



Article

Bibliometric Analysis for Working Capital: Identifying Gaps, Co-Authorships and Insights from a Literature Survey

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Abstract: From a financial perspective, working capital represents the liquidity of firms that makes them able to deal with short-term liabilities in current assets (inventories, receivables accounts, and net financial resources). However, this concept is also considered in scientific literature as, among other meanings, stock of productive capital, or variables costs. Considering the importance of working capital in a firms' dynamics, the principal objective of this study is to highlight the main gaps and insights in literature concerning working capital and to suggest future research. For this purpose, bibliometric analysis was carried out through bibliographic information from both the Web of Science Core Collection and from the Scopus for the topic of "working capital". These data were first worked through bibliometric approaches, considering the VOSviewer and Gephi software and later surveyed through a literature review. As the main insights, it is worth highlighting that there are several gaps in related literature, where the most worrying is the weak reference to sustainability or sustainable development concepts. Finally, the majority of the networked research was focused on just a few authors, organizations, and countries.

Keywords: Web of Science; Scopus; benchmarking; financial studies; VOSviewer; Gephi; centrality; literature review



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1. Introduction

The concept of working capital has several dimensions interrelated with the profitability and financial performance of firms. In general, it is considered in the literature with a financial perspective, however, it is sometimes associated with other connotations, such as productive capital stock (Pena Sanchez et al. 2018), or operating costs. In any case, the fields related to working capital are vast and with space to be explored.

On the other hand, a search on the Web of Science (WoS), in November 2020, revealed that there were very few studies applying the bibliometric approach concerning the topic of working capital (da Silva Macedo and Lunga 2010; Motylska-Kuzma 2017), revealing the pertinence of this particular research. In addition, Nobanee and Dilshad (2021) shows that there is still much work to be done in these fields.

Considering the aforementioned context, the main objective of this research is to highlight the main insights produced from scientific literature about "working capital" dimensions, showing gaps and suggestions for future lines of research. Specifically, in this study, the intention is to answer the following questions related with the topic "working capital": (1) Are there significant differences between the WoS and Scopus databases for the main items (subject areas and countries) and trends (over the last decades)?; (2) What are the main gaps in scientific literature?; (3) What is the level of network and centrality in the co-authorships?; (4) What are the most relevant insights from specific subtopics (namely "working capital management" and "policies")?; (5) What are the main suggestions for future research?; What are the main practical implications?

Other previous studies carried out both reviews (Kayani et al. 2019) and bibliometric analysis (Nobanee and Dilshad 2021), however, these considered other approaches. In any case, the relevance given to the relationships between working capital management and

policies by [Nobanee and Dilshad \(2021\)](#) should be highlighted, justifying the importance given to these topics in this study.

Compared with previous studies, this research focuses on the topic “working capital”, firstly benchmarking two scientific databases (WoS and Scopus), after performing bibliometric analyses and, finally, reviewing the literature on working capital management policies.

From this perspective, the main contribution of this study to the literature is focused on the various dimensions of “working capital” revealed by the literature, with special emphasis on the main highlights of working capital management policies.

As the main insights, it should be noted that this is a field to be explored in these issues, namely the relationships between working capital and sustainability and the impact of working capital management on specific sectors and economic activities. On the other hand, there is space to increase networking between authors and organizations on the topics covered.

The remaining parts of this research are intended for material and methods, bibliometric analysis, literature review on working capital management policies, discussion, and conclusions.

2. Material and Methods

Bibliometric analysis is an interesting approach towards highlighting the main insights produced from the enormous amount of scientific literature supplied every year by researchers from various countries across the globe. A search on the [Web of Science \(2020\)](#) shows that the interest from researchers for bibliometric approaches has increased over recent years.

Bibliometric analysis has been considered across many different fields of science, such as agriculture ([Martinho 2020](#)), forestry ([Mourao and Martinho 2020](#)), the environment ([Martinho and Mourão 2020](#)), energy ([Martinho 2018](#)), leading universities ([Cancino et al. 2017](#)), academic innovation ([Merigó et al. 2016](#)), the board of directors in certain organizations ([Kent Baker et al. 2020](#)), and food consumption ([Martinho 2021](#)). These studies show that the identification of the topic(s) considered in order to select the documents from databases is often arbitrary.

Considering the objectives proposed for this research, for a search performed on 18 November 2020 (University of Vigo, Campus of Ourense), without any constraints, namely for the years considered, so as to avoid any bias in the analysis (in fact, any refinement in the dataset used may condition the results and are always subjective), more than one thousand documents (1342 studies) were considered from [Web of Science \(2020\)](#) and more than two thousand studies (2200 documents) were obtained from [Scopus \(2020\)](#) for the topic “working capital”. These studies were first worked on with bibliometric analysis through the VOSviewer ([van Eck and Waltman 2020](#); [VOSviewer 2020](#)) and Gephi ([Bastian et al. 2009](#); [McTavish 2020](#); [Gephi 2020](#)) software and then analyzed through a literature review for the more relevant topics highlighted in the bibliometric approach.

3. Bibliometric Analysis Covering “Working Capital” on Web of Science and Scopus

Considering the information related to the documents obtained from the [Web of Science \(2020\)](#) and [Scopus \(2020\)](#) for the search topic “working capital”, in this section, bibliometric analysis will be carried out, following, for example, [Motylska-Kuzma \(2017\)](#). Nonetheless, for the topics “working capital” and “bibliometric” only two studies were found on the WoS (November 2020), which again highlights the pertinence of this research.

3.1. Benchmarking the Information Available on the Two Scientific Platforms

Figures 1 and 2 show that there was an increased interest in scientific literature for the topic “working capital” over the past few decades, which further increased after 2007/2008 and then decreased in 2020. This may have been due to the Covid-19 pandemic, which reduced working dynamics in some cases and changed search topics in other cases. In any

case, from 18 November 2020 there was almost a month and a half left to the end of the year.

