

A BIBLIOMETRIC ANALYSIS ON WORKING CAPITAL MANAGEMENT: CURRENT STATUS, DEVELOPMENT, AND FUTURE DIRECTIONS

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ABSTRACT

This paper aims to evaluate existing research studies on working capital management. The bibliometric method, a quantitative analytical approach, was used to analyze published studies from the year 1954 to 2020. VOSviewer and Nvivo mapping software tools were used for analyzing the retrieved qualitative and quantitative data. There were five main clusters of themes identified in this bibliometric analysis paper which helped in visualizing research trends of working capital management. An analysis of 1124 research papers depicted that research in this domain has significantly increased over the last fifteen years. Data were analyzed based on journals, authors, year of publications, countries, and research streams. Extracted results further indicated that the United States has taken a lead in publications in this field, followed by China and India. This study has helped in revealing the latest trends in Working Capital Management research (WCM). Results have further indicated that there have been recent research advancements in this topic and gaps in studies have paved ways for future research. This review paper will provide further guidance to finance professionals, researchers as well as policymakers on the WCM topic.

Keywords: Working Capital Management, Bibliometric Analysis, Profitability

INTRODUCTION

The topic of working capital management holds significant importance in the corporate finance literature. Researchers in the past have proven that working capital can have a major impact on the performance and profitability levels of a firm. This implies that the management of working capital is essential to ensure that company has adequate cash flows to meet its current liabilities in the form of expenses and short-term debts. The word 'adequate' holds importance here because working capital must not be high or low but at a satisfactory level for the operational success of a company. Working capital can easily affect the long-term goals of a company, therefore, its management comes as a continuous responsibility to increase business efficiency. Companies also need to ensure that resources are not underutilized, and overtrading is avoided so that operational efficiency can be maximized. Working capital management is considered to be one of the strongest indicators to indicate the financial health of any business. This implies that a financially solvent business directly correlates to managing the working capital appropriately. This further indicates that having essential business acumen is critical to the growth of the company and to capitalize on the assets.

Improving the credit score of the company's ability to deal with unforeseen circumstances such as financial crisis, using their fixed assets efficiently, and expanding their business are some of the reasons which highlight the importance of adequately managing working capital. The ability of the company to pay off its debt on time and simultaneously, generating more revenues helps in boosting the credit score. A high credit score builds the credibility of the company in the market, making it easier to obtain finances for future projects. An optimal amount of working

capital enables companies to operate with adequate cash flows for operational expenses and short-term liabilities (Mohamad&Saad, 2010). This strong financial standing of the company in the competitive market also helps businesses to qualify for corporate loans at a lower rate comparatively. The company will incur costs on fixed assets if they are not being used efficiently. These fixed expenses may come in the form of the depreciation assets face and the interest on the amount borrowed to purchase these assets. An adequate amount of working capital would enable the company to use its fixed assets for production purpose efficiently, thereby, increasing their revenue generation. Also, businesses can be adversely affected during the time of recession, therefore, they must ensure that there is adequate management of working capital to deal with unforeseen circumstances. Additional capital is required for companies to expand their businesses in the long run. Therefore, effectively managing their working capital can help companies in implementing their future strategies successfully.

The working capital level may vary during the fiscal year of a company. Statistical studies reveal that accounts receivables, cash conversion cycles, accounts payable and the number of days inventories are the most commonly used working capital ratios (Lukkari, 2011). A study by (Filbeck& Krueger, 2005)revealed in their findings that economic factors such as innovation rates, fluctuating interest rates, and competitive markets have a strong impact on working capital management across industries. With an increase in interest rates, payments would be delayed which would have a direct impact on accounts receivables, cash accounts, and accounts receivables. The working capital amount needs to be factored out but any company must derive an accurate amount to function efficiently, operate smoothly and competitively. This further implies that measures of working capital are not constant across firms annually and there can be significant movements throughout the year. Also, a high level of working capital would indicate that the company is neglecting the growth factor by not investing in suitable opportunities and favoringa high liquidity level.

Section 1 has discussed the significance of working capital management for firms and reviewed relevant researches. Section 2 provides an insight into the statistical method used to analyze the existing publications on this topic and parameters essential for this analysis. Section 3 presents graphical and tabular illustrations and interprets the derived data. The subsequent section provides analysis and summarises the findings of this study. Lastly, section 4 discusses the current streams, section 5 discusses several directions for future research on this topic identified by researchers, and section 6 concludes the paper.

