into the network structure and the significance of each keyword inside the network.

Figure 23: Co-occurrence Network



Note. Figure created using VOSviewer based on data obtained from Scopus Database.

Betweenness: This measure signifies how often a node appears on the shortest paths between nodes in the network. A higher betweenness centrality suggests that the node is central in the network structure. As we can see, "working capital management" has the highest betweenness, indicating its central role in the network of co-occurring terms.
Closeness: It measures how close a node is to all other nodes in the network. Here, "working capital management" also leads, implying that it is, on average, closer to all other nodes.
PageRank: This algorithm measures the importance of each node in the network. Similar to Betweenness and Closeness, "working capital management" has the highest PageRank, reinforcing its importance in the network. The close relationship between all the terms in the cluster column is indicated by **Figure 23**.

Interpretation

Central Topic: "Working Capital Management" is the most central topic, with the highest betweenness, closeness, and PageRank values. This suggests that it is a hub within the network, linking many other topics together. It's likely that this topic is foundational or essential in the field you're studying.

Secondary Importance: "Profitability" and "Working Capital" have the next highest metrics but are considerably less central than "Working Capital Management". These could be important but secondary topics that are often discussed in conjunction with "Working Capital Management".

Emerging Topics: The nodes with lower betweenness but relatively higher closeness or PageRank could be emerging topics that are starting to gain importance but are not yet central in the discussion. The data provided doesn't necessarily point to any "emerging topics" based on the metrics available.

Peripheral Topics: "Firm Profitability: Firm Profitability" and other topics with low values for all three metrics are more peripheral to the network. They may be more specialized topics or new entrants that have not yet gained centrality in the literature.

Network Cohesiveness: All the topics belong to the same cluster (Cluster 1), suggesting that the terms are closely related and likely often appear together in the literature.

Research Focus: Given the high metrics for "Working Capital Management," it may be beneficial to focus on this topic for comprehensive research or literature review. It could serve as a good starting point from which other related topics can be explored.

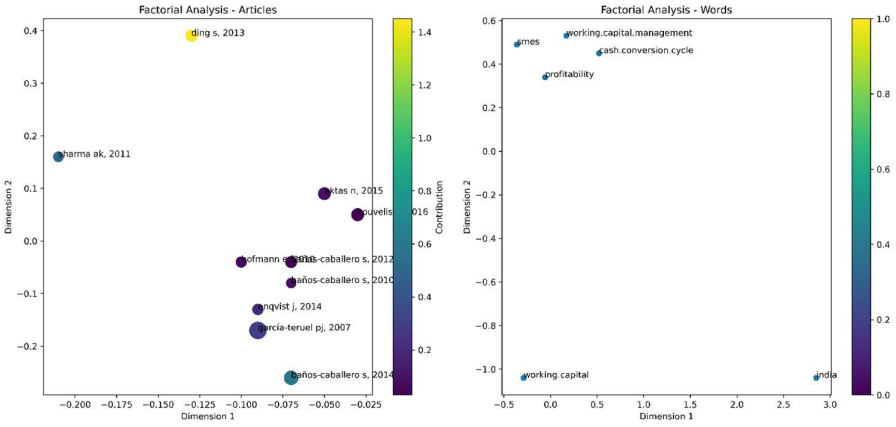
Factorial Analysis

Factorial analysis in bibliometric studies is a technique used to identify and analyze underlying relationships among a large set of variables, such as articles and words. It helps to reduce the dimensionality of the data and to identify the most significant factors that explain the variance in the dataset. Factorial analysis can be particularly useful in understanding the thematic structure of a field, identifying the most influential words, and revealing the relationships between different articles or authors.

For example, a study by Maryam Gull, Alia Ahmed, and Imran Asghar Warraich conducted a systematic literature review on job characteristics and work engagement. The study employed bibliometric analysis to develop research themes and included factorial analyses among other methods. The factorial analyses were used to identify the most significant theories, influential words, and dominant authors in the field (50).

Another study by P. Palos-Sánchez, P. Baena-Luna, A. Badicu, and J. Infante-Moro performed a bibliometric analysis on the application and impact of Artificial Intelligence in Human Resource Management. The study used various bibliometric tools, likely including factorial analysis, to provide information on annual production, analysis of journals, authors, documents, and keywords (51).

