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How to conduct a bibliometric analysis: An overview and guidelines

Naveen Donthu [a,*], Satish Kumar [b,e], Debmalya Mukherjee [c], Nitesh Pandey [b], Weng Marc Lim [d,e]

[a] Department of Marketing, Georgia State University, Atlanta, GA 30303, USA
[b] Department of Management Studies, Malaviya National Institute of Technology Jaipur, 302017 Rajasthan, India
[c] Department of Management, College of Business, The University of Akron, 259 South Broadway, Akron, OH 44325, USA
[d] Swinburne Business School, Swinburne University of Technology, John Street, 3122 Hawthorn, Victoria, Australia
[e] School of Business, Swinburne University of Technology, Jalan Simpang Tiga, 93350 Kuching, Sarawak, Malaysia

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ABSTRACT

Bibliometric analysis is a popular and rigorous method for exploring and analyzing large volumes of scientific data. It enables us to unpack the evolutionary nuances of a specific field, while shedding light on the emerging areas in that field. Yet, its application in business research is relatively new, and in many instances, underdeveloped. Accordingly, we endeavor to present an *overview* of the bibliometric methodology, with a particular focus on its different techniques, while offering step-by-step *guidelines* that can be relied upon to rigorously perform bibliometric analysis with confidence. To this end, we also shed light on *when* and *how* bibliometric analysis should be used vis-à-vis other similar techniques such as meta-analysis and systematic literature reviews. As a whole, this paper should be a useful resource for gaining insights on the available techniques and procedures for carrying out studies using bibliometric analysis.

1. Introduction

Bibliometric analysis has gained immense popularity in business research in recent years (Donthu, Kumar, & Pattnaik, 2020b; Donthu, Kumar, Pattnaik, & Lim, 2021; Khan et al., 2021), and its popularity can be attributed to (1) the advancement, availability, and accessibility of bibliometric software such as Gephi, Leximancer, VOSviewer, and scientific databases such as Scopus and Web of Science, and (2) the cross-disciplinary pollination of the bibliometric methodology from information science to business research. More importantly, the popularity of bibliometric analysis in business research is not a fad but rather a reflection of its utility for (1) handling large volumes of scientific data, and (2) producing high research impact.

Scholars use bibliometric analysis for a variety of reasons, such as to uncover emerging trends in article and journal performance, collaboration patterns, and research constituents, and to explore the intellectual structure of a specific domain in the extant literature (Donthu, Kumar, Pandey, & Lim, 2021a; Verma & Gustafsson, 2020; Donthu et al., 2020c). The data that takes center stage in bibliometric analysis tends to be massive (e.g., hundreds, if not thousands) and objective in nature (e.g., number of citations and publications, occurrences of keywords and topics), though its interpretations often rely on both objective (e.g., performance analysis) and subjective (e.g., thematic analysis) evaluations established through informed techniques and procedures. In other words, bibliometric analysis is useful for deciphering and mapping the cumulative scientific knowledge and evolutionary nuances of well-established fields by making sense of large volumes of unstructured data in rigorous ways. Therefore, bibliometric studies that are well done can build firm foundations for advancing a field in novel and meaningful ways—it enables and empowers scholars to (1) gain a one-stop overview, (2) identify knowledge gaps, (3) derive novel ideas for investigation, and (4) position their intended contributions to the field.

Notwithstanding its merits, bibliometric analysis remains relatively new in business research, and in many instances, its deployment does not make full use of its potential. This occurs when bibliometric studies rely on a limited set of bibliometric data and techniques and provide only a piecemeal understanding of the field under study (e.g., performance analysis without science mapping—e.g., Brown, Park, & Pitt, 2020). It is important to note that an authoritative guide to bibliometric analysis in business research remains absent, which poses as a significant challenge for business scholars who wish to learn more about the bibliometric methodology and its application for business research in a

* Corresponding author.
E-mail addresses: ndonthu@gsu.edu (N. Donthu), skumar.dms@mnit.ac.in (S. Kumar), dmukher@uakron.edu (D. Mukherjee), 2018RBM9016@mnit.ac.in (N. Pandey), lim@wengmarc.com (W.M. Lim).

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holistic yet easy-to-digest manner. Though authoritative guides on systematic literature reviews are available (e.g., Palmatier, Houston, & Hulland, 2018; Snyder, 2019), they do not provide adequate breadth and depth on the bibliometric methodology.

Given the aforementioned gaps, this paper aims to offer (1) an *overview* of the bibliometric methodology and (2) step-by-step *guidelines* for conducting bibliometric analysis for business research. In particular, this paper introduces bibliometric analysis to business scholars, wherein its fundamentals, techniques, and procedures, with exemplars and rationales, are provided. The contributions of this paper are manifold. First, the paper, which presents an *overview* of bibliometric analysis and the *guidelines* on *how* to conduct it, can help business scholars to learn about the bibliometric methodology and to use that understanding to evaluate specific fields in the extant literature with large bibliometric data and corpus. Second, the paper, which provides several suggestions regarding the different *techniques* that can be used for bibliometric analysis and *when* they should be used, can widen the perspective of business scholars on the alternatives and rationales for using the different variants of bibliometric analysis. As a whole, this paper enhances understanding of the bibliometric methodology for business research with clarity and rigor, and thus, paves the way for business scholars to use bibliometric analysis appropriately, meaningfully, and rigorously in their future research.

The rest of the paper is structured as follows. The paper begins with an overview of bibliometric analysis, followed by a toolbox of available techniques for bibliometric analysis with accompanying guidelines on when to use them. Next, the paper delves into the different research metrics and clustering algorithms used in the network analysis of bibliometric data. The paper then explains the process of conducting a bibliometric analysis before concluding with its final remarks on the limitations associated to bibliometrics.

2. The bibliometric methodology

The bibliometric methodology encapsulates the application of quantitative techniques (i.e., bibliometric analysis—e.g., citation analysis) on bibliometric data (e.g., units of publication and citation) (Broadus, 1987; Pritchard, 1969). Early discussion on bibliometrics started in the 1950s (Wallin, 2005), which suggests that the bibliometric methodology is not new. Yet, the proliferation of bibliometrics is fairly recent, as seen through its growth in the fields of "business, management, and accounting," "economics, econometrics, and finance," and "social sciences" on Scopus using "bibliom*" as a keyword in the "article title, abstract, and keywords" (see Fig. 1). Specifically, publications using bibliometrics have grown over the years, with an average of 1021 publications in the last decade, which can be attributed to the growth of scientific research itself. Yet, large bibliographic datasets have made classic review methods cumbersome and impractical (Ramos-Rodrígue & Ruíz-Navarro, 2004). It is noteworthy that the emergence of scientific databases such as Scopus and Web of Science has made acquiring large volumes of bibliometric data relatively easy, and bibliometric software such as Gephi, Leximancer, and VOSviewer enable the analysis of such data in a very pragmatic way, thereby raising scholarly interest in bibliometric analysis in recent times. Indeed, the bibliometric methodology has been applied in a variety of fields in business research, including business strategy (Kumar, Surekha, Lim, Mangla, & Goyal, 2021), electronic commerce (Kumar, Lim, Pandey, & Westland, 2021), finance (Durisin & Puzone, 2009; Linnenluecke, Chen, Ling, Smith, & Zhu, 2017; Xu et al., 2018), human resources (Andersen, 2019), management (Ellegaard & Wallin, 2015; Zupic & Čater, 2015), and marketing (Backhaus, Lügger, & Koch, 2011; Donthu, Kumar, Pandey, & Soni, 2020d; Donthu, Kumar, & Pattnaik, 2020b; Donthu, Kumar, Pattnaik, & Lim, 2021; Hu, Song, & Guo, 2019; Samiee & Chabowski, 2012; Donthu et al., 2020c), wherein the application of bibliometrics ranges from studying publication to collaboration patterns and exploring the intellectual structure of the research field. Here, the research field can also manifest as journals. Indeed, the bibliometric methodology has been applied to provide retrospectives of journals (e.g., *Journal of Business Research*), which typically occur in milestone years (Donthu et al., 2020b).

At this juncture, it is important to compare bibliometric analysis with other frequently used review alternatives such as meta-analysis and systematic literature reviews. In essence, meta-analysis estimates (1) "the overall strength and direction of effects or relationships," and (2)

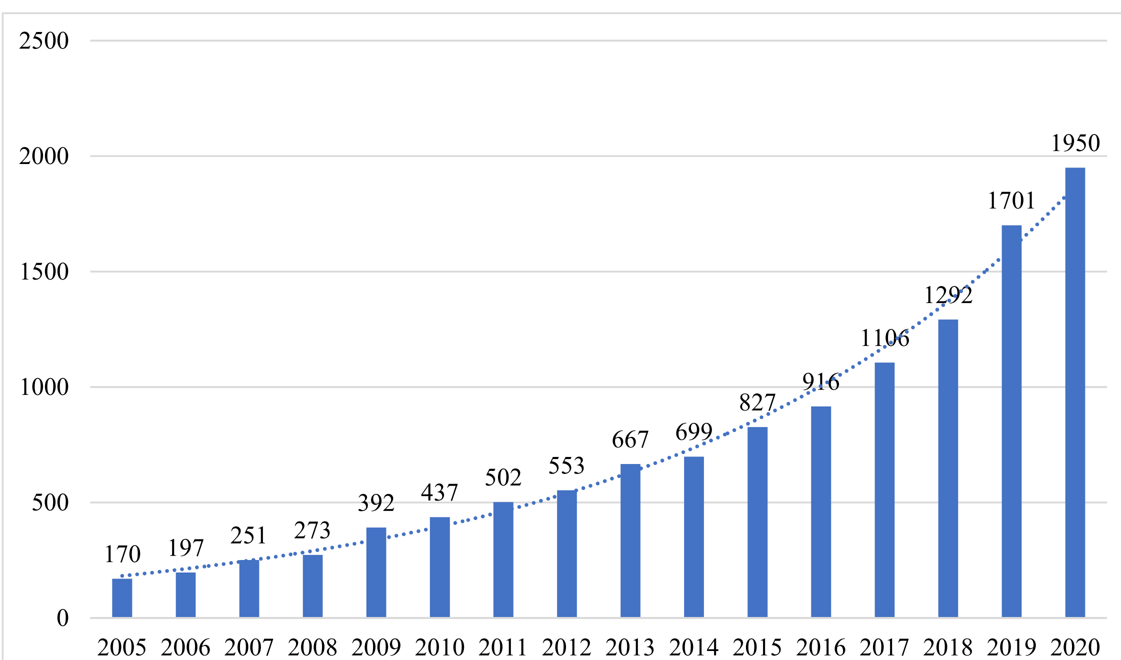

Fig. 1. Year wise publication of bibliometric papers. **Note(s):** This figure represents the publication trend of bibliometric papers between 2005 and 2020. The data was retrieved from the Scopus database in the subject areas of "business, management, and accounting," "economics, econometrics, and finance," and "social sciences" using the keyword "bibliom*".