RESEARCH METHOD

The bibliometric method has been used to present a literature review of this research topic. This signifies that the objective of this research is to perform a bibliometric analysis of published researches on working capital management (Nobanee, 2020). This method centers on evaluating the scientific knowledge produced and disseminating that information to add value to the research (Archambault& Vignola-Gagne, 2004). This quantitative research measures the impact of published researches in a diverse network of the scientific community. The bibliometric method, a form of descriptive study, uses content analysis in a structured manner to evaluate the chosen articles and statistical techniques used to define those research studies. Citation analysis, another component of the bibliometric method, uses data to gauge the impact of chosen articles in the study (Nobanee, 2021). This helps in understanding if that study can prove to be a significant part of contributing scientific knowledge. Publication language, keys words of each study, most cited articles, countries of publication are some of the analyzed parameters in the bibliometric analysis (Chiu &Ho, 2007).Similarly, these analyzed parameters have been used in this analysis to assess the academic productivity of working capital

management. These parameters must be clearly understood by a researcher for correct interpretations and to avoid any manipulations. Structural indicators, mainly used to measure patterns between publications, areas of research, and researchers (Durieux&Gevenois, 2010) have also been used in this study for analysis (Nobanee et al., 2021). These parameters would enable us to gauge mathematically and statistically the relative significance of each article and journal on working capital management. Citations of qualitative data have also been used as one of the several other indicators to evaluate the impact of research on this topic. Aksnes, et al., (2019)claim that solely relying on citation as an indicator to measure the quality of research may imply less focus towards other quality parameters such as originality, societal impact, or credibility.

This bibliometric analysis begins with narrowing down influenced work published by authors, on working capital management, from over 1000 published research papers. Systematic mapping, on this topic, has also been used to help in identifying links between key themes of research topics and patterns based on collaborations. Network analysis based on co-authoring would enable to identify the connecting patterns of researchers, countries, and research institutes based on the frequency of publications that have been co-produced (Van Eck &Waltman, 2014). Evolutions of publications on working capital management have been graphically illustrated in upcoming sections to identify future directions and gaps in this study. Findings from this analysis will provide a robust roadmap to fill the identified gaps in this topic. The dominant language in all these articles was English.

Scopus, a literature database, was used to select high-quality papers published in high-quality journals. Keywords used in this search process were "working capital management" OR "current assets management" or "operating cycle" or "cash conversion cycle" or "cash to cash" or "cash 2 cash" or "cash-to-cash" or "net trade cycle" or "modified cash conversion cycle" or "cash cycle" or "days sales in receivables" or "receivable period" or "receivable collection period" or "receivable days" or "receivable cycle" or "inventory conversion period" or "inventory cycle" or "days sales in inventory" or "inventory period" or "payable cycle" or "payable period" or "payable deferral period" or "payable days" or "inventory days" or "trade credit" or "net trade credit" showing 1,376 document results. This search was limited to document types of articles and review papers. As mentioned above, we have also limited the search to document types of articles and review papers, we have also limited the search to English sources, and the final number of papers included in the analysis is 1,124 documents.

Nvivo and VOS viewer softwares were also used in this bibliometric analysis. VOS viewer was mainly used to create bibliometric maps between the main themes of this topic and examine them thoroughly. Nvivo was used to discover the main concepts from the qualitative data of this research study. Comprehensive details on each map would be provided in subsequent sections.

BIBLIOMETRIC ANALYSIS: RESULTS AND DISCUSSION

This section would provide a detailed insight of results extracted from our bibliometric review. The following figures would provide an overview of the relationship between working capital management and enterprises' success.