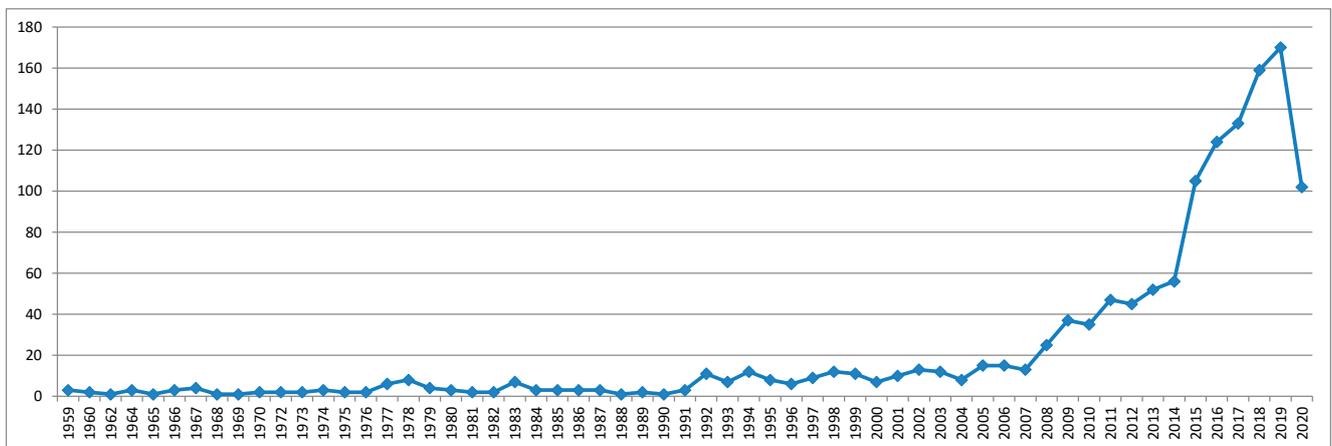


Figure 1. Distribution of records by year (WoS).

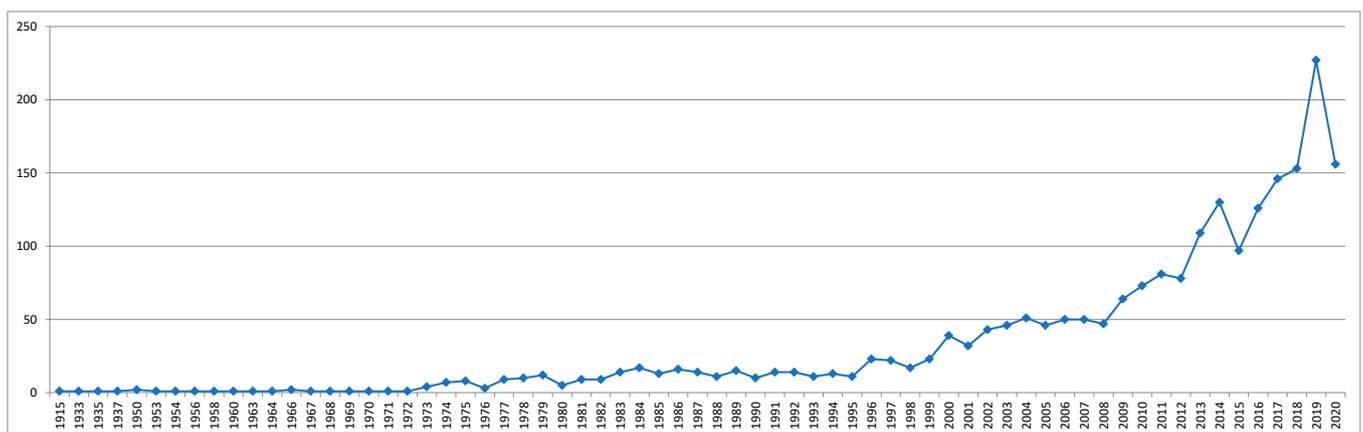


Figure 2. Distribution of records by year (Scopus).

The main search areas on WoS were those relating to “Business Economics”, “Engineering”, “Operations Research Management Science”, “Agriculture”, “Computer Science”, “Social Sciences Other Topics”, “Science Technology Other Topics”, “Public Administration”, “Environmental Sciences Ecology” and “Government Law” (Figure 3). Figure 4 reveals that in the Scopus database, the main subject areas are “Business, Management and Accounting”, “Economic, Econometrics and Finance”, “Engineering”, “Social Sciences”, “Decision Sciences”, “Computer Science”, “Chemical Engineering”, “Agricultural and Biological Sciences”, “Environment Science”, “Energy”, and “Material Science”. Figures 3 and 4 show that the topic “working capital” is multidisciplinary, nonetheless, the great part of the research was carried out in the domains of business, economics, management, and engineering.

A large amount of the studies were developed by researchers affiliated to institutions from the USA and China, but also, from England, India, Poland, Germany, Turkey, Malaysia, Russia, Brazil, Canada, Czech Republic, Taiwan, Australia, Italy, and Spain (Figures 5 and 6). The USA, China, India, and the United Kingdom are, in fact, the leading countries in terms of the number of studies associated with the various dimensions for working capital and this may provide interesting findings, namely, to support the identification of groups of study in these fields for future cooperation and networking.