"the across-study variance in the distribution of effect-size estimates and the factors that explain this variance" (Aguinis, Pierce, Bosco, Dalton, & Dalton, 2011, p. 310), whereas systematic literature reviews, such as domain-, method-, and theory-based reviews, encapsulate the acquisition, arrangement, and assessment of the extant literature using systematic procedures (Palmatier et al., 2018; Tranfield, Denyer, & Smart, 2003), which are typically carried out manually (e.g., content and thematic analyses) by scholars (Lahiri, Mukherjee, & Peng, 2020; Lim, Yap, & Makkar, 2021).

Similar to bibliometric analysis, meta-analysis is able to handle large amounts of literature and provides a nuanced summary of a given field, though the literature considered tend to be less diverse, and the heterogeneity of existing studies and the existence of a publication bias can have an adverse effect on the validity of the results obtained via meta-analysis (Aguinis, Gottfredson, & Wright, 2011; Junni, Sarala, Taras, & Tarba, 2013). In contrast, systematic literature reviews using classic methods require a narrow scope of study and thus tend to include a lesser number of papers for review (e.g., between tens [e.g., 40] and low hundreds [e.g., 100–300]) (Snyder, 2019). In that sense, systematic literature reviews are better suited for confined (e.g., customer engagement on social media) or niche research areas (e.g., social media influencer marketing). Unlike systematic literature reviews that tend to rely on qualitative techniques, which could be marred by interpretation bias from scholars across different academic backgrounds (MacCoun, 1998), bibliometric analysis and meta-analysis rely upon quantitative techniques and thus can avoid or mitigate that bias.

Since meta-analysis and bibliometric analysis are both quantitative in nature, the distinction between the two methods can be confusing to some scholars. To shed light on this distinction, business scholars should note that their quantitative methods are relatively different in terms of usage, though they can both handle large amounts of literature. Specifically, meta-analysis concentrates on summarizing empirical evidence by analyzing the direction and strength of effects and relationships among variables and is "useful in addressing open research questions with data that are closer to definitive than those reported in any single primary study" (Carney, Gedajlovic, Heugens, Van Essen, & Van Oosterhout, 2011, p 438). It is performed to throw light on mixed empirical findings and boundary conditions. Thus, meta-analyses are often used as theory extension tools (Combs, Ketchen, Crook, & Roth, 2011). In contrast, bibliometric analysis summarizes the bibliometric and intellectual structure of a field by analyzing the social and structural relationships between different research constituents (e.g., authors, countries, institutions, topics).

In summary, the use of any of the three review methods discussed herein is dependent upon the goals of the review and the magnitude and nature of the literature being reviewed. Nonetheless, these review methods remain complementary to one another and they offer unique advantages to scholars who are interested in using them. Table 1 presents the methodological comparison of bibliometric analysis, meta-analysis, and systematic literature reviews across different criteria to help authors make informed decisions with respect to the selection of the appropriate review method.

3. The bibliometric analysis technique toolbox

The techniques for bibliometric analysis manifest across two categories: (1) performance analysis and (2) science mapping. In essence, performance analysis accounts for the *contributions* of research constituents, whereas science mapping focuses on the *relationships* between research constituents. The next sub-sections sheds light on the techniques available for performance analysis and science mapping, which are illustrated in Fig. 2.

3.1. Performance analysis

Performance analysis examines the *contributions* of research constituents to a given field (Cobo, López-Herrera, Herrera-Viedma, & Herrera, 2011; Ramos-Rodrígue & Ruíz-Navarro, 2004). The analysis, which is descriptive in nature, is the hallmark of bibliometric studies (Donthu, Reinartz, Kumar, & Pattnaik, 2020). Performance analysis can be found in most reviews, even in those that do not engage in science mapping, because it is a standard practice in reviews to present the performance of different research constituents (e.g., authors, institutions, countries, and journals) in the field, which is akin to the background or profile of participants that is typically presented in empirical research albeit more analytically.

Table 1
Comparison of major review methods.

Review type	Goal	When to use	When not to use	Scope	Dataset	Analysis
Bibliometric analysis	• Summarizes large quantities of bibliometric data to present the state of the intellectual structure and emerging trends of a research topic or field.	• When the scope of review is broad. • When the dataset is too large for manual review.	• When the scope of review is specific. • When the dataset is small and manageable enough that its content can be manually reviewed.	• Broad	• Large	• Quantitative (evaluation and interpretation) • Qualitative (interpretation only)
Meta-analysis	• Summarizes the empirical evidence of relationship between variables while uncovering relationships not studied in existing studies.	• When the focus of review is to summarize results rather than to engage with content, which may be broad or specific. • When studies in the field are homogenous. • When the number of homogeneous studies available is sufficiently high. • When the number of homogeneous studies remaining after removing low quality studies is sufficiently high.	• When studies in the field are heterogeneous. • When the number of homogenous studies is relatively low. • When the number of high-quality homogeneous studies is relatively low.	• Broad • Specific	• Large • Small but adequate	• Quantitative (evaluation and interpretation)
Systematic literature review	• Summarizes and synthesizes the findings of existing literature on a research topic or field.	• When the scope of review is specific. • When the dataset is small and manageable enough that its content can be manually reviewed.	• When the scope of review is broad. • When the dataset is too large for manual review.	• Specific	• Small	• Qualitative (evaluation and interpretation)

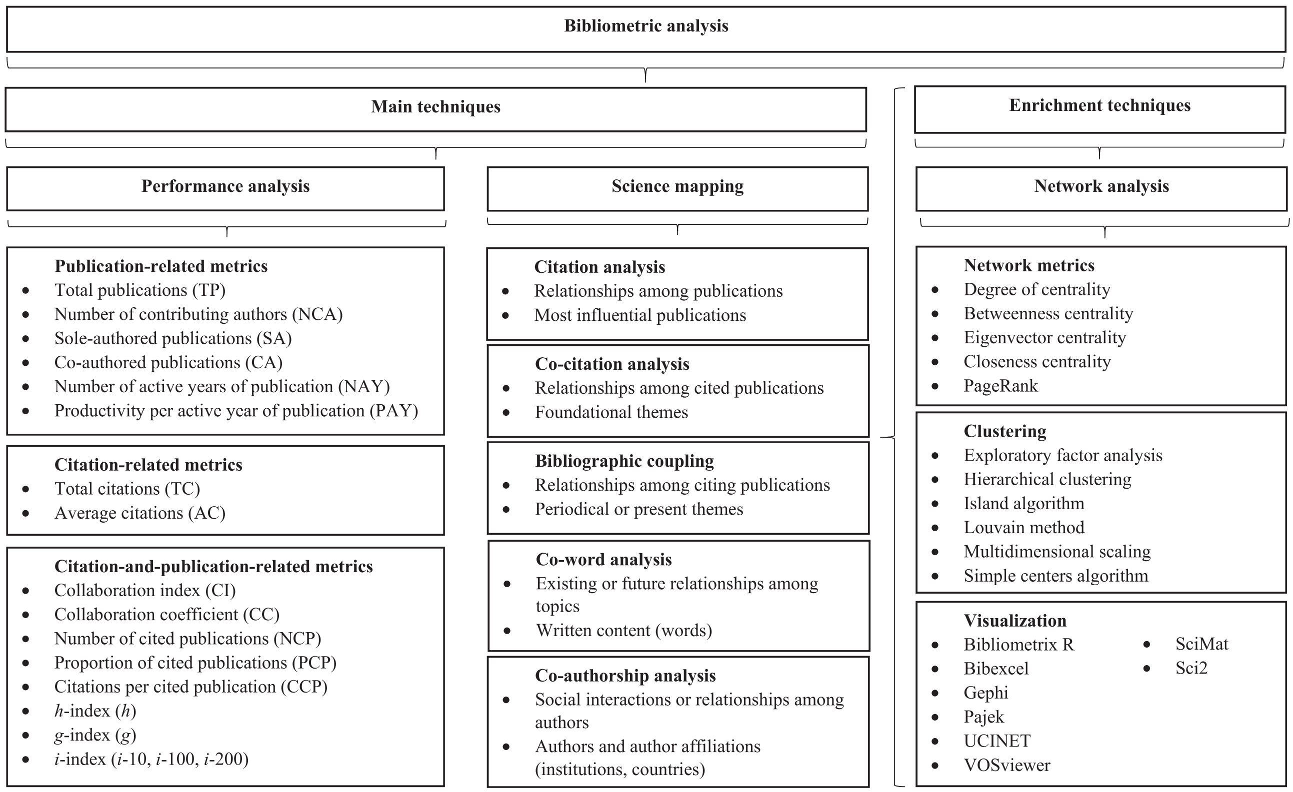

Fig. 2. The bibliometric analysis toolbox.