Figure 24: Factorial analysis of Articles and Words.



*The **Figure 24** above is the Factorial Analysis for articles shows the distribution based on two dimensions (dimension1 and dimension2).*

***Note.** Figure created by the author using Python programming language based on data obtained from Scopus Database*

Articles like "ding s, 2013" contributed more to the factorial analysis, as indicated by its high 'contribution' value (1.45).

The total citation (TC) is represented by the size of the point. For example, (31)" has the highest total citations (372), making it the most cited paper in this cluster.

Most of the articles are clustered near the origin, suggesting that they are closely related in terms of the topics they cover.

Factorial Analysis - Words

The scatter plot for words shows how each term is oriented in the two-dimensional space.Words like "India" and "working.capital.management" are far apart from the rest, suggested that they may represent distinct aspects or dimensions within the working capital management literature.

Most of the key terms are clustered around the origin, indicating that they are frequently co-occurring and are central themes in the cluster.

Overall Insights

The topic "working capital management" is a major focus in this cluster, and it has been studied in various dimensions.

The term "India" suggested that there might be a focus on working capital management in the context of India.

The factorial analysis helps to visualize how articles and words are related to each other in a two-dimensional space, providing an overview of the research landscape for "Working Capital Management and Its Effect on Profit and Return on Assets/Investments."

Co-citation Network

A Co-citation Network is a graphical representation that illustrates how different publications are cited together within a particular field of study. In this network, nodes represent individual publications and edges between nodes indicate that the two publications have been cited together in another paper. The strength and frequency of these co-citations can reveal patterns, clusters, or themes within a research area, as well as the relationships between different authors, journals, or institutions.

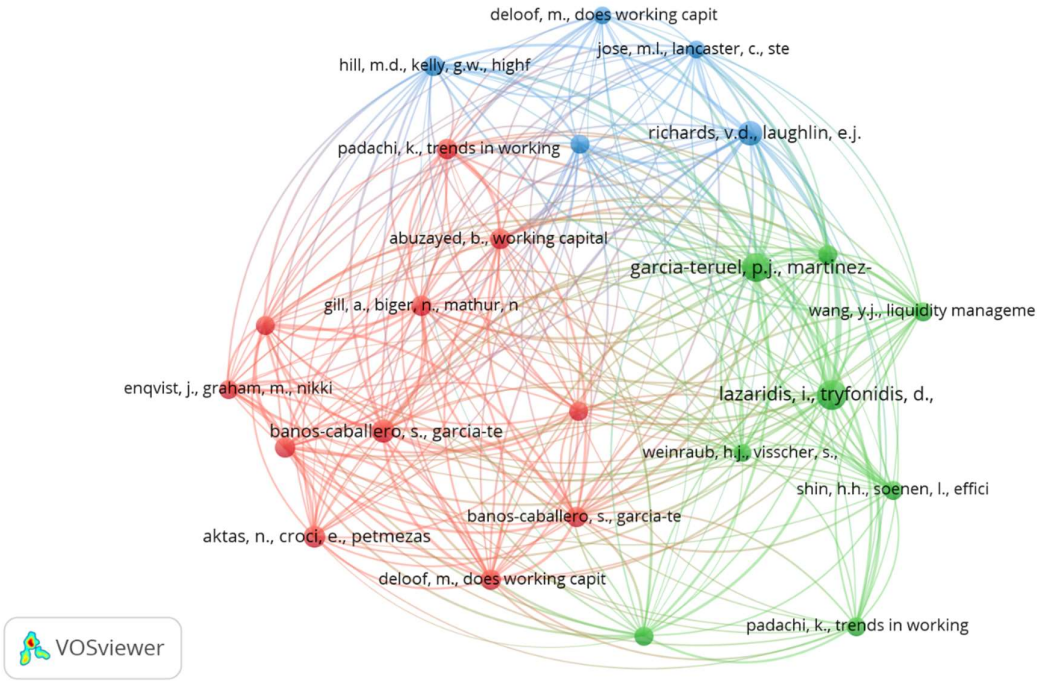
For example, a study by Navarro-Ballester et al. (2022) conducted a bibliometric citation and co-citation network analysis on publications related to COVID-19 in radiology journals. The study generated a co-citation matrix to perform a co-citation network, which helped in identifying key themes in the study of COVID-19 in radiology publications (52).