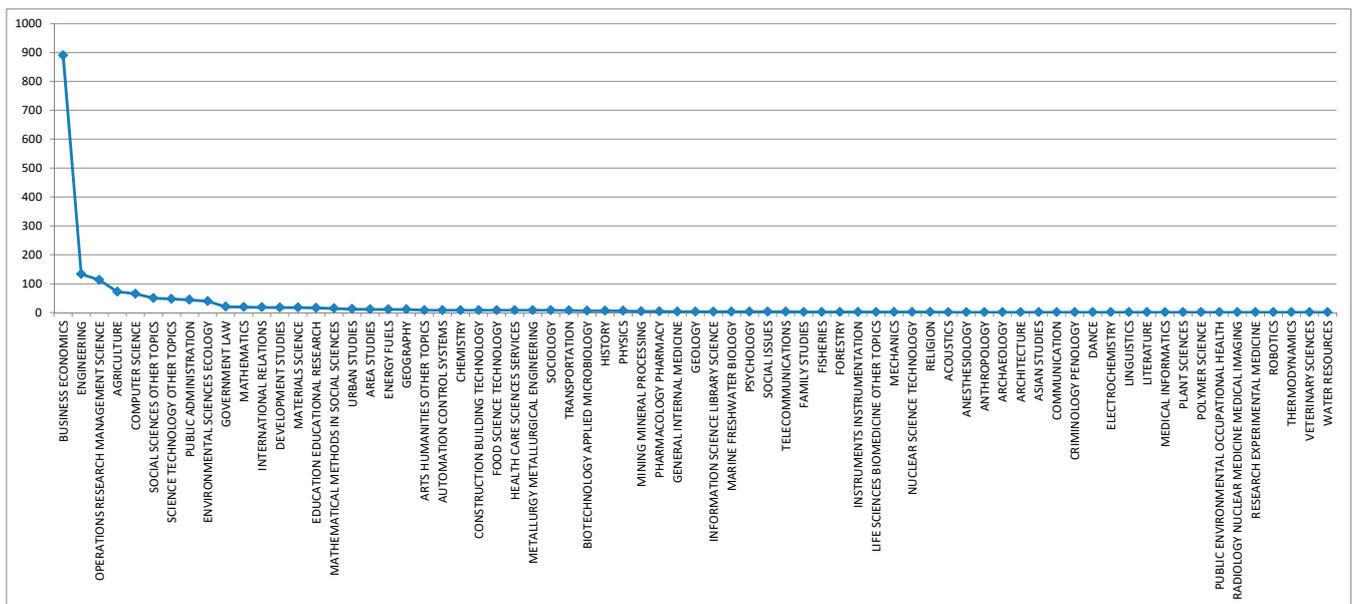


Figure 3. Distribution of records by areas of search (WoS).

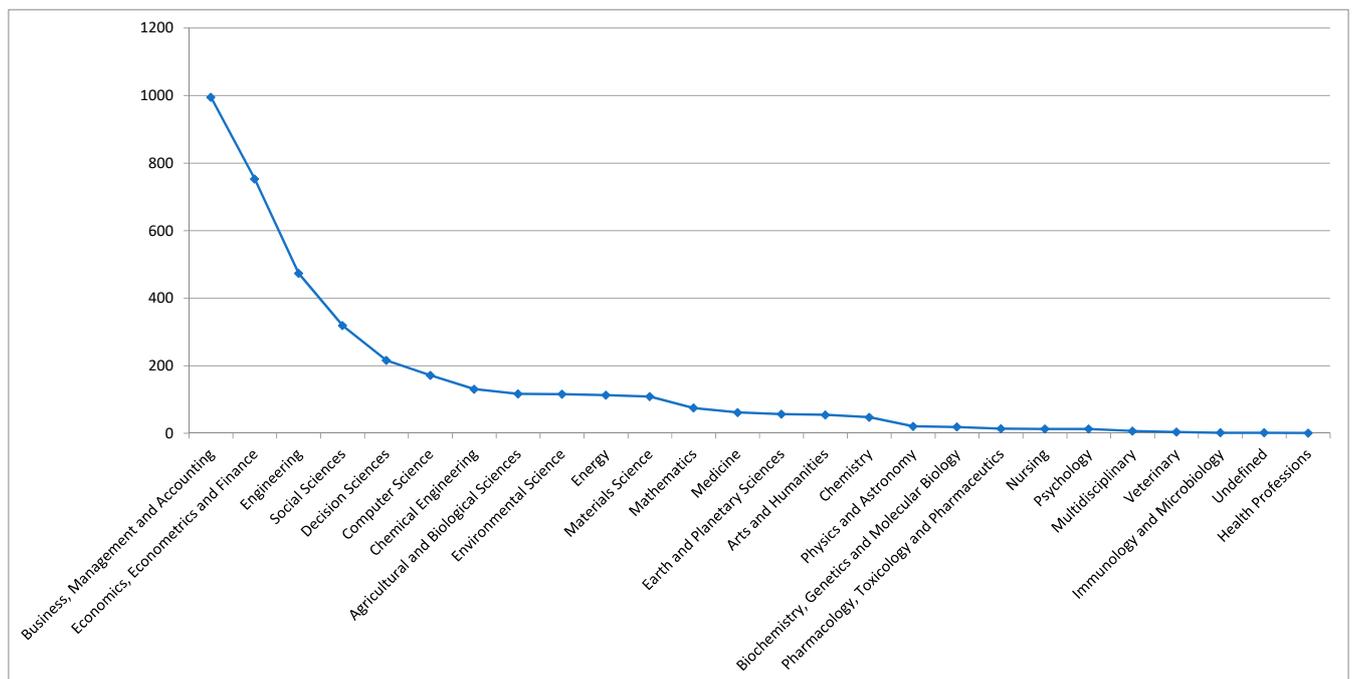


Figure 4. Distribution of records by subject area (Scopus).

The benchmark carried out here, to answer the research question “(1) Are there significant differences between the WoS and Scopus databases?”, reveals that, indeed, there is very little difference between the two scientific databases concerning the topic “working capital”, showing that in terms of metadata assessment they may be considered as alternatives.

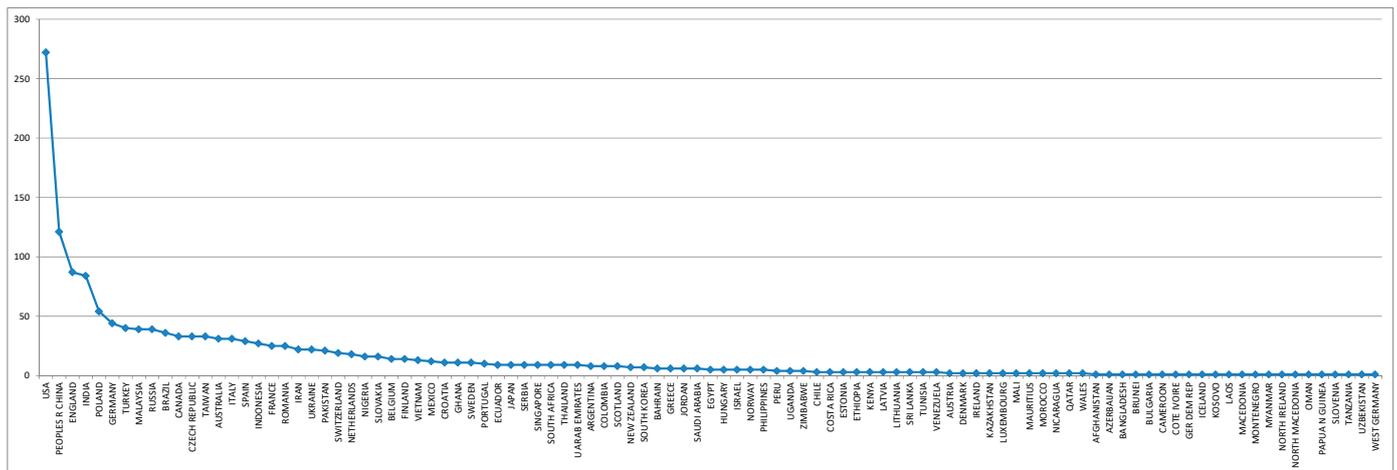


Figure 5. Distribution of records by country/region (WoS).