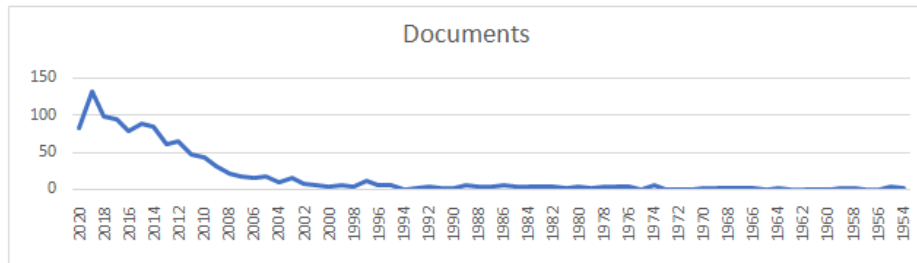


FIGURE 1
PER YEAR PUBLICATIONS

Figure 1, shows the amount of research that has been conducted and literature has been published on working capital over the past 66 years. It can be seen from the graph above that a significant amount of research has been conducted on this topic from the year 2006 onwards to address this topic and scholar's responses have been centered towards introducing new relevant strategies on working capital management to improve business's efficacy.

Period	Number of Documents	Citations	Period	Number of Documents	Citations
2016-2020	485	43.10%	1981-1985	14	1.20%
2011-2015	347	30.90%	1976-1980	14	1.20%
2006-2010	129	11.50%	1971-1975	5	0.40%
2001-2005	56	5.00%	1966-1970	6	0.50%
1996-2000	29	2.60%	1961-1965	1	0.10%
1991-1995	13	1.20%	1956-1960	3	0.30%
1986-1990	18	1.60%	1954-1955	4	0.40%
Total	1077	100%			

The numerical data of the growth of working capital management literature can be seen in table 1. This data reveals that there has been an exponential growth over the years in research of this topic. This table further reveals that citations, one of the performance indicators of research, is reflecting an increase in the impact of research on this topic gradually over time. This quality dimension, citation of documents, in the table depicts the impact of research and relevance in the market in different periods. This table further implies that changes in working capital have been reflected in the company's performances, therefore, research has become more prominent on this topic to recognize its importance in identifying value-creating prospects, reach meaningful targets and improve their efficiency in the long-run.

Rank	Source by number of documents	documents	citations	Source by citations	documents	citations
1	international journal of production economics	33	1835	international journal of production economics	33	1835
2	computers and industrial engineering	24	663	review of financial studies	7	1677
3	applied mathematical modelling	17	772	european journal of	17	1159

				operational research		
4	european journal of operational research	17	1159	applied mathematical modelling	17	772
5	journal of corporate finance	17	371	journal of business finance and accounting	7	708
6	journal of banking and finance	15	647	journal of the operational research society	13	674
7	investment management and financial innovations	14	35	computers and industrial engineering	24	663
8	international journal of operational research	13	113	journal of banking and finance	15	647
9	international journal of systems science	13	268	journal of finance	4	606
10	journal of the operational research society	13	674	journal of financial and quantitative analysis	8	562

Table 2 above presents an overview of the volume of literature and citations on working capital management published in quality journals. This distribution of published literature across various journals and disciplines provides an insight into the development of this topic in different fields. This table helps in revealing the academic strength of these scientific journals with the number of documents published and citations of these journals contributing to working capital management.

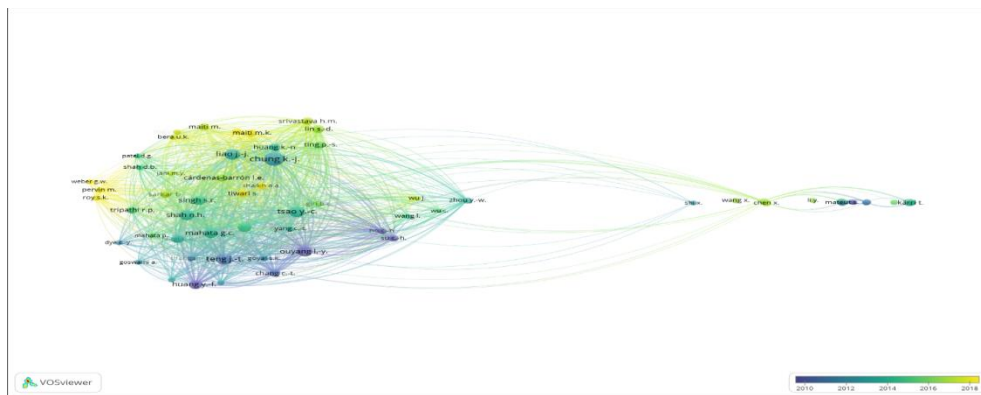


FIGURE 2
AUTHORS' VISUALIZATION THROUGH VOSVIEWER SOFTWARE OVER THE PERIOD OF 1954–2020 IN WORKING CAPITAL MANAGEMENT LITERATURE.