Myriad measures for performance analysis exist. The most prominent measures are the number of publications and citations per year or per research constituent, wherein publication is a proxy for productivity, whereas citation is a measure of impact and influence. Other measures such as citation per publication and *h*-index combines both citations and publications to measure the performance of research constituents. The analysis, despite being descriptive, recognizes the importance of different constituents in a research field. Table 2 presents a sample of metrics suitable for performance analysis.

3.2. *Science mapping*

Science mapping examines the *relationships* between research constituents (Baker, Kumar, & Pandey, 2021; Cobo et al., 2011; Ramos-Rodrígue & Ruíz-Navarro, 2004). The analysis pertains to the intellectual interactions and structural connections among research constituents. The techniques for science mapping include citation analysis, co-citation analysis, bibliographic coupling, co-word analysis, and co-authorship analysis. Such techniques, when combined with network analysis, are instrumental in presenting the bibliometric structure and the intellectual structure of the research field (Baker, Pandey, Kumar, & Haldar, 2020; Tunger & Eulerich, 2018). Table 3 presents a summary of the different techniques for science mapping with focus on their usage and data considerations.

3.2.1. *Citation analysis*

Citation analysis is a basic technique for science mapping that operates on the assumption that citations reflect intellectual linkages between publications that are form when one publication cites the other (Appio, Cesaroni, & Di Minin, 2014). In this analysis, the impact of a publication is determined by the number of citations that it receives. The analysis enables the most influential publications in a research field to be ascertained. Though there are a variety of methods (e.g., network metrics) to determine the importance of publications in a research field, the most objective and straightforward measure of its impact is its citation (Pieters & Baumgartner, 2002; Stremersch, Verniers, & Verhoef, 2007). Therefore, using citations, one can analyze the most influential publications in a research field to gain an understanding of the intellectual dynamics of that field.

3.2.2. *Co-citation analysis*

Co-citation analysis is a technique for science mapping that assumes publications that are cited together frequently are similar thematically (Hjørland, 2013). The analysis can be used to reveal the intellectual structure of a research field (Rossetto, Bernardes, Borini, & Gattaz, 2018), such as its underlying themes (Liu, Yin, Liu, & Dunford, 2015). In a co-citation network, two publications are connected when they co-occur in the reference list of another publication. The benefit of using co-citation analysis is that, in addition to finding the most influential publications, business scholars can also discover thematic clusters. Here, the thematic clusters are derived based on the *cited publications*. However, co-citation analysis concentrates only on highly-cited publications, and leaves publications that are recent or niche out of its thematic clusters. In that sense, co-citation analysis is suitable for business scholars who wish to uncover seminal publications and knowledge foundations.

3.2.3. *Bibliographic coupling*

Bibliographic coupling is a technique for science mapping that operates on the assumption that two publications sharing common references are also similar in their content (Kessler, 1963; Weinberg, 1974). The analysis concentrates on the division of publications into thematic clusters based on shared references, and is best used within a specific timeframe (Zupic & Čater, 2015). Here, the thematic clusters are formed based on the *citing publications*, and thus, recent and niche publications can gain visibility through bibliographic coupling (unlike co-citation analysis). In that sense, bibliographic coupling is suitable for business scholars who wish to uncover a broad spectrum of themes and its latest

Table 2
Metrics for performance analysis.

Metric	Description
Publication-related metrics	
Total publications (TP)	Total publication of research constituent
Publications from academia (TP-A)	Total publication of research constituent from academia
Publications from industry (TP-I)	Total publication of research constituent from industry
Publications from academia-industry collaboration (TP-AI)	Total publication of research constituent from academia-industry collaboration
Number of contributing authors (NCA)	Total number of authors contributing to publications of research constituent
Sole-authored publications (SA)	Total number of sole-authored publications by research constituent
Co-authored publications (CA)	Total number of co-authored publications by research constituent
Number of active years of publication (NAY)	Number of years that research constituent record a publication
Productivity per active year of publication (PAY)	TP ÷ NAY
Citation-related metrics	
Total citations (TC)	Total citations of research constituent
Average citations (AC)	Average citations (e.g., per publication, per year, per period) of research constituent
Citation-and-publication-related metrics	
Collaboration index (CI)	(NCA ÷ TP) ÷ TP (i.e., the extent of collaboration of research constituent)
Collaboration coefficient (CC)	1 – (TP ÷ NCA) (i.e., standardizes the extent of author collaboration between 0 and 1)
Number of cited publications (NCP)	Number of publications of research constituent that are cited
Proportion of cited publications (PCP)	NCP ÷ TP
Citations per cited publication (CCP)	TC for NCP
h-index (*h*)	*h* number of publications cited at least *h* times (i.e., measure of influence)
g-index (*g*)	*g* number of publications receiving at least g^2 citations (i.e., measure of impact)
i-index (*i*-10, *i*-100, *i*-200)	*i* number of publications cited at least *i* times (e.g., $i = 10, 100, 200$, etc.)

Note(s): Compilation based on author experience and expertise in bibliometric analysis. Metrics can be computed for each research constituent (e.g., authors, institutions, countries, journals) as an aggregate (e.g., research constituent) or in specific (e.g., research constituent per publication, per year, or per period) depending on information needs (e.g., aggregates for overviews, specifics for trends observation).

Table 3
Techniques for science mapping and their usage, unit of analysis, and data requirements.

Technique	Usage	Unit of analysis	Data requirements	Example
Citation analysis	To analyze the *relationships* among publications by identifying the *most influential publications* in a research field.	Documents	Author name Citations Title Journals DOI References	Podsakoff, Mackenzie, Bachrach, and Podsakoff (2005)
Co-citation analysis	To analyze the *relationships* among *cited publications* to understand the development of the *foundational themes* in a research field.	Documents	References	Fahimnia, Sarkis, and Davarzani (2015)
Bibliographic coupling	To analyze the *relationships* among *citing publications* to understand the *periodical* or *present* development of themes in a research field.	Documents	Author name Title Journals DOI References	Donthu et al. (2020b)
Co-word analysis	To explore the *existing* or *future relationships* among *topics* in a research field by focusing on the *written content* of the publication itself.	Words	Title Abstract Author keywords Index keywords Full text	Emich et al. (2020)
Co-authorship analysis	To examine the *social interactions* or *relationships* among *authors* and their *affiliations* and equivalent impacts on the development of the research field.	Authors Affiliations	Author Affiliation (institution and country)	Acedo et al. (2006)

developments. The analysis can therefore provide a representation of the *present* of the research field.

3.2.4. Co-word analysis

While the previous three techniques for science mapping focus on publications, the unit of analysis for co-word analysis is “words.” In other words, unlike citation analysis, co-citation analysis, and bibliographic coupling, which employs either cited or citing publications as a focal point or a proxy, the co-word analysis is a technique that examines the actual content of the publication itself. The words in a co-word analysis are often derived from “author keywords”, and in its absence, notable words can also be extracted from “article titles,” “abstracts,” and “full texts” for the analysis (e.g., Baker, Kumar, & Pandey, 2020; Burton, Kumar, & Pandey, 2020; Donthu, Gremler, Kumar, & Pattnaik, 2020; Emich, Kumar, Lu, Norder, & Pandey, 2020; Liu, Mai, & MacDonald, 2019). Similar to co-citation analysis, the co-word analysis assumes that words that frequently appear together have a thematic relationship with one another.

The usage of words as a unit of analysis, however, has its downsides. For example, certain words are used in multiple contexts, and thus, (re) reading of publications becomes necessary to understand the meaning of the relationships between words. Besides that, some words can be very general (e.g., subject field names—e.g., advertising), and thus, it may be challenging to assign them to any one thematic cluster.

To mitigate the potential downsides of co-word analysis, business scholars are encouraged to use the analysis strategically. Here, two recommendations are provided. First, a co-word analysis can be used as a supplement to enrich understanding about the thematic clusters derived from co-citation analysis or bibliographic coupling because the themes formed through the commonalities in publications tend to be relatively general (Chang, Huang, & Lin, 2015), and thus, the use of co-word analysis can help business scholars to elaborate on the content of each thematic cluster. Second, a co-word analysis can be used to forecast future research in the field, which can be happen when notable “words” from the publication’s implications and future research directions are used in the analysis. In that sense, the co-word analysis is suitable for business scholars who wish to enrich their interpretations of co-citation analysis (*past*) or bibliographic coupling (*present*) and to predict forthcoming trajectories. The co-word analysis can therefore provide a preview of the *future* of the research field.