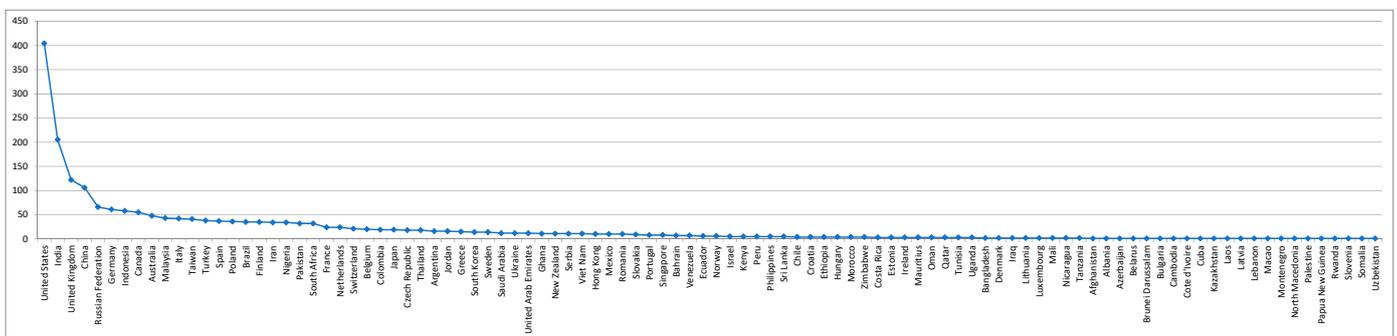


Figure 6. Distribution of records by country (Scopus).

3.2. Outputs from Bibliographic Data

The great number of documents found on Scopus (2200 studies) hampers the export of information from this database. For this reason, only the information from the WoS, which was explored through the VOSviewer and Gephi supports, was considered in this subsection.

In this subsection the following concepts will be considered with the respective meanings:

- Norm. Citations: number of citations of the document weighted by the average number of citations of all documents published in the same year and considered in the data that is supplied by VOSviewer. The normalization adjusts for the fact that older documents have had more time to obtain citations than more recent documents (van Eck and Waltman 2020; VOSviewer 2020);
- Avg. citations: the average number of citations received by the studies in which a keyword appears or the average citations obtained by the documents published by a source, an author, an organization, or a country (van Eck and Waltman 2020; VOSviewer 2020);
- Avg. pub. year: the average publication year of the studies in which a keyword appears or the average publication year of the studies published by a source, an author, an organization, or a country (van Eck and Waltman 2020; VOSviewer 2020);
- Degree: number of edges that connect with a node (Bastian et al. 2009; McTavish 2020; Gephi 2020);
- Eccentricity: distance from a node to the extreme node from it within the network (Bastian et al. 2009; McTavish 2020; Gephi 2020);
- Closeness centrality: average distance between any two nodes within the network (Bastian et al. 2009; McTavish 2020; Gephi 2020);

- Harmonic closeness centrality: variant of closeness centrality, which was carried out to deal with problems of unconnected graphs (Bastian et al. 2009; McTavish 2020; Gephi 2020);
- Betweenness centrality: quantifies how often a node appears on the shortest path between any two nodes (Bastian et al. 2009; McTavish 2020; Gephi 2020);
- Authority: estimates the value of the content of the node (Bastian et al. 2009; McTavish 2020; Gephi 2020);
- Hub: estimates the value of its links to other nodes (Bastian et al. 2009; McTavish 2020; Gephi 2020);
- Modularity: processes the division of the network into clusters (Bastian et al. 2009; McTavish 2020; Gephi 2020);
- Pageranks: probability of clicking through to each node, given a certain number of casual clicks through links (Bastian et al. 2009; McTavish 2020; Gephi 2020);
- Clustering: measures the connections between nodes (Bastian et al. 2009; McTavish 2020; Gephi 2020);
- Triangles: number of triangles that pass through each node (Bastian et al. 2009; McTavish 2020; Gephi 2020);
- Eigenvector Centrality: measures the node's importance considering its connections to other nodes (Bastian et al. 2009; McTavish 2020; Gephi 2020).

The data obtained were bibliometrically tested through co-occurrence and co-authorship links.

3.2.1. Co-Occurrence Analysis

Figures 7 and 8 and Tables 1 and 2 were obtained with the VOSviewer software for the links' co-occurrences and items all keywords and author keywords, respectively. In Figures 7 and 8, the dimension of the circle represents the number of occurrences and the proximity of the relatedness (number of documents in which they occur together). In addition, each color represents a cluster. In Tables 1 and 2 occurrences is the number of studies in which a keyword appears, (van Eck and Waltman 2020). Tables 1 and 2 were presented to complement the readability of Figures 7 and 8. In these tables only the top 15 items were presented as a compromise between avoiding presenting too much information and presenting sufficient data to support the analysis, following, for example, (Martinho 2021).

Table 1. Co-occurrence links and top 15 (occurrences) all keyword items, considering 1 as the minimum number of occurrences of a keyword and 1000 as the number of keywords selected.

Keyword	Occurrences	Avg. Pub. Year	Avg. Citations
working capital management	196	2016.695	5.893
working capital	182	2015.551	7.132
performance	155	2016.463	15.994
profitability	128	2016.832	5.391
management	127	2016.207	17.063
investment	110	2016.129	15.646
determinants	104	2017.180	9.490
trade credit	99	2016.862	14.172
firms	77	2016.355	10.416
impact	65	2017.629	7.185
liquidity	65	2014.785	21.877
cash conversion cycle	62	2017.123	5.226
model	57	2013.895	11.930
policy	49	2014.348	13.816
information	46	2014.304	48.783

Table 2. Co-occurrence links and top 15 (occurrences) author keywords, considering 1 as the minimum number of occurrences of a keyword and 1000 as the number of keywords selected.