Figure 2 presents a collaborative network of author co-citations on working capital management. The minimum number of documents in each source is kept at 5 to make the result meaningful, the number of citations per document is 10; this results in 64 sources. Each node in the figure represents the name of each author and the size of each node depicts the number of times the author has been cited in 64 documents. There can be seen a link between the authors in the figure which represents their relationship in terms of co-citation. Authors with similar shades belong to the same cluster which indicates that similar topics were explored and published in different periods by authors. There is a total of five clusters shown on this map. A closer relationship was depicted with a shorter distance between authors if they were cited together frequently whereas, on the contrary, authors farthest in this mapping analysis represent a weaker relationship between each other.

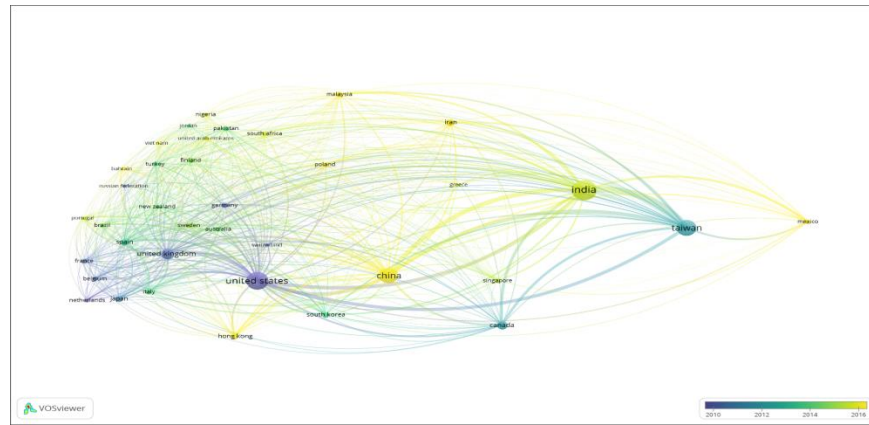


FIGURE 4
COUNTRIES’ VISUALIZATION THROUGH VOSVIEWER SOFTWARE OVER THE PERIOD OF 1954–2020 IN WORKING CAPITAL MANAGEMENT LITERATURE. THE MINIMUM NUMBER OF DOCUMENTS IN EACH SOURCE ARE KEPT AT 5 TO MAKE RESULT MEANINGFUL, THE NUMBER OF CITATIONS PER DOCUMENT IS 20, THIS RESULTS TO 37 SOURCE CALCULATION

Figure 4, another bibliographic mapping analysis, shows the coupling of different countries in which studies were written by various authors. It can be seen from the figure that the most productive country in terms of publishing research on this topic has been the United States of America which is then followed by several other countries on a varied scale such as China, India, Taiwan, etc. These countries have actively stood out in publishing useful content on working capital management. This trend has been followed by several other countries, over the past few years, to contribute significantly towards this topic.

Table 3			
MOST FREQUENT KEYWORDS			
Keyword	Occurrences	Keyword	Occurrences
trade credit	441	costs	68
commerce	218	working capital	67
inventory	209	supply chain management	67
sales	144	optimization	66
working capital management	138	permissible delay in payments	61
inventory control	115	cash conversion cycle	61
profitability	113	deteriorating items	56
deterioration	106	sensitivity analysis	50
supply chains	104	EOQ	49
supply chain	69	finance	41

Table 3 sheds light on the top 20, most frequently used, and important keywords, in research papers discussing working capital management. These distinct keywords help in revealing the essential themes in each research domain. This varied structure of keywords helps in understanding and emphasizing on the specialized area of research focusing on this topic.

DISCUSSION

Research studies have revealed that investment decisions and financing decisions are not dependent variables in perfect capital markets. This suggests that investment policies are causally linked with the opportunities available to invest depicting positive NPV (net present value) because of the firm's unlimited access to external funds and different sources of finance as a substitute to internal finance (Baños-Caballero et al., 2010). Empirical studies have further shown that these growth opportunities could have a direct impact on the company's working capital, thereby, affecting their inventory investment levels and trade credits received by businesses. Baños-Caballero, et al., (2010) further highlighted in their study that external finance cannot be a perfect substitute for internal resources. Issuance of new shares or debt, forms of the external fiancé, can turn out to be more expensive as compared to internal finance if market imperfections exist. In the given circumstances, financing and investment decisions must be independent of each other and firms need to have an optimal level of cash conversion cycle to maximize their economic value and maintain a balance between cost and benefit.