3.2.5. Co-authorship analysis

Co-authorship analysis examines the interactions among scholars in a research field. Since co-authorship is a formal way of intellectual collaboration among scholars (Acedo, Barroso, Casanueva, & Galan, 2006; Cisneros, Ibanescu, Keen, Lobato-Calleros, & Niebla-Zatarain, 2018), it is therefore important to understand how scholars interact amongst themselves (including associated author attributes such as affiliated institutions and countries). With the increasing methodological and theoretical complexity in research, collaborations among scholars have become a commonplace (Acedo et al., 2006). In fact, collaborations among scholars can lead to improvements in research—for example, contributions from different scholars can contribute to greater clarity and richer insights (Tahamtan, Safipour Afshar, & Ahamdzadeh, 2016). Here, scholars that collaborate form a network known as "invisible collages," whose study can help develop the undertakings in the research field (Crane, 1969). For example, the analysis can shed light on clustered research among scholars from a particular region, and such insights can be used to justify and spark new research among scholars in underrepresented regions. The analysis also enables collaborations to be mapped across different periods of time, thereby enabling scholars to review the trajectory of intellectual development against collaboration networks, while equipping prospective scholars with valuable information to reach out and collaborate with established and trending scholars in the research field.

4. The bibliometric analysis enrichment toolbox

Building on the core techniques of bibliometric analysis, this section presents the add-ons that can augmented to enrich the outcomes of the analysis techniques applied in bibliometric studies. In total, three enrichment pathways predicated on network analysis are suggested in the form of network metrics, clustering, and visualization.

4.1. Network metrics

Network metrics can be used to enrich the assessment of bibliometric analysis. In particular, network metrics shed light on the relative importance of research constituents (e.g., authors, institutions, countries), which may not necessarily be reflected through publications or citations. Importantly, network metrics are commonly employed to enrich the discussion of research fields in bibliometric studies (Andersen, 2019; Andrikopoulos & Economou, 2016; Baker, Kumar, and Pattnaik, 2020; Cisneros et al., 2018), and thus, they represent a legitimate method for enriching bibliometric assessments. To provide greater clarity, several exemplars of network metrics are provided (e.g., degree of centrality, betweenness centrality, eigenvector centrality, closeness centrality, and PageRank), along with a sample table of publication ranking that can be curated across different centrality measures (see Table 4). Specifically:

- *Degree of centrality* refers to the number of relational ties a research constituent has in a network. For example, if an author in a co-authorship network has worked with four different authors, then his or her degree of centrality would be four. This is by far the simplest measure of centrality as it relies on the numerical count of relational ties. A variant of this measure is the *weighted degree of centrality*, which is calculated by multiplying the total number of relational ties with the strength of each tie. For example, if Author A has written two publications with Author B and one each with Author C and Author D, then Author A's degree of centrality will be three but his or her weighted degree of centrality would be four. Though the simplicity of these measures is an advantage in itself, the measures do not present information on what role a research constituent plays in the research field.

Table 4
Sample ranking for publications according to different centrality measures.

Article	Degree of centrality	Weighted degree of centrality	Betweenness centrality	Eigen-centrality
Adams and Ferreira (2009)	280	280	0.001228	1.000000
Carter et al. (2010)	157	157	0.002459	0.429861
Campbell and Mínguez-Vera (2008)	157	157	0.000973	0.576924
Farrell and Hersch (2005)	125	125	0.000383	0.79642
Rose (2007)	103	103	0.000468	0.547304
Bear et al. (2010)	95	95	0.000597	0.333566
Gul et al. (2011)	94	94	0.000038	0.261708
Francoeur et al. (2008)	88	88	0.000319	0.322196
Nielsen and Huse (2010)	84	84	0.001128	0.239786
Srinidhi et al. (2011)	72	72	0.000315	0.193446
Brammeret al. (2007)	53	53	0.000195	0.33335
Joecks et al. (2013)	52	52	0.001647	0.098639
Kang et al. (2007)	52	52	0.000163	0.202528
Liu et al. (2014)	50	50	0.000608	0.103164
Post et al. (2011)	48	48	0.001654	0.167437
Van der Walt and Ingley (2003)	47	47	0	0.325318
Dezső and Ross (2012)	45	45	0.000064	0.108403
Adams and Funk (2012)	45	45	0.000034	0.11754
Terjesen and Singh (2008)	44	44	0	0.183499
Mahadeo (2012)	43	43	0.002295	0.119584

Note(s): Centrality measures for publications on board diversity cited within the network sourced from Baker, Kumar, and Pattnaik (2020). Degree of centrality = the number of relational ties an article or a research constituent (e.g., author, country, institution, journal) has in a network. Weighted degree of centrality = the total number of relational ties an article or a research constituent (e.g., author, country, institution, journal) has in a network multiply the strength of each tie. Betweenness centrality = a node's ability to carry information between unconnected groups of nodes in a network, wherein each node represents an article or a research constituent (e.g., author, country, institution, journal). Eigen-centrality = the importance of the node in the network that is responsible for transmitting information to other highly-connected nodes, wherein each node represents an article or a research constituent (e.g., author, country, institution, journal).

- *Betweenness centrality* refers to a node's ability to carry information between unconnected groups of nodes, wherein each node represents a research constituent. Though betweenness centrality is more complex than the degree of centrality, the measure does present information about the role played by the research constituent in a network. In particular, betweenness centrality is measured by calculating the total number of shortest paths passing through a particular node ($\delta_{v,w}(u)$) and dividing it by the total number of shortest paths in the entire network ($\delta_{v,w}$).

$$B(u) = \sum \frac{\delta_{v,w}(u)}{\delta_{v,w}}$$

- *Eigenvector centrality* is higher for nodes that are connected to other highly-connected nodes, wherein each node represents a research constituent. Specifically, a higher value of eigenvector centrality is a reflection of the importance of the node in the network that is responsible for transmitting information to other highly-connected nodes. This network metric is calculated as

$$x_i = \frac{1}{\lambda}\sum_{j\in M(i)} x_j$$

where, $M(i)$ is the set of neighbours of i, and λ is a constant.

- *Closeness centrality* refers to the capability of nodes to carry information effectively by being closer to other nodes in the network. The sum of distance of such nodes from other nodes in the network indicates the relative ease for these nodes to carry information effectively.
- *PageRank* analysis is an alternative measure of a publication's impact (Ding et al., 2009). Though PageRank was initially designed to prioritize web pages in a keyword search, the method has found its way to bibliometrics. In particular, PageRank can be used to calculate the prestige of publications that have an influence on the research field by influencing highly-cited publications despite not being highly cited themselves. In that sense, a publication with a high PageRank is deemed as "high quality" and thus a "must cite" among highly-cited publications. In addition, PageRank can also be applied in clustering, which will be discussed in the next section, to reveal the themes in a review domain. The formula for calculating PageRank is given as follows:

$$PR(A) = \frac{(1-d)}{N} + d\left(\frac{PR(T_1)}{C(T_1)} + \cdots + \frac{PR(T_n)}{C(T_n)}\right)$$

where A is the publication cited by highly-cited publications T_1, T_2, T_3, …, T_n, $C(T_i)$ is the citations of publication T_i, $PR(T_i)$ is the publication's PageRank, d is a dampening factor, and N is the size of the network. Table 5 presents a sample of publication rankings according to PageRank.

Table 5
Sample table for publication rankings according to PageRank.

Article	PageRank	Global citations	Local citations
Agrawal and Knoeber (2001)	0.081163	289	15
Van der Walt and Ingley (2003)	0.062236	117	47
Adams and Ferreira (2009)	0.061156	738	280
Farrell and Hersch (2005)	0.058248	267	125
Arfken et al. (2004)	0.0293	88	29
Rose (2007)	0.023957	222	103
Campbell and Mínguez-Vera (2008)	0.021228	330	157
Brammer et al. (2009)	0.017147	65	35
Carter et al. (2010)	0.015828	260	157
Brammer et al. (2007)	0.01415	96	53
Bear et al. (2010)	0.012278	272	95
Francoeur et al. (2008)	0.012166	167	88
Hoskisson et al. (2002)	0.012118	354	6
Nielsen and Huse (2010)	0.01164	192	84
Gul et al. (2011)	0.010513	177	94
Ruigrok et al. (2007)	0.009813	90	32
Kang et al. (2007)	0.009008	147	52
Huse et al. (2009)	0.008574	72	35
Tuggle et al. (2010)	0.007884	99	15
Srinidhi et al. (2011)	0.007277	155	72

Note(s): PageRank of the top 20 publications on board diversity sourced from Baker, Kumar, and Pattnaik (2020). PageRank = a metric derived from the citations that an article receives from other highly-cited articles, which indicates the prestige of that article. Global citations = the citations that an article receives as is (without filtration). Local citations = the citations that an article receives from other articles in the review corpus only (with filtration—i.e., the review domain). Local citations are generally lower and can never be higher than global citations, wherein the occurrence of the latter is an indication of an erroneous entry. The comparison of global and local citations can enrich understanding of research impact and influence as they reveal the actual or true state of affairs (e.g., articles with high global citations demonstrate impact and influence across disciplines, whereas articles with high local citations indicate impact and influence within the discipline).

4.2. Clustering

Clustering is another enrichment technique for bibliometric analysis whose primary goal is to create thematic or social clusters (depending upon the type of analysis being conducted). Curating network clusters and observing their development can be useful for understanding how a research field manifests and develops. For example, the thematic clusters created using co-citation analysis and bibliographic coupling shed light on the major themes underpinning the intellectual structure and their development over time in the research field. Several techniques can be used for clustering such as exploratory factor analysis, hierarchical clustering, Island algorithm, Louvain method, multidimensional scaling, and simple centers algorithm, which can be complementary to one another (Zupic & Čater, 2015).

4.3. Visualization

The use of bibliometric analysis often goes hand in hand with network visualization software, which ranges from entirely graphical user interface-based software such as VOSviewer (van Eck & Waltman, 2010) to command-based software such as Bibliometrix package in R (Aria & Cuccurullo, 2017). Other prominently-used bibliometric software includes Bibexcel, Pajek, Gephi, SciMat, Sci2, and UCINET. Fig. 3 and Fig. 4 present random exemplars of network visualization using VOSviewer and Gephi, respectively.