Keyword	Occurrences	Avg. Pub. Year	Avg. Citations
working capital	182	2015.551	7.132
working capital management	148	2016.247	6.831
profitability	95	2016.753	3.926
cash conversion cycle	52	2016.896	5.750
liquidity	39	2015.692	4.308
smes	30	2016.517	8.167
supply chain finance	29	2017.759	11.655
financial constraints	27	2016.962	10.889
trade credit	27	2017.080	11.074
supply chain management	23	2014.044	16.957
firm performance	22	2017.474	2.091
cash flow	21	2014.381	13.667
net working capital	19	2016.105	2.947
earnings management	18	2009.278	111.778
panel data	18	2017.438	4.444

When all keywords are considered, the results show that working capital management appears to be interrelated in literature with concepts such as the following: performance; profitability; management; investment; determinants; trade credit; firms; impact; liquidity; cash conversion cycle; model; policy; information; growth; risk; financial constraints; SMEs; firm performance; quality; demand; credit; constraints; finance; governance. In fact, working capital does have implications in the performance and profitability of firms, but is dependent on several factors, such as the availability of credit and financial constraints. Due to this context, good management and governance is crucial, where financial policies and information may play a decisive role. In turn, cash flows and money are older keywords, whereas coordination and leverage are more recent. The documents having a greater average of citations are those where the keyword ‘cash flows’ appears and less so with those where the keyword ‘agriculture’ occurs.

Only when the authors’ keywords are considered, concepts such as profitability, cash conversion cycle, liquidity and SMEs have greater importance. The working capital policies, such as the cash conversion cycle, are essential for a firm’s good performance, as well as the liquidity, namely in small and medium-sized enterprises (SMEs). The most recent keyword is ‘financial stability’ and the oldest ‘earnings management’. The studies having a greater average in citations are those with the keyword ‘operating cycle’ and less so for those with keywords such as ‘management’.

These findings highlight that the new concerns and interest for researchers related to the “working capital” topic are more focused on questions related to coordination, leverage, and financial stability.

- Highlighting the main gaps in literature

Concerning the research question “(2) What are the main gaps in scientific literature?”, the co-occurrence analysis complemented by the literature analysis reveals that related to the “working capital” topic, there are not many studies associated with sustainability and sustainable development, which should be a motive of concern for the several stakeholders, namely researchers. In addition, there are also few studies related to the fields of research of the author, such as, for example, the wine sector and the context of the affiliated country (Portugal) ([Web of Science 2020](#)). From this perspective, there are gaps here in the scientific literature which call for more research in these fields. In fact, working capital is an interesting indicator in order to assess the financial and economic dynamics in the European wine sector, namely in terms of liquidity. Low levels of WC (working capital) for wine producers may be signs of weaknesses in their liquidity ([Migliaccio and Tucci 2019](#)). The WC, across its several dimensions highlighted by the literature, jointly with

other farm indicators such as farm labor costs and land may support in the definition of sustainable frameworks for vineyards and the wine sector as a whole (Falcone et al. 2015). It may also be a useful indicator, jointly with the cost of capital and operating costs, in the identification of the most profitable investment alternatives for vineyards (Repisky 2013). In the Portuguese context, the WC indicator was considered to carry out investment analysis in dealing with forest biomass (Cardoso et al. 2019) and to assess the interrelationships of working capital management with profitability in the SMEs (Pais and Gama 2015). The relationships between WC management and profitability were also assessed for the Spanish context, namely for cheese companies, where financial constraints were highlighted for the SMEs and the relevance of the WC policies (Fernandez-Lopez et al. 2020b). These interrelationship assessments are particularly important in order to analyze implications when the ecological variables are considered from a global context of great change in the environmental and human health dimensions (Fernandez-Lopez et al. 2020a).

Considering the relevance given by researchers to the keyword “working capital management” in this study the main insights from the documents associated in WoS with the topics “working capital management” and “policies” will be highlighted through literature review. Following, for example, Fernandez-Lopez et al. (2020b), it is interesting to further explore the dimensions for working capital management policies.

3.2.2. Co-Authorship Analysis

Considering VOSviewer procedures, the co-authorship analysis takes into account as relatedness between the items researched (authors, organizations, and countries) and networked, the number of co-authored documents. In this part of the research the network output was obtained through the VOSviewer software and this information was later worked through the Gephi software to obtain several metrics, namely centrality statistics. The intention here was to answer the research question “(3) What is the level of network and centrality in co-authorships?”.

- The most productive networked authors

The researchers Timo Karri and Miia Pirttila are the authors having more documents (3) and more total citations (37). However, when the citations are corrected from the time effects (Norm. Citations), Florian Schupp is the leading author and when the citations are considered on average the authors with more impact are Lotta Lind and Sari Viskari. These two last authors are also those with an older average for the publication year, which has influenced the high number of total and average citations received (Table 3).

Table 3. Co-authorship links and authors items, considering 1 as the minimum number of documents from an author.

Author	Documents	Citations	Norm. Citations	Avg. Citations	Avg. Pub. Year
Karri, Timo	3	37	2.618	12.333	2014.667
Pirttila, Miia	3	37	2.618	12.333	2014.667
Schupp, Florian	2	35	4.480	17.500	2015.500
Talonpoika, Anna-Maria	2	7	1.068	3.500	2016.000
Ancarani, Alessandro	1	5	2.930	5.000	2019.000
Cannella, Salvatore	1	5	2.930	5.000	2019.000
Di Mauro, Carmela	1	5	2.930	5.000	2019.000
Dominguez, Roberto	1	5	2.930	5.000	2019.000
Lind, Lotta	1	30	1.550	30.000	2012.000
Monto, Sari	1	7	1.068	7.000	2016.000
Viskari, Sari	1	30	1.550	30.000	2012.000

Table 4 shows that Florian Schupp is the author having a greater number of edge connections (degree), less distance with the most extreme author within the network (eccentricity), the most average distance between any two authors in the network (closeness centrality), appears the most on the shortest path between any two authors (betweenness

centrality), the most estimated value over other authors (authority), the most estimated value given by other authors (hub), more importance inside the network (pageranks), greatest number of triangles that pass through this author (triangles), and more connections with other authors (eigenvector centrality).

This means that this author alternatively has co-authorships with the majority of the other authors in the network. In addition, the authors Timo Karri and Miia Pirttila have the same metrics (Table 4) and this means that they are co-authors and in this case within the same documents.

- The leader networked organizations

The National Bureau of Economic Research, University of Illinois, American University, Boston University, Purdue University, University of Michigan, University of Oxford and University of Texas in Austin are the most productive organizations concerning the topic “working capital”. Nonetheless, in terms of scientific impact, the University of Michigan and University of Washington are the organizations that have a greater total and average of citations and NBER with more normalized citations. The University of Texas is among the organizations with an older average publication year and the University of North Carolina among those with the most recent. Table 5 only shows the results for the top 15 organizations, as a consequence, some of the institutions mentioned here do not appear in this table.