This research paper has been used different bibliometric parameters to discuss the increased importance of management working capital across firms globally. Based on the analysis presented above, it can be seen that the United States of America is taking a lead in publications on this topic. It can be further concluded that this topic of working capital management has been approached by researchers in multiple ways. Some researchers have studied inventory management and its impact on the firm's efficiency level whereas others have focused on reasons behind managing accounts receivable and deriving an optimal policy to maximize the firm's profits. Results from these researches further indicate that there is a requirement of working capital every company should work towards achieving and achieve maximized returns.

CURRENT STREAMS

In this paper, streams of research were identified by cluster analysis on the VOS viewer (Figure 5) and content analysis (Figure 6). The major research themes were clustered in nine segments. Table 4 below presents the current streams of research for each paper in this main domain of working capital management. These diverse research themes have helped in understanding the aim of researchers delving deeper into this research topic from different perspectives. However, it also further reveals the areas of this subject which have not been explored in depth.

FUTURE RESEARCH AGENDA

New theoretical frameworks need to be introduced as research outcomes and add new empirical insights on this topic. Gaps to be filled by future researches have been found in this bibliometric analysis by reviewing the most recent literature on this topic (2016 to 2020) published in journals with high impact factors. Research gaps have been changed into research questions identified in the latest researches by researchers. This systematic process of future research agenda has been drawn from the latest study published by (Bahoo, 2020). Table 4 also presents 30 questions addressing areas of future research on working capital management after examining the existing theoretical frameworks on it.

Table 4			
FUTURE RESEARCH QUESTIONS			
	Reference	Streams	Research Question
1	Pirttila, et al., (2020)	Trade credits policies	What is the role of regulators in the development and management of a business? Why some companies do not tend to follow any specific strategy concerning working capital management?
2	Moussa (2019)		What are the determinants of working capital management before the Egyptian revolution of 2011 and after too? What are the external and internal factors which could have an impact on the working capital management of a firm?
3	Lyngstadaas& Berg (2016)		What are the underlying reasons behind the length of different determinants of the cash conversion cycle?
4	Peng& Zhou (2019)	Supply chain management	What would be the impact of more complex supply and chain network on companies working towards capital management? Would capital constraints bring more problems for companies to address and create a more dire need for suitable working capital management?
5	Panda, et al., (2020)	Small and medium-sized enterprises	Which financing strategies can be integrated with working capital management strategies for the SMEs sector to maximize the value of the firm? Which macroeconomic parameter can have a significant influence on the SME sector in India?
6	Louw, et al., (2019)		Which policies would help in increasing the profitability level of firms and providing additional working capital for firms?
7	Orazalin (2019)		Would measures of market-based performance help in identifying a relationship between working capital management and performance of firms? What are the implications for managers and investors in this WCM context to emerging economies such as Russia or Kazakhstan?
8	Amponsah-Kwatiah&Asiamah (2020)		What is the link to internal control systems of a firm with working capital management? Another variable <i>i.e.</i> profitability also needs to be examined with these two factors of manufacturing firms.
9	Seth, et al., (2020)		What are the qualitative factors that may affect the efficiency level of working capital management in companies? Are there any market variations that would help in explaining the strategies leading to a greater efficiency level of working capital management? New trends emerging from these themes must be examined and theoretical frameworks must be introduced accordingly.
10	Shahid, et al., (2020)		Is there an impact of corporate governance, whereas working capital management is taken