Most network visualization software are open source and free, and thus, the choice of software reside with scholars. Each software has its own pros and cons. For example, though Pajek and UCINET have many features, their speed of development is slower as compared to software such as Gephi and R. The flexibility of the generated network is another challenge. For example, in a network generated using VOSviewer, different forms of the same words cannot be merged, while the same can be done using Gephi. One method to address this issue is to use bibliometric analysis and network visualization software in combination with one another. In fact, many bibliometric studies do take such a complementary approach to leverage on software strengths and to overcome software shortcomings (e.g., Baker et al., 2020a; Donthu, Kumar, Pandey, & Gupta, 2021; Xu et al., 2018). Therefore, considerations pertaining to software features and the flexibility of the resulting network should be taken into account when making a decision to choose a bibliometric or a combination of bibliometric software for analysis and visualization.

5. The bibliometric analysis procedure

In this section, the paper presents the steps for conducting bibliometric analysis along with the general guidelines to be followed. Fig. 5 presents an illustration of the steps while Table 6 presents the guidelines for bibliometric analysis with a focus on the specific (questions) recommendations regarding what scholars should ask themselves in each of these steps.

5.1. Step 1: Define the aims and scope of the bibliometric study

This first step is to define the aims and scope of the bibliometric study, which must occur before the selection of bibliometric analysis techniques and the gathering of bibliometric data. Doing the latter before the former is risky as unsuitable aims and scope can render bibliometric analysis useless, and thus, wasting precious resources that could be better invested with careful planning.

The *aims* of a bibliometric study should relate to a *retrospection* of the performance and science of a research field. In terms of *performance*,

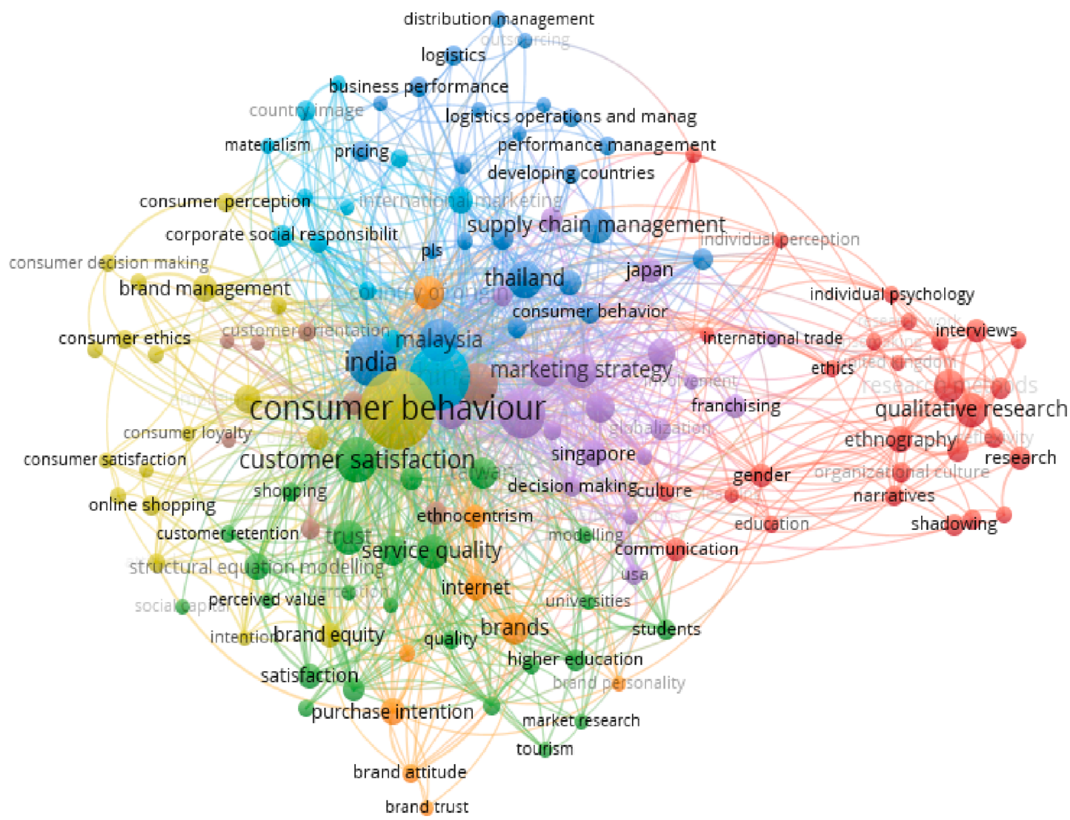

Fig. 3. Example of co-word (keyword co-occurrence) network visualization using VOSviewer. **Note(s):** Each *node* in a network represents an entity (e.g., article, author, country, institution, keyword, journal), and in the case of Fig. 3, a *keyword*, wherein: (1) the *size of the node* indicates the *occurrence of the keyword* (i.e., the number of times that the keyword occurs), (2) the *link between the nodes* represents the *co-occurrence between keywords* (i.e., keywords that co-occur or occur together), (3) the *thickness of the link* signals the *occurrence of co-occurrences between keywords* (i.e., the number of times that the keywords co-occur or occur together), (4) the *bigger the node*, the *greater the occurrence of the keyword*, and (5) the *thicker the link between nodes*, the *greater the occurrence of the co-occurrences between keywords*. Each *color* represents a *thematic cluster*, wherein *the nodes and links in that cluster* can be used to *explain the theme's (cluster's) coverage of topics (nodes) and the relationships (links) between the topics (nodes) manifesting under that theme (cluster)*.

bibliometric studies are often set out to unpack the prolific research constituents in the research field, which may include authors, institutions, countries, and journals. In terms of *science*, bibliometric studies are usually designed to reveal the *bibliometric structure* that encapsulates the networks between research constituents contributing to the *intellectual structure* that is founded upon clusters of pertinent themes in the research field.

The *scope* for study should generally be *large* enough to warrant bibliometric analysis because the analysis is designed to handle large volumes of bibliometric data (Ramos-Rodrígue & Ruíz-Navarro, 2004). To determine whether the scope of the study is adequately large, scholars can review the number of papers that avail on the intended research field for study. If there are considerable hundreds (e.g., 500 or more) or thousands of papers, then that research field can be considered to be large enough to warrant the use of bibliometric analysis. If there are only tens (e.g., 50) or low hundreds (e.g., 100–300) of papers, then the research field is considered to be small and thus do not warrant the use of bibliometric analysis, as forcing the analysis on this small corpus would be an overkill. In this case, alternative review methods such as meta-analysis and systematic literature reviews may be better suited.

5.2. Step 2: Choose the techniques for bibliometric analysis

The second step is to design the bibliometric study, wherein the techniques for bibliometric analysis are chosen to meet the aims and scope of the study in the first step. One challenge that scholars often encounter at this stage is the decision of whether to choose a technique based on the bibliometric data sought or to choose a technique first and then prepare the bibliometric data according to that selected technique thereafter. To overcome this challenge, this paper recommends the latter as the former limits the choice of techniques that can be used by scholars. Moreover, bibliometric data is often retrieved in a raw format, and thus, scholars will need to clean and prepare that data according to the format that is required for the chosen bibliometric analysis techniques. In this regard, the paper's recommendation of the latter will provide scholars with a wider rather than a limiting selection of bibliometric analysis techniques for deployment. More importantly, the choice of bibliometric analysis techniques will depend on the aims of the study. For example, if the study intends to provide a review of the past, present, and future of a research field with a large bibliometric corpus, then a combination of co-citation analysis (*past*), bibliographic coupling (*present*), and co-word analysis (e.g., notable words in the implications and future research directions of full texts) (*future*) can be selected. Whereas, if the study is interested to uncover the themes in general and over specific periods, then the latter (i.e., co-word analysis) can be used in conjunction with author keywords to enrich the analysis of the former two (i.e., co-citation analysis and bibliographic coupling). As mentioned, the performance analysis in bibliometric studies is akin to the profile of participants in empirical studies, and thus, by default, the components (e.g., total publications, total citations) of the performance analysis should be selected now, and analyzed and reported in a descriptive (i.e., what it is) yet analytical (i.e., what it means) way thereafter.