The MIT is the most important organization in the network in terms of connections and importance (considering the higher values for the degree and for the eigenvector centrality). The same happens in terms of importance received and given to the other authors (authority and hub, respectively). However, in terms of betweenness centrality (bridge between different clusters) the NBER appears in the interface among different organizations in terms of co-authorship (Table 6). On the other hand, there are a set of organizations, such as real estate firms, banks, energy, and oil companies, which have the same metrics, revealing their interrelationships in these co-authorship analyses.

- The most productive networked countries

Table 7 (which only presents the results for the top 15 organizations, as a consequence, some of the institutions mentioned here do not appear) reveals that the most productive networked countries are the USA, China, England, India, Poland, Germany, Malaysia, Russia, Turkey, and Brazil, in line with the findings highlighted from Figure 5. In addition, the USA, China, and England are the countries having a greater scientific impact, in terms of total and normalized. For the average citations Denmark, Ireland, Argentina, and then the USA appear. The United States is, indeed, a determinant country for these networks of co-authored documents.

The USA, England, China, Australia, and Argentina are the most important countries inside the network, considering their connections with other countries (higher values for degree, eigenvector centrality, authority, and hub). On the other hand, the USA, England, Malaysia, Australia, India, Argentina, and Germany are the main bridges inside the network, considering the values for betweenness centrality (Table 8). These findings highlight the importance, in terms of co-authorships in the topic, “working capital”, for countries such as England and Germany in Europe, the USA in the northern America, Argentina in southern America, Malaysia, China and India in Asia, and Australia in Oceania.

Table 4. Network, node, and edge statistics for co-authorship links and author items, considering 1 as the minimum number of documents of an author.

Authors	Degree	Eccentricity	Closeness Centrality	Harmonic Closeness Centrality	Betweenness Centrality	Authority	Hub	Modularity_Class	Pageranks	Clustering	Triangles	Eigencentrality
Ancarani, Alessandro	4	3	0.556	0.667	0	0.243	0.243	0	0.082	1.000	6	0.522
Cannella, Salvatore	4	3	0.556	0.667	0	0.243	0.243	0	0.082	1.000	6	0.522
Di Mauro, Carmela	4	3	0.556	0.667	0	0.243	0.243	0	0.082	1.000	6	0.522
Dominguez, Roberto	4	3	0.556	0.667	0	0.243	0.243	0	0.082	1.000	6	0.522
Schupp, Florian	8	2	0.833	0.900	24	0.473	0.473	0	0.150	0.429	12	1.000
Karri, Timo	6	2	0.714	0.800	7	0.372	0.372	1	0.117	0.600	9	0.779
Lind, Lotta	4	2	0.625	0.700	0	0.309	0.309	1	0.080	1.000	6	0.645
Monto, Sari	3	3	0.476	0.583	0	0.189	0.189	1	0.065	1.000	3	0.395
Pirttila, Miia	6	2	0.714	0.800	7	0.372	0.372	1	0.117	0.600	9	0.779
Talonpoika, Anna-Maria	3	3	0.476	0.583	0	0.189	0.189	1	0.065	1.000	3	0.395
Viskari, Sari	4	2	0.625	0.700	0	0.309	0.309	1	0.080	1.000	6	0.645

Table 5. Co-authorship links and top 15 (documents) organizations items, considering 1 as the minimum number of documents of an organization.

Organizations	Documents	Citations	Norm. Citations	Avg. Citations	Avg. Pub. Year
Natl Bur Econ Res	8	385	11.931	48.125	2008.625
Univ Illinois	8	440	12.379	55.000	2000.625
Amer Univ	6	23	8.598	3.833	2018.167
Boston Univ	6	279	6.012	46.500	2002.667
Purdue Univ	6	72	10.501	12.000	2005.333
Univ Michigan	6	2908	26.603	484.667	2008.000
Univ Oxford	6	186	15.330	31.000	2010.200
Univ Texas Austin	6	90	9.286	15.000	2014.167
Capital Univ Econ And Business	5	9	7.916	1.800	2019.000
Harvard Univ	5	836	18.980	167.200	2003.200
Hunan Univ	5	89	28.092	17.800	2017.000
Insead	5	39	5.366	7.800	2009.000
Nber	5	1185	50.120	237.000	2011.800
Shanghai Jiao Tong Univ	5	386	34.306	77.200	2015.400
Univ Bahrain	5	8	3.908	1.600	2015.000

Table 6. Network, node, and edge statistics for co-authorship links and top 15 (degree) organization items, considering 1 as the minimum number of documents of an organization.

Organizations	Degree	Eccentricity	Closeness Centrality	Harmonic Closeness Centrality	Betweenness Centrality	Authority	Hub	Modularity _Class	Pageranks	Clustering	Triangles	Eigencentrality
MIT	18	11	0.167	0.252	2795.000	0.277	0.277	2	0.008	0.575	88	1.000
CEPR	16	10	0.195	0.287	4457.000	0.034	0.034	5	0.012	0.258	31	0.254
Natl Bur Econ Res	16	7	0.248	0.318	11,248.967	0.000	0.000	6	0.017	0.150	18	0.094
NBER	15	10	0.205	0.288	2780.517	0.005	0.005	5	0.013	0.248	26	0.151
Capitaland	13	12	0.144	0.209	0.000	0.266	0.266	2	0.005	1.000	78	0.925
Cimb	13	12	0.144	0.209	0.000	0.266	0.266	2	0.005	1.000	78	0.925
Citibank NA	13	12	0.144	0.209	0.000	0.266	0.266	2	0.005	1.000	78	0.925
DBS	13	12	0.144	0.209	0.000	0.266	0.266	2	0.005	1.000	78	0.925
Energy Exchange Chicago	13	12	0.144	0.209	0.000	0.266	0.266	2	0.005	1.000	78	0.925
First Natl Bank Chicago	13	12	0.144	0.209	0.000	0.266	0.266	2	0.005	1.000	78	0.925
Gasprom Bank	13	12	0.144	0.209	0.000	0.266	0.266	2	0.005	1.000	78	0.925
Gen Elect	13	12	0.144	0.209	0.000	0.266	0.266	2	0.005	1.000	78	0.925
HSBC	13	12	0.144	0.209	0.000	0.266	0.266	2	0.005	1.000	78	0.925
Lindlakers	13	12	0.144	0.209	0.000	0.266	0.266	2	0.005	1.000	78	0.925

Table 7. Co-authorship links and top 15 (documents) countries items, considering 1 as the minimum number of documents of a country.