			as a mediating variable to determine the company's performance, on varied manufacturing industries? Will adding another variable such as reliable leadership have an impact on the performance of firms too?
11	Singh, et al., (2017)	Profitability	Can Fisher's Z transformation, a unique methodology, prove and support a conventional theory that aggressive policies on working capital management can lead to higher profitability levels?
12	Tran, et al., (2017)		Do larger enterprises and SMEs in other sectors reveal the same standard relationship between profitability level and working capital management or they differ in nature?
13	Masri& Abdulla (2018)		Is maintaining certain liquidity levels essential to maximize the profitability level?
14	Tahir&Anuar (2016)		What are the implications of practices of WCM on non-financial companies' performances?
15	Salehi, et al., (2019)		Will the outcome of accessing finance to reduce financial problems at the corporate level in markets facing financial sanctions be similar to the market with no economic sanctions? Also, will the results be any different for economies facing a low inflation level?
16	Le (2019)	Optimization, optimal systems, and solutions	What is an optimal level of net working capital which helps in balancing the risk and profitability level of a firm?
17	Wetzel & Hofmann (2019)		What are the external and internal determinants which help in revealing the optimal level of working capital to increase the performance of a firm? Which theoretical frameworks can explain the inter-organizational phenomenon of working capital management and supply chain finance?
18	Prasad, et al., (2019)	Inventory modeling	Can working capital efficiency multiplier be replaced as a new variable to measure financial performance and replace other measures such as return on assets, gross operating income, return on equity, and return on invested capital or net operating income?
19	Boisjoly, et al. (2020)		Do financial measures such as inventory level or turnover reveal more of the effect of policy changes in terms of working capital management? Does the nature of the industry matter as well?
20	Ben-Nasr (2016)		What is the ownership role in establishing the link between investments and efficiency levels such as human capital investment?
21	Ren, et al., (2019)	Financial crisis	What is the impact of the effects of working capital management on the profitability level of a company in fluctuating economic cycles? Does extreme event such an economic crisis have an impact on the relationship between working capital management and profitability?
22	Panda & Nanda (2018)		Does the contractionary or expansionary monetary policy, in fluctuating business

			cycles, have an impact on working capital financing of businesses?
23	Ramiah, et al., (2016)	Economic order quantity	Do behavioral biases help in making effective managerial decisions and achieving the targets concerning working capital management?
24	Bořoc& Anton (2017)	Corporate governance	Can corporate governance exert an influence on the relationship between WCM and the company's performance?
25	Fiador (2016)		Does governance influence on WCM differ from industry to industry?
26	Pestonji&Wichitsathian (2019)	Cost reduction	Is there any standard model of capital expenditure firms operating overseas need to determine to manage working capital? Would a comparison of policies between different countries help in determining appropriate working capital management policies for firms?
27	Dhole, et al., (2019)		Why reducing capital expenditure to manage cash flows would have adverse effects on the long-term growth of a firm? Is there a need to increase capital expenditure by a firm to manage working capital effectively?
28	Soukhakian&Khodakarami (2019)		What is the role of the inflation rate and gross domestic product on working capital management and the performance of businesses? Can these macroeconomic variables as controlled variables help us understand the relationship between these independent and dependent variables?
29	Dalci, et al., (2019)	Cash conversion cycles	What is the relationship between the cash conversion cycle and return on assets in moderate-sized firms? This also needs to be studied in countries other than Germany (the focus of study) by using a large sample to comprehend the results.
30	Wang (2019)		Why firms with short-term debt are more sensitive to the financial crisis? Why stocks with high cash conversion cycle features are more sensitive to intermediary capital ratios?

CONCLUSION

This research helps in concluding that the cash conversion cycle is one of the popular measures to gauge the effectiveness of working capital management. Wang (2019) reiterates that the cash conversion cycle, an effective metric, measures the firm's working capital management and determines the external financing need of the firm. These studies have further concluded that there can be a negative or positive impact on the profitability level of companies as an outcome from the management of working capital. Furthermore, this in turn can have a positive or negative impact on the wealth of shareholders. Literature in this research contributes towards comprehending the relationship between the profitability level of firms and working capital management in different ways. Recent studies have validated some of the findings of researchers from the past few years by examining the relationship between these two variables. Also, recent studies have added more substance to theories introduced by researchers over the past few years. Moreover, this literature depicts that countries like Sweden, Nigeria, Pakistan have conducted limited research on this topic. Louw, et al., (2019) revealed in their study that companies in

South Africa have recently recognized the link between working capital and profitability. Consequently, the efforts of these firms have been intensified after realizing the importance of optimized working capital to achieve desired profit levels. Governments must intervene to establish a safe business environment to run the operations and increase the awareness of the relationship between the two varied factors *i.e.* profitability and working capital management.

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