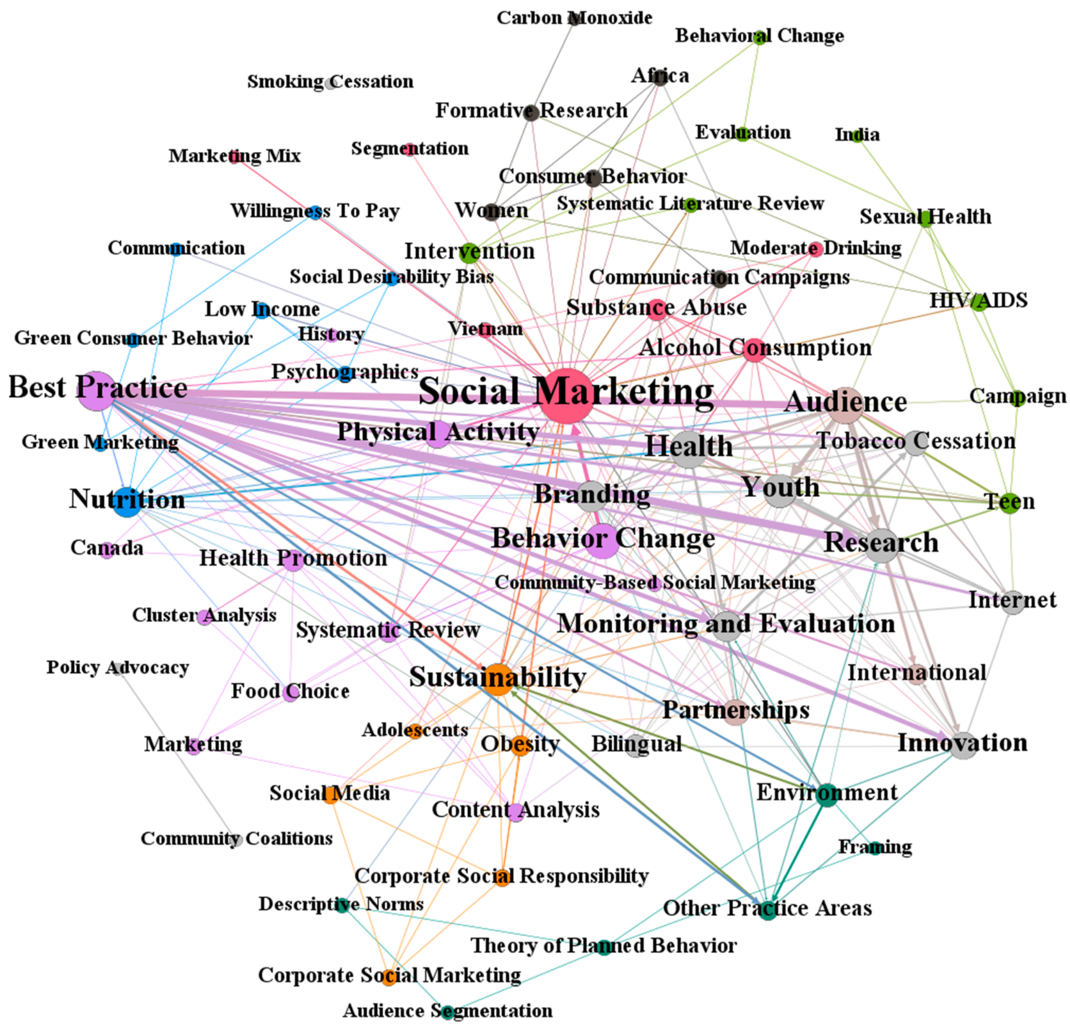

Fig. 4. Example of co-word (keyword co-occurrence) network visualization using Gephi. **Note(s):** Each *node* in a network represents an entity (e.g., article, author, country, institution, keyword, journal), and in the case of Fig. 4, a *keyword*, wherein: (1) the *size of the node* indicates the *occurrence of the keyword* (i.e., the number of times that the keyword occurs), (2) the *link between the nodes* represents the *co-occurrence between keywords* (i.e., keywords that co-occur or occur together), (3) the *thickness of the link* signals the *occurrence of co-occurrences between keywords* (i.e., the number of times that the keywords co-occur or occur together), (4) the *bigger the node*, the *greater the occurrence of the keyword*, and (5) the *thicker the link between nodes*, the *greater the occurrence of the co-occurrences between keywords*. Each *color* represents a *thematic cluster*, wherein *the nodes and links in that cluster* can be used to *explain the theme's (cluster's) coverage of topics (nodes) and the relationships (links) between the topics (nodes) manifesting under that theme (cluster)*.

5.3. Step 3: Collect the data for bibliometric analysis

The third step is to gather the data required for the selected bibliometric analysis techniques in the second step. In this step, scholars will need to define search terms in a way that will yield search results that is large enough to warrant bibliometric analysis and yet focused enough to remain in the dedicated research field or the scope of study specified in the first step. In this regard, scholars have two options: first, scholars can consult the literature to identify a relevant combination of search terms, and second, scholars can brainstorm among themselves or with subject-matter experts to curate suitable search terms. Following that, scholars will need to ascertain the bibliometric data that needs to be collected from the search results that are returned. In this regard, scholars should refer back to their chosen bibliometric analysis techniques for the study. For example, if scholars have selected co-word analysis in the second step, then they should focus on collecting the title, abstract, keywords, and full text of publications in the search results. However, in cases where the required data is not available, then the first and second steps should be revisited. More importantly, given that different databases have their own format of bibliometric data and that scholars may decide to use multiple databases (e.g., Scopus and Web of Science), then efforts should be made to combine them into a single format. However, the paper's recommendation is to settle on one appropriate database to mitigate the need for that consolidation, as minimizing unnecessary action items can help to mitigate potential human errors. Moreover, data cleaning is essential because these databases are not exclusively designed for bibliometric analysis. Specifically, scholars should remove duplicates and erroneous entries. For example, the affiliation in the author field of entry may include more than one institution for a single author, which may be due to the database's assignment as a result of author profiling rather than that listed in the publication, and thus, in such cases, scholars should clean the entry so that only one valid affiliation, which is the affiliation of the author at the time of publication, remains in the final dataset. Leaving such errors unattended may lead to an incorrect representation of the research field.

5.4. Step 4: Run the bibliometric analysis and report the findings

The fourth and final step is to run the bibliometric analysis and report the findings. In theory, the running of the bibliometric analysis (and the generation of its accompanying summary) and the writing of the bibliometric review are generally defined as separate steps (e.g.,

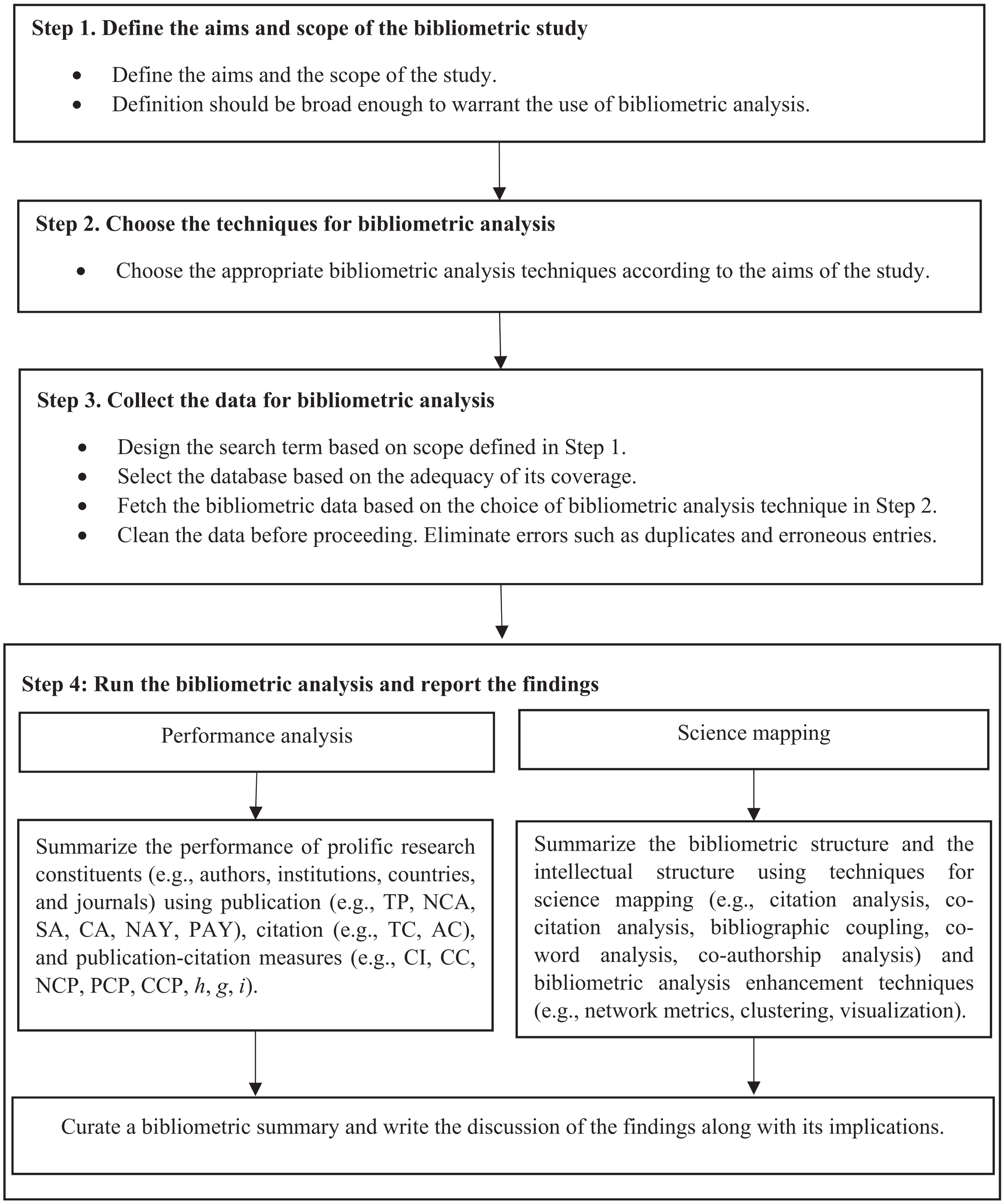

Fig. 5. The bibliometric analysis procedure. **Note(s):** TP = total publications. NCA = number of contributing authors. SA = sole-authored publications. CA = co-authored publications. NAY = number of active years of publication. PAY = productivity per active year of publication. TC = total citations. AC = average citations. CI = collaboration index. CC = collaboration coefficient. NCP = number of cited publications. PCP = proportion of cited publications. CCP = citations per cited publication. h = h-index. g = g-index. i = i-index. Performance analysis metrics = see Table 2. Science mapping techniques = see Table 3.