Countries	Documents	Citations	Norm. Citations	Avg. Citations	Avg. Pub. Year
USA	242	9560	412.128	39.504	2007.328
Peoples R China	121	1105	203.690	9.132	2015.731
England	84	1331	118.020	15.845	2010.305
India	81	295	74.246	3.642	2015.893
Poland	52	235	33.613	4.519	2016.173
Germany	41	694	67.568	16.927	2014.195
Malaysia	39	100	23.507	2.564	2016.744
Russia	39	26	3.608	0.667	2016.513
Turkey	39	74	11.623	1.897	2014.595
Brazil	36	117	13.347	3.250	2014.528
Czech Republic	33	44	11.197	1.333	2014.606
Taiwan	33	328	40.831	9.939	2013.031
Australia	31	580	38.295	18.710	2011.774
Canada	31	156	42.854	5.032	2014.500
Italy	31	520	77.213	16.774	2014.677

Table 8. Network, node, and edge statistics for co-authorship links and top 15 (degree) countries items, considering 1 as the minimum number of documents of a country.

Countries	Degree	Eccentricity	Closeness Centrality	Harmonic Closeness Centrality	Betweenness Centrality	Authority	Hub	Modularity_Class	Pageranks	Clustering	Triangles	Eigencentrality
England	36	4	0.598	0.695	838.421	0.331	0.331	3	0.062	0.176	93	0.944
USA	35	3	0.612	0.709	866.528	0.351	0.351	1	0.064	0.178	106	1.000
Australia	29	4	0.549	0.628	351.230	0.272	0.272	0	0.041	0.239	66	0.836
Argentina	21	3	0.527	0.597	212.882	0.248	0.248	3	0.033	0.322	55	0.705
Peoples R China	21	3	0.530	0.608	154.159	0.284	0.284	0	0.036	0.371	78	0.802
Germany	19	4	0.503	0.584	168.075	0.242	0.242	3	0.034	0.333	57	0.687
Malaysia	18	3	0.513	0.584	368.275	0.219	0.219	0	0.035	0.314	48	0.619
France	15	4	0.497	0.558	77.626	0.218	0.218	0	0.024	0.527	48	0.615
India	13	4	0.494	0.553	257.653	0.145	0.145	2	0.026	0.244	19	0.420
Finland	12	4	0.485	0.541	42.520	0.200	0.200	0	0.021	0.606	40	0.558
Russia	12	4	0.485	0.541	149.395	0.199	0.199	0	0.021	0.606	40	0.561
Belgium	11	4	0.473	0.530	105.801	0.168	0.168	3	0.021	0.473	26	0.479
Canada	10	4	0.446	0.502	42.724	0.129	0.129	1	0.017	0.417	15	0.368
Saudi Arabia	10	4	0.470	0.522	37.924	0.167	0.167	0	0.018	0.711	32	0.464

4. Highlighting Insights Related to the Topics “Working Capital Management” and “Policies”

This section aims to obtain answers to the question “(4) What are the most relevant insights from specific subtopics?”.

4.1. Working Capital Dimensions

The WC dimension is dependent on the several components of the current assets and liabilities, where, for example, accounts receivable (Abdulla et al. 2020), accounts payable (Abuhommous 2017), and inventories and cash (Michalski et al. 2018) have their impacts. In turn, the trade credit strategy depends on several factors such as cash flow, sales growth, and profitability (Abuhommous and Mashoka 2018), as well as, inventories, market share, export conditions (Afrifa and Gyapong 2017), market cycles (Lorentz et al. 2016), and collateral to secure financing (Paul et al. 2018). The relationships between trade credit and profitability were found to be inverted, U-shaped, in the SMEs, characterized by the existence of an optimal (Hoang et al. 2019), influenced by the periods considered for the accounts receivable and payable (Rauscher and Wheeler 2012), and depend on the firms’ characteristics (Yazdanfar and Ohman 2016). The accounts receivable are, in some cases, negatively interrelated to the managerial risk-taking incentives (Yao and Deng 2018). Nonetheless, sometimes in some contexts, these relationships between trade credit and profitability are not the consequence of any firm strategy, but a natural implication (Nguyen and Nguyen 2018).

4.2. Working Capital Management Policies

The working capital management (WCM) policies influence the financial performance (Adam and Quansah 2019) of firms in several sectors around the world (Kabuye et al. 2019), namely in terms of liquidity (Chen 2018), their economic results (Adam et al. 2017), value creation (Frimpong 2018), and shareholder returns (Masri and Abdulla 2018). Firm value is interrelated with cash holdings (Anton and Nucu 2019). However, the shape of the relationships between the WCM and profitability are not unanimous among the researchers (Altaf and Shah 2018). In any case, the inverted U-shape relationship is defended by several findings (Botoc and Anton 2017). It would be worth highlighting that the different WCM policies have distinct impacts on firm variables (Pham et al. 2020) in several sectors around the world (Tahir and Anuar 2016). The firms’ performance dimension depends on the variable considered to quantify it (Vieira et al. 2019). Nonetheless, the performance is, also, impacted by the inventory holding strategies (Afrifa and Berchie 2019) and by the economic resource management (Maity et al. 2019). In general, firms with higher levels of WC pay their liabilities over a shorter period (Falavigna and Ippoliti 2020). The WCM policies also impact the firm’s ability to deal with adverse market cycles (Filbeck et al. 2017). The lack of WC is a constraint for firms (Maliwichi et al. 2011), because it hampers the management of current debts and obligations (Monastyrenko 2017) and may increase financing costs (Zabolotnyy and Sipilainen 2020).

The impacts from the WCM on profitability depend on internal options (Azeez et al. 2016), on external factors such as the level of globalization (Akdogan and Dinc 2019) and the current stage of the firm’s life cycle (Wang et al. 2020). Globalization and internationalization have, indeed, real implications on a firm’s performance (Shah et al. 2018). These relationships between the WCM and profitability are often influenced, specifically, by the level of financial leverage (Dalci and Ozyapici 2018), reverse factoring approaches (Dami-anos Lekakos and Serrano 2016), reinvestment in the firms (Heryan 2020), inventories, receivables and payables management (Lyngstadaas and Berg 2016), and macroeconomic indicators (Simon et al. 2019). The variables considered to represent the WCM and profitability have their implications in the respective interrelationships (Vukovic et al. 2017). On the other hand, WCM practices are different around the world, between sectors and firm sizes. For example, in India the SME firms have an informal approach to WC, preferring, often, maturity of assets (Baker et al. 2019).