Another study by Baghalzadeh Shishehgarkhaneh et al. (2022) used co-citation investigations to explore the patterns of research interactions in the construction industry, focusing on Building Information Modeling (BIM), the Internet of Things (IoT), and Digital Twins (DT) (53).

Figure 25 shows Co-citation network. Co-citation occurs when two documents receive a citation from a third document. In other words, when Document A and Document B are cited together in Document C, they are said to be co-cited. Co-citation networks are graphical representations of how documents are cited together in the literature, often used to identify the most influential works and to uncover relationships between different works or clusters of works (54).

High Influence Nodes: The node (29) has the highest Betweenness centrality and PageRank, making it the most influential node in the network. Its high Betweenness centrality suggested that it often acts as a "bridge" between other nodes, while its high PageRank indicates its importance or authority in the network.

Figure 25: Co-citation network where noted represents the author or paper



Note. *Figure created based on data obtained from Scopus Database, using the VOSviewer*

Secondary Influencers: (27)" and (55) also have relatively high Betweenness and PageRank but are less influential than (29)"". They still play a significant role in the co-citation network.

Closeness Centrality: The size of the points indicates the Closeness centrality. A larger point size implies that the

node is closer to other nodes in the network. In our plot, most nodes have similar sizes, indicating comparable levels of closeness to other nodes.

Cluster Distribution: The colour-coded points represent different clusters in the co-citation network. Most of the influential papers (higher PageRank and Betweenness) belong to the same cluster (Cluster 1), indicating a focused area of research or interest.

Less Influential Nodes: Nodes with lower Betweenness and PageRank values are less central in the network. They are cited less frequently and are not often used as bridges between other nodes.

Cluster 3 Special Case: The nodes in cluster 3 have relatively lower Betweenness but higher PageRank, suggesting that while they may not serve as bridges, they are still important papers within their cluster.

Isolated Nodes: If there were nodes far from the cluster of points, it would indicate papers that are less connected to the main body of research. However, in this plot, most nodes are closely packed, suggesting a well-connected network.

In summary, this plot provides a nuanced view of the co-citation network, identifying key papers and their roles within the research community on "Working Capital Management and Its Effect on Profit and Return on Assets/Investments."

Collaboration World Map

The term "Collaboration World Map" in bibliometric analysis refers to a graphical representation that showcases the collaborative efforts between researchers, institutions, or countries in a specific field of study. While the term itself may not have a seminal paper introducing it, the concept is often used in bibliometric studies to visualize international or inter-institutional collaborations.

For example, a study on global scientific research on human monkeypox used VOSviewer to create density and network visualization maps, highlighting the international collaboration between the USA, UK, and Congo (56). Another study on climate change and transportation also used bibliometric tools to show that the US, China, and European countries dominate this field, and it highlighted the basis of international organizations and government agencies' reports on climate change (57).

Figure 26 represents a cooperation network in the form of a world map, exhibiting links between nations depending on the frequency of research collaboration. Each row of the table represents a pair of cooperating nations (From and To) and the number of collaborations between them (Frequency).

Observable based on the presented data are the following:

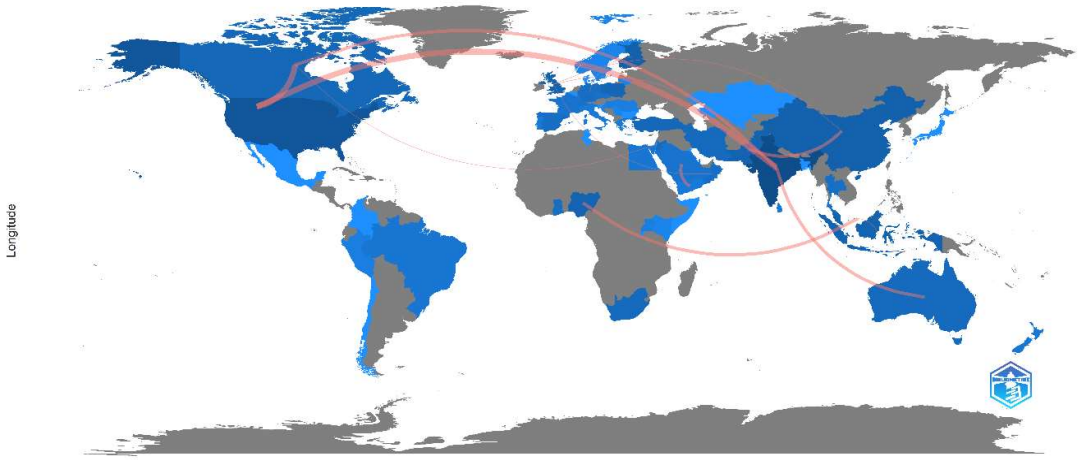
The United States of America (USA) and India have the highest number of collaborations, totalling six, indicating significant scientific cooperation between these two nations.