Zupic & Čater, 2015). However, in practice, these action items often go hand in hand. For example, the division of the network into clusters and the generation of visual network summaries directly inform the writing of the paper, wherein the need to bolster what is written in the paper can, in turn, lead to the addition of bibliometric summaries into the paper. Given this feedback loop, this paper positions the running of the bibliometric analysis, which generates bibliometric summaries, and the writing of the findings as a single step.

The style of writing is also important in this step. Most often, the style of writing is informed by the journal that the scholar is targeting and the field for which the study is being conducted. For example, one journal may want scholars to focus on the theoretical aspects of the study (e.g., journals with an emphasis on theory and an unspecified page or word limitation) while another journal may want scholars to go straight into the summary of study findings (e.g., journals with specified and strict page or word limitation). In this regard, this paper recommends scholars to check with target journals to see if they have a history of publishing review papers, and if yes, then to retrieve those papers, and if possible, those that use bibliometrics, so that a similar style of writing can be crafted.

Finally, the paper encourages scholars to craft insightful discussions that engage directly with relevant trends and equivalent rationales

Table 6
The bibliometric analysis procedure and best practice (questions) guidelines.

No.	Step	Best practice (questions) guidelines
Step 1	Define the aims and scope of the bibliometric study	• What are the aims and scope of the study? • Is the scope of the study large enough to warrant the use of bibliometric analysis?
Step 2	Choose the techniques for bibliometric analysis	• What bibliometric analysis techniques should be chosen to meet the aims and scope of the study?
Step 3	Collect the data for bibliometric analysis	• Do the search terms exemplify the scope of the study? • Is the coverage of the database adequate for the study? • Is the data free of errors such as duplicates and erroneous entries? • Does the final dataset fulfil the requirements of the bibliometric analysis techniques chosen for the study?
Step 4	Run the bibliometric analysis and report the findings	• Can the bibliometric summary be easily understood by readers? • Does the writing align with the bibliometric summary presented? • Does the writing explain the peculiarities and implications of the bibliometric summary? • Does the writing align with the target outlet for publication?

rather than simply reporting a summary of the bibliometric corpus. That is, scholars should use bibliometric visualization in figures and tables to curate analytical over descriptive discussions. It would also be appropriate to touch upon the concepts of content and context. In interpreting the findings from bibliometric analysis, it is important to understand the content of each thematic cluster and the meaning entailed in the topics of publications in that cluster. In order to grasp a good understanding of the content, it is also important to examine their contextual meaning in relation to the entities or events that characterize that content. For example, the co-word analysis presents scholars with different clusters of words. Scholars can rely on the words that manifest prominently in the cluster to understand its content (e.g., words that are more connected than others), yet they must also review how the words are connected to each other in order to decipher the context of each cluster (e.g., studies in which those words appear).

6. Conclusion

In sum, this paper demonstrated that bibliometric analysis is a scientific method that can be useful for both established and emerging scholars who wish to pursue a retrospective of broad and rich areas in business research. The paper also established that the bibliometric methodology has gained immense popularity in recent times due to the omnipresence and usefulness of bibliometric software and databases that ease the acquisition and assessment of large volumes of scientific data in business research, including in relatively new but highly rich areas such as artificial intelligence and big data (Makarius, Mukherjee, Fox, & Fox, 2020; Mustak, Salminen, Ple, & Wirtz, 2021). More importantly, the paper, in its pursuit of a collegial and pragmatic endeavor, illustrated the anatomy of a meaningful bibliometric analysis for business research, wherein the bibliometric methodology is introduced, the various techniques are explained, the bibliometric analysis enhancements are unpacked, and the related procedures are provided. Through this endeavor, the paper makes clear that the techniques chosen and the decisions associated with each step to perform bibliometric analysis are critical because they influence the results obtained and the inferences that can be drawn from the analysis.

Nonetheless, it is important to understand that though bibliometric analysis is an effective method of summarizing and synthesizing literature, it is not without limitations. First, the bibliometric data from scientific databases such as Scopus and Web of Science are not produced exclusively for bibliometric analysis and therefore can contain errors, wherein the presence of errors are bound to affect any analysis that is performed using such data. To mitigate errors, scholars must carefully clean the bibliometric data that they acquire, which includes removing duplicates and erroneous entries. Second, the nature of the bibliometric methodology is in itself a limitation. In particular, the qualitative assertions of bibliometrics can be quite subjective given that bibliometric analysis is quantitative in nature, wherein the relationship between quantitative and qualitative results is often unclear (Wallin, 2005). In this regard, scholars should take extra care when making qualitative assertions about bibliometric observations and supplement them with content analysis, where appropriate (Gaur & Kumar, 2018). Third, bibliometric studies can only offer a short-term forecast of the research field (Wallin, 2005), and thus, scholars should avoid making overambitious assertions about the research field and its impact in the long run.

Notwithstanding these limitations, the bibliometric methodology can empower scholars to overcome the fear of dealing with large bibliometric datasets and to pursue ambitious retrospectives of business research. Indeed, the enhanced understanding of science through bibliometric analysis can facilitate knowledge creation not only in business research but also in other fields. We take a short yet significant step in that direction.

References

Acedo, F. J., Barroso, C., Casanueva, C., & Galan, J. L. (2006). Co-authorship in management and organizational studies: An Empirical and Network Analysis. *Journal of Management Studies, 43*(5), 957–983.

Aguinis, H., Gottfredson, R. K., & Wright, T. A. (2011). Best-practice recommendations for estimating interaction effects using meta-analysis. *Journal of Organizational Behavior, 32*(8), 1033–1043.

Aguinis, H., Pierce, C. A., Bosco, F. A., Dalton, D. R., & Dalton, C. M. (2011). Debunking myths and urban legends about meta-analysis. *Organizational Research Methods, 14*(2), 306–331.

Andersen, N. (2019). Mapping the expatriate literature: A bibliometric review of the field from 1998 to 2017 and identification of current research fronts. *International Journal of Human Resource Management.* Available at doi: 10.1080/09585192.2019.1661267 (in press).

Andrikopoulos, A., & Economou, L. (2016). International Review of Financial Analysis coauthorship and subauthorship patterns in financial economics. *International Review of Financial Analysis, 46*, 12–19.

Appio, F. P., Cesaroni, F., & Di Minin, A. (2014). Visualizing the structure and bridges of the intellectual property management and strategy literature: A document co-citation analysis. *Scientometrics, 101*(1), 623–661.

Aria, M., & Cuccurullo, C. (2017). bibliometrix: An R-tool for comprehensive science mapping analysis. *Journal of Informetrics, 11*(4), 959–975.

Backhaus, K., Lügger, K., & Koch, M. (2011). The structure and evolution of business-to-business marketing: A citation and co-citation analysis. *Industrial Marketing Management, 40*(6), 940–951.

Baker, H. K., Kumar, S., & Pandey, N. (2020). A bibliometric analysis of Managerial Finance: A retrospective. *Managerial Finance, 46*(11), 1495–1517.

Baker, H. K., Kumar, S., & Pandey, N. (2021). Forty years of the Journal of Futures Markets: A bibliometric overview. *Journal of Futures Markets.* Available at doi: 10.1002/fut.22211 (in press).

Baker, H. K., Kumar, S., & Pattnaik, D. (2020). Twenty-five years of the Journal of Corporate Finance: A scientometric analysis. *Journal of Corporate Finance, 66*, Article 101572.

Baker, H. K., Pandey, N., Kumar, S., & Haldar, A. (2020a). A bibliometric analysis of board diversity: Current status, development, and future research directions. *Journal of Business Research, 108*(January), 232–246.

Broadus, R. N. (1987). Toward a definition of "bibliometrics". *Scientometrics, 12*(5–6), 373–379.

Brown, T., Park, A., & Pitt, L. (2020). A 60-year bibliographic review of the Journal of Advertising Research: Perspectives on trends in authorship, influences, and research impact. *Journal of Advertising Research, 60*(4), 353–360.

Burton, B., Kumar, S., & Pandey, N. (2020). Twenty-five years of The European Journal of Finance (EJF): A retrospective analysis. *The European Journal of Finance, 26*(18), 1817–1841.

Carney, M., Gedajlovic, E. R., Heugens, P. P., Van Essen, M., & Van Oosterhout, J. (2011). Business group affiliation, performance, context, and strategy: A meta-analysis. *Academy of Management Journal, 54*(3), 437–460.

Chang, Y. W., Huang, M. H., & Lin, C. W. (2015). Evolution of research subjects in library and information science based on keyword, bibliographical coupling, and co-citation analyses. *Scientometrics, 105*(3), 2071–2087.

Cisneros, L., Ibanescu, M., Keen, C., Lobato-Calleros, O., & Niebla-Zatarain, J. (2018). Bibliometric study of family business succession between 1939 and 2017: Mapping and analyzing authors' networks. *Scientometrics, 117*(2), 919–951.

Combs, J. G., Ketchen, D. J., Jr, Crook, T. R., & Roth, P. L. (2011). Assessing cumulative evidence within 'macro'research: Why meta-analysis should be preferred over vote counting. *Journal of Management Studies, 48*(1), 178–197.

Cobo, M. J., López-Herrera, A. G., Herrera-Viedma, E., & Herrera, F. (2011). An approach for detecting, quantifying, and visualizing the evolution of a research field: A practical application to the Fuzzy Sets Theory field. *Journal of Informetrics, 5*(1), 146–166.

Crane, D. (1969). Social structure in a group of scientists: A test of the "invisible college". *American Sociological Review, 34*(3), 335–352.

