




Revealing the structure of combinative research design and performance in an operations management context

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Abstract

This study defines the conceptual structure of combinative research design in operations management by relying on several proxies of combinative research topics, methods, and author affiliations, covering a decade of research and analyzing 1026 bibliographic records in an applied social science research context. Through the use of bibliometrics, co-word analyses are conducted to compute keyword co-occurrences to determine distinct interdisciplinary structures. Furthermore, this study conducts a series of regression analyses to determine the associations between combinative research (based on combinative topics, methods and author affiliations) and several proxies of article performance, including usage metrics (citations and views) and effort and time expenditures (the number of days under review and the number of revisions), while controlling for article age and the journal outlet. The results indicate strong associations with multi-country author affiliations with reduced effort and time expenditures as well as increased usage and scholarly attention. Future research directions are provided that integrate with replication studies, meta-analyses, and literature reviews.

Keywords Bibliometrics · Interdisciplinary · Usage metrics · Effort · Combinative research

JEL Classification M19

1 Introduction

The scope of “combinative research,” which originally focused on multiple methods, has since broadened, reflecting the importance of building stronger bridges and finding creative solutions to create opportunities for greater knowledge generation (Roth and Rosenzweig 2020). However, despite the benefits of combinative research, social science scholars sometimes hesitate to pursue it, given that incentive structures are tied to specialization in one’s field and area of expertise. In this

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context, social scientists need to understand the impact of opting for different avenues of combinative research—despite structures that incentivize alternative actions.

In this paper, combinative research is characterized as bridging different research areas represented by scholars from multiple backgrounds. This terminology can be delineated in multiple ways. To this end, we have identified three combinative proxies (defined as ways of representing combinative research): combinative topics, methods, and affiliations. Combinative topics refers to the use of multiple topics in a study. Similar to interdisciplinary research that integrates two or more academic disciplines, this approach is not constrained to using two or more academic disciplines but can integrate several topics within an academic discipline. Combinative methods involve the use of two or more methods in one study. In addition, combinative affiliations, in this study, refers to the inclusion of two or more authors from different geographical regions. The role of combinative research, its impact on usage metrics, the amount of time required for the peer review process, and the number of revisions depend on the nuances of the various fields. However, from business and economics to medicine and engineering, editors and researchers call for multi-method, interdisciplinary research that is global in scope.

In light of the above, assessing the impact of combinative research capabilities on article