With six collaborations between them, the United States and Canada likewise demonstrate a high number of collaborations, demonstrating a strong scientific relationship between these two countries.

India collaborates with other nations, including Australia, Canada, Indonesia, Malaysia, Saudi Arabia, South Africa, the United Kingdom (UK), the United States of America, and Yemen, highlighting India's significant participation in worldwide research collaborations.

Multiple collaborations occur in Europe, including those between Finland and Germany (2), Germany and Italy (1), Germany and Switzerland (1), Spain and Italy (1), and the United Kingdom and Germany (1). This necessitates extensive research collaborations inside Europe.

Figure 26: Countries collaboration on WCM and it's effect on ROCI and profit



Note. *Figure created based on data obtained from Scopus Database, analysed using the Bibliometrix package in R by Author*

Collaborations between countries within the same region also exist, such as Indonesia and Malaysia (2), Croatia and Slovenia (1), and Hungary and Romania (1).

Additionally, the collaboration network exposes ties between countries from various regions. China partners with Canada, Ghana, Hong Kong, and the United Kingdom, among others.

This analysis finds that research collaborations occur across countries and regions, enabling the sharing of knowledge and fostering the growth of research fields. The collaboration global map can assist researchers in identifying potential collaborators or research partners, comprehending the distribution of research efforts, and identifying international research collaboration opportunities.

Future Trends

1. Integration of Financial Technologies (Fintech)

Trend: The influence of fintech on working capital management is obtaining focus, as these technologies use new ways to optimize capital, inventory administration, and receivables. Future research ought to concentrate on understanding just how fintech tools such as AI and blockchain can improve WCM performance (36).

Implications: This can result in improved functional efficiencies and strategic decision-making capacities in companies, permitting real-time information analysis and predictive analytics in WCM techniques.

2. Sustainability and Environmental, Social, and Governance (ESG) Factors

Trend: Gradually the ESG factors is being unavaidable factor that company has to consider, understanding their influence on WCM is essential. Study can discover how organizations incorporate ESG factors into WCM to achieve sustainable business practices (20).

Implications: Understanding ESG integration can lead to sustainable financial management that aligns profitability with ethical and environmental responsibilities.

3.Industry-Specific WCM Strategies

Trend: Different industries have special WCM needs and challenges. Future studies must focus on customizing WCM approaches to fit specific market requirements, particularly in fields with complicated supply chains or variable demand patterns (6).

Implications: Tailoring WCM methods can enhance industry-specific monetary performance, permitting companies to maximize their working capital management according to their unique functional needs.

4. Behavioral Aspects of WCM

Trend:

The role of behavioral finance in working capital management is gaining attention. Study can explore how cognitive biases, and managerial behaviour influence monetary decisions and WCM efficiency (11).

Implications: Understanding these behavioral aspects can lead to better-informed financial techniques and improved WCM methods.

5. Impact of Globalization on WCM.

Trend: Globalization adds complexity to managing working capital across various countries. Future study ought to examine exactly how multinational companies adjust their WCM methods in varied financial and regulatory contexts (17).

Applications: This research can direct services in optimizing global WCM techniques, accounting for variables like financial threats and cross-border supply chain administration.

Conclusion

This research provides a detailed bibliometric analysis of the literature on Working Capital Management (WCM) and its impact on profitability and Return on Assets (ROA). By using the Scopus data source, we have determined key trends, significant writers, and emerging area of study, providing a detail map of the present state of WCM study.

More comprehensive Implications

The results of this study have significant implications for the academic community and research methodology.