The Cash Conversion Cycle (CCC) is a WCM policy considered as a target by several SME firms (Banos-Caballero et al. 2010), considering its relationship with profitability (Barac and Muminovic 2018), firm performance, and value (Moussa 2018). The relationship between CCC and profitability depends on the firm strategies (aggressive or conservative) in terms of WCM (Chang 2018) and the sector considered. For example, for agricultural and food firms in Thailand a significant and inverse relationship was found between the CCC and profitability (Linh and Mohanlingam 2018). This negative relationship was found in many other contexts (Singh et al. 2017), showing that profitability may be increased through shorter CCC and lower periods for accounts receivable (Talezari et al. 2015). Women as managers adopt, in general, more conservative WC strategies (Nastiti et al. 2019). More aggressive WCM policies are often related to higher levels of profitability (Pais and Gama 2015) in firms (Prempeh and Peprah-Amankona 2020). Some studies support negative relationships between the CCC and the cash holding for SMEs, as well as for the CCC and bank credit (Sabki et al. 2019).

In turn, there is an optimal dimension for WC policies (Aktas et al. 2015) which has been persecuted by several studies (Poluyanov and Palamarchuk 2017), since it was necessary to find a satisfactory solution for several parties (Arcelus and Srinivasan 1993), in order to avoid decreases in firm returns (Banos-Caballero et al. 2012) and increases in costs (McDaniel 1995). Nonetheless, this is not a consensual approach among the researchers. In fact, in some cases, there is a relative persistence over time in working capital strategies, contradicting the idea of an effort of the firms to achieve an optimal (Chauhan 2019).

The main factors that affect the WC are market cycles, firm conditions, and macroeconomic contexts (Ali and Khan 2011). The variables for a firm's condition are often those related to age, size (Fiador 2016), and observed utility (Orobia et al. 2016). The availability of bank credit is another variable that affects the working capital management strategies considerably and which is different among firms in terms of their dependencies on bank funding (Chen and Kieschnick 2018). Sales expectations, financial limitations and bankruptcy risks (Kieschnick et al. 2013), hedging strategies (Kieschnick and Rotenberg 2016), and inventory strategies (Luo and Shang 2019) are other factors that may impact the WC. Financial constraints are often represented by investment-cash flow sensitivities (Riaz et al. 2016).

5. Discussion

The main objective of this research was to analyze several dimensions of the "working capital" topic highlighted in scientific literature. Therefore, thousands of documents from the Web of Science Core Collection and Scopus were assessed, first through bibliometric approaches and subsequently through literature review. In this framework, the metadata from the two databases were benchmarked, gaps in the literature were identified, co-authorships between authors, organizations and countries were analyzed and insights into the specific subtopics "working capital management" and "policies" were highlighted.

The benchmark among the WoS and Scopus reveals that there are not many differences in the metadata supplied by both databases for the topic "working capital" and in this case may be considered as an alternative for meta-analysis. This is in line with the findings of Martinho (2021) for other topics. This benchmark also highlights that interest from researchers for this topic has increased over recent decades and increased significantly over the last few years, following the trend verified by science in general. On the other hand, it has also shown that the approaches concerning this topic cross several domains within science, whilst fields related to business, the economy, and engineering predominate. Finally, the USA, China, India, and the United Kingdom focus a large part of the studies produced on "working capital".

The bibliographic data analysis reveals several gaps in the literature related to this topic. The major concern is the reduced amount of research covering the subtopics related to sustainability and sustainable development in thousands of documents associated with "working capital". This should be a motive for concern and should be addressed

appropriately by several stakeholders, namely policymakers and researchers. Another gap is the almost total absence of studies related to specific subtopics, as highlighted by [Nobanee and Dilshad \(2021\)](#), but relevant for many countries and regions, such as, for example, agriculture, in general. In turn, this approach shows the relevance of subtopics such as “working capital management” that were surveyed through the literature review in this study, namely in its interrelationships with the respective “policies”. Finally, a centrality analysis highlights an importance for the co-authorship network of authors such as Florian Schupp, in terms of connections with other authors and in terms of “bridging” among groups of authors. The centrality analysis also highlights the relevance of institutions such as MIT and the NBER and countries such as England, Germany (Europe), the USA, Argentina (America), Malaysia, China, India (Asia), and Australia (Oceania).

The assessments of the topics “working capital management” and “policies” highlight that the relationships between trade credit and profitability are U-shaped ([Hoang et al. 2019](#)) and dependent on firms’ characteristics, however these findings are not unanimous among researchers. Indeed, there is a continuous objective within working capital management policies in order to achieve better profitability and financial performance, thus annulling the perspective that firms intend towards finding an optimal.

6. Conclusions, Practical Implications and Suggestions for Future Research

Working capital (WC) is a concept considered in literature as being, in general, a financial indicator having impacts on profitability and is used as a balance between current assets and current liabilities. This concept is used to assess the liquidity of companies and their capacity to deal with short-term commitments ([Jiang et al. 2016](#)). Sometimes it is referred to in literature as being related to other meanings such as, for example, stock of productive capital ([Pena Sanchez et al. 2018](#)), or variable inputs.

In terms of practical implications, this research shows that there is potential for further investigation into co-authorship, and this is because the groups of networked research which already exist are few and short. On the other hand, it is important to increase research for the topics addressed here in more countries around the world, as currently, the documents found were from authors affiliated to a limited number of countries. In any case, the authors, institutions, and countries identified as being the most relevant within those networked may be considered as benchmarks and a propulsion for new networks. In turn, the databases WoS and Scopus seem to be alternatives for these topics. In addition, these studies presented that the relationships between the working capital and the sustainability could be better addressed and the impacts from the working capital management in specific sectors.

For future research, it will be necessary to create more networks, namely in terms of co-authorship in order to carry out more studies in topics related to working capital where several gaps in literature were identified, such as, those related to sustainability and agriculture, for example. In addition, it could be interesting to perform a deeper analysis of the following points:

- What are the main relationships between profitability, financial performance, and the working capital management policies? In practice, are they U-shaped or inverted U-shaped?
- How does globalization and internationalization impact these relationships in several sectors and regions?
- What are the marginal impacts from the several dimensions of the working capital management policies on profitability and financial performance worldwide?
- What are the main relationships of the working capital dimensions with the social and environmental concerns of the firms?
- How do the social and environmental concerns of the firms impact the profitability and the financial performance?

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