Dezső, C. L., & Ross, D. G. (2012). Does female representation in top management improve firm performance? A panel data investigation. *Strategic Management Journal, 33*(9), 1072–1089.

Ding, Y., Yan, E., Frazho, A., & Caverlee, J. (2009). PageRank for ranking authors in co-citation networks. *Journal of the American Society for Information Science, 60*(11), 2229–2243.

Donthu, N., Gremler, D. D., Kumar, S., & Pattnaik, D. (2020a). Mapping of Journal of Service Research themes: A 22-year review. *Journal of Service Research.* Available at doi: 10.1177/1094670520977670032 (in press).

Donthu, N., Kumar, S., & Pattnaik, D. (2020b). Forty-five years of Journal of Business Research: A bibliometric analysis. *Journal of Business Research, 109*(1), 1–14.

Donthu, N., Kumar, S., & Pandey, N. (2020c). A retrospective evaluation of Marketing Intelligence and Planning: 1983–2019. Marketing Intelligence and Planning. Available at doi: https://doi.org/10.1108/MIP-02-2020-0066 (in press).

Donthu, N., Kumar, S., Pandey, N., & Gupta, P. (2021). Forty years of the International Journal of Information Management: A bibliometric analysis. *International Journal of Information Management, 57*, Article 102307.

Donthu, N., Kumar, S., Pandey, N., & Lim, W. M. (2021a). Research constituents, intellectual structure, and collaboration patterns in Journal of International Marketing: An analytical retrospective. *Journal of International Marketing.* Available at doi: 10.1177/1069031X211004234 (in press).

Donthu, N., Kumar, S., Pandey, N., & Soni, G. (2020d). A retrospective overview of Asia Pacific Journal of Marketing and Logistics using a bibliometric analysis. *Asia Pacific Journal of Marketing and Logistics.* Available at doi: 10.1108/APJML-04-2020-0216 (in press).

Donthu, N., Kumar, S., Pattnaik, D., & Lim, W. M. (2021). A bibliometric retrospection of marketing from the lens of psychology: Insights from Psychology & Marketing. *Psychology & Marketing, 38*(5), 834–865. https://doi.org/10.1002/mar.21472.

Donthu, N., Reinartz, W., Kumar, S., & Pattnaik, D. (2020e). A retrospective review of the first 35 years of the International Journal of Research in Marketing. *International Journal of Research in Marketing.* Available at doi: 10.1016/j.ijresmar.2020.10.006 (in press).

Durisin, B., & Puzone, F. (2009). Maturation of corporate governance research, 1993–2007: An assessment. *Corporate Governance: An International Review, 17*(3), 266–291.

Ellegaard, O., & Wallin, J. A. (2015). The bibliometric analysis of scholarly production: How great is the impact? *Scientometrics, 105*(3), 1809–1831.

Emich, K. J., Kumar, S., Lu, L., Norder, K., & Pandey, N. (2020). Mapping 50 years of Small Group Research through small group research. *Small Group Research, 51*(6), 659–699.

Fahimnia, B., Sarkis, J., & Davarzani, H. (2015). Green supply chain management: A review and bibliometric analysis. *International Journal of Production Economics, 162*, 101–114.

Gaur, A., & Kumar, M. (2018). A systematic approach to conducting review studies: An assessment of content analysis in 25 years of IB research. *Journal of World Business, 53*(2), 280–289.

Hjørland, B. (2013). Facet analysis: The logical approach to knowledge organization. *Information Processing and Management, 49*(2), 545–557.

Hu, C., Song, M., & Guo, F. (2019). Intellectual structure of market orientation: A citation/co-citation analysis. *Marketing Intelligence and Planning, 37*(6), 598–616.

Junni, P., Sarala, R. M., Taras, V. A. S., & Tarba, S. Y. (2013). Organizational ambidexterity and performance: A meta-analysis. *Academy of Management Perspectives, 27*(4), 299–312.

Kessler, M. M. (1963). Bibliographic coupling between scientific articles. *American Documentation, 14*(1), 123–131.

Khan, M. A., Pattnaik, D., Ashraf, R., Ali, I., Kumar, S., & Donthu, N. (2021). Value of special issues in the Journal of Business Research: A bibliometric analysis. *Journal of Business Research, 125*, 295–313.

Kumar, S., Lim, W. M., Pandey, N., & Westland, J. C. (2021). 20 years of Electronic Commerce Research. *Electronic Commerce Research., 21*(1), 1–40.

Kumar, S., Surekha, R., Lim, W. M., Mangla, S. K., & Goyal, N. (2021). What do we know about business strategy and environmental research? Insights from Business Strategy and the Environment. Business Strategy and the Environment. Available at doi: https://doi.org/10.1002/bse.2813 (in press).

Lahiri, S., Mukherjee, D., & Peng, M. W. (2020). Behind the internationalization of family SMEs: A strategy tripod synthesis. *Global Strategy Journal, 10*(4), 813–838.

Lim, W. M., Yap, S. F., & Makkar, M. (2021). Home sharing in marketing and tourism at a tipping point: What do we know, how do we know, and where should we be heading? *Journal of Business Research, 122*, 534–566.

Linnenluecke, M. K., Chen, X., Ling, X., Smith, T., & Zhu, Y. (2017). Research in finance: A review of influential publications and a research agenda. *Pacific Basin Finance Journal, 43*(April), 188–199.

Liu, Ying, Mai, F., & MacDonald, C. (2019). A big-data approach to understanding the thematic landscape of the field of business ethics, 1982–2016. *Journal of Business Ethics, 160*(1), 127–150.

Liu, Z., Yin, Y., Liu, W., & Dunford, M. (2015). Visualizing the intellectual structure and evolution of innovation systems research: A bibliometric analysis. *Scientometrics, 103*(1), 135–158.

Makarius, E. E., Mukherjee, D., Fox, J. D., & Fox, A. K. (2020). Rising with the machines: A sociotechnical framework for bringing artificial intelligence into the organization. *Journal of Business Research, 120*, 262–273.

Mustak, M., Salminen, J., Plé, L., & Wirtz, J. (2021). Artificial intelligence in marketing: Topic modeling, scientometric analysis, and research agenda. *Journal of Business Research, 124*, 389–404.

MacCoun, R. J. (1998). Biases in the interpretation and use of research results. *Annual Review of Psychology, 49*(1), 259–287.

Palmatier, R. W., Houston, M. B., & Hulland, J. (2018). Review articles: Purpose, process, and structure. *Journal of the Academy of Marketing Science, 46*, 1–5.

Pieters, R., & Baumgartner, H. (2002). Who talks to whom? Intra-and interdisciplinary communication of economics journals. *Journal of Economic Literature, 40*(2), 483–509.

Podsakoff, P. M., Mackenzie, S. B., Bachrach, D. G., & Podsakoff, N. P. (2005). The influence of management journals in the 1980s and 1990s. *Strategic Management Journal, 26*(5), 473–488.

Pritchard, A. (1969). Statistical bibliography or bibliometrics? *Journal of Documentation, 25*(4), 348–349.

Ramos-Rodrígue, A. R., & Ruíz-Navarro, J. (2004). Changes in the intellectual structure of strategic management research: A bibliometric study of the Strategic Management Journal, 1980–2000. *Strategic Management Journal, 25*(10), 981–1004.

Rossetto, D. E., Bernardes, R. C., Borini, F. M., & Gattaz, C. C. (2018). Structure and evolution of innovation research in the last 60 years: Review and future trends in the field of business through the citations and co-citations analysis. *Scientometrics, 115*(3), 1329–1363.

Samiee, S., & Chabowski, B. R. (2012). Knowledge structure in international marketing: A multi-method bibliometric analysis. *Journal of the Academy of Marketing Science, 40*(2), 364–386.

Snyder, H. (2019). Literature review as a research methodology: An overview and guidelines. *Journal of Business Research, 104*(July), 333–339.

Stremersch, S., Verniers, I., & Verhoef, P. C. (2007). The quest for citations: Drivers of article impact. *Journal of Marketing, 71*(3), 171–193.

Tahamtan, I., Safipour Afshar, A., & Ahamdzadeh, K. (2016). Factors affecting number of citations: A comprehensive review of the literature. *Scientometrics, 107*(3), 1195–1225.

Tranfield, D., Denyer, D., & Smart, P. (2003). Towards a methodology for developing evidence-informed management knowledge by means of systematic review. *British Journal of Management, 14*(3), 207–222.

Tunger, D., & Eulerich, M. (2018). Bibliometric analysis of corporate governance research in German-speaking countries: Applying bibliometrics to business research using a custom-made database. *Scientometrics, 117*(3), 2041–2059.

van Eck, N. J., & Waltman, L. (2010). Software survey: VOSviewer, a computer program for bibliometric mapping. *Scientometrics, 84*(2), 523–538.

Verma, S., & Gustafsson, A. (2020). Investigating the emerging COVID-19 research trends in the field of business and management: A bibliometric analysis approach. *Journal of Business Research, 118*, 253–261.

Wallin, J. A. (2005). Bibliometric methods: Pitfalls and possibilities. *Basic and Clinical Pharmacology and Toxicology, 97*(5), 261–275.

Weinberg, B. H. (1974). Bibliographic coupling: A review. *Information Storage and Retrieval, 10*(5–6), 189–196.

Xu, X., Chen, X., Jia, F., Brown, S., Gong, Y., & Xu, Y. (2018). Supply chain finance: A systematic literature review and bibliometric analysis. *International Journal of Production Economics, 204*, 160–173.

Zupic, I., & Čater, T. (2015). Bibliometric methods in management and organization. *Organizational Research Methods, 18*(3), 429–472.