Integration of Fintech in WCM:

The adaptation of financial innovation (fintech) into WCM techniques offers considerable opportunities for services to enhance their working capital techniques. By leveraging technologies such as blockchain, machine learning, and artificial intelligence, companies can attain extra reliable cash flow management, reduce transaction costs, and enhance real-time decision-making capacities. This technical change not just enhances functional efficiency yet also lines up with the expanding pattern towards digital transformation in financial management.

Sustainability and ESG Considerations:

The increasing focus on ESG highlights the need for WCM techniques to incorporate sustainability factors. This integration has the potential to create sustainable business models that prioritize both profitability and ethical/environmental responsibilities. Business that proactively adjust their WCM methods to consist of ESG factors are most likely to obtain a competitive edge by attracting socially mindful capitalists and customers.

Globalization and Industry-Specific Strategies:

In the face of globalization's impact on service landscapes, firms must tailor their WCM methods to accommodate varying economic and governing atmospheres. Industry-specific approaches are critical in this context, as they allow companies to tailor their WCM techniques to special market problems, supply chain characteristics, and competitive stress. This adaptability can bring about enhanced financial efficiency and risk management across varied geographical areas.

Behavior Insights in WCM:

The consolidation of behavioral finance into WCM methods uses brand-new perspectives on managerial decision-making. Understanding cognitive prejudices and psychological factors that affect financial decisions can cause more enlightened and strategic WCM techniques. This approach not only enhances the efficiency of financial management however also promotes a culture of continuous enhancement and technology within companies.

Managerial Implications

The study has several useful implications for managers and practitioners.

Improved Decision-Making:

Managers can utilize the insights from this study to enhance their decision-making procedures related to working capital. By recognizing the crucial fads and techniques in WCM, managers can make enlightened decisions that line up with their organization's financial goals and market conditions.

Strategic Planning:

The research emphasizes the value of lining up WCM practices with wider planned objectives, such as sustainability and digital transformation. Supervisors ought to focus on integrating ESG factors to consider and fintech services into their WCM methods to make certain lasting stability and competitiveness.

Risk Management:

Reliable WCM methods play a critical function in threat management by ensuring adequate liquidity and financial security. Supervisors ought to leverage the insights from this study to create durable risk management structures that reduce the effect of market volatility and financial uncertainties on working capital.

Cooperation and Innovation:
The study highlights the requirement for cross-functional cooperation and innovation in WCM methods. Managers must encourage partnership in between finance, operations, and innovation groups to establish cutting-edge services that drive effectiveness and value creation in working capital management.

Future Research Directions
While this study gives a detailed summary of the present state of WCM research study, numerous areas warrant more examination. Future study ought to check out the lasting impact of fintech combination on WCM practices, the function of ESG factors in shaping financial approaches, and the influence of behavioral finance on managerial decision-making. Furthermore, cross-country relative studies can offer beneficial understandings into the effectiveness of WCM approaches in various financial contexts.

In conclusion, this research study contributes to the existing literature by giving a detailed evaluation of WCM methods and their implications for profitability and ROA. By highlighting the broader and managerial effects of WCM, this research provides valuable understandings for academics and professionals looking for to optimize financial management approaches in a significantly complicated and vibrant business atmosphere.

Author Contributions

Conception and Design of the Study:
Dr. Afzalur Rahman conceptualized the study and designed the research framework.

Data Collection:
Author B was responsible for data collection, including setting up and executing the search queries in the Scopus Database.

Analysis and Interpretation of Data:
Dr. Afzalur Rahman performed the bibliometrics analysis using the biblioshiny package in R and interpreted the results.

Drafting of the Paper:
Author C drafted the introduction, literature review, and conclusion sections.
Author B drafted the methodology and data collection sections.
Author C drafted the results and discussion sections.

Revising the Paper Critically for Intellectual Content:
All authors contributed to revising the paper critically for intellectual content. Author C focused on the coherence and logical flow, Author B ensured the accuracy of the methodology, and Author C verified the validity of the results and interpretations.

Final Approval of the Version to be Published:
All authors have read and approved the final version of the manuscript for publication.

Accountability:
All authors agree to be accountable for all aspects of the work, ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

Data Availability Statement
The data supporting the results and analyses presented in this paper are available on Zenodo, a public data repository. The dataset can be accessed using the following DOI: 10.5281/zenodo.8415033. There are no ethical, privacy, or security concerns that restrict the sharing of this dataset. The Data can also be downloaded from the Scopus database using the query shared in this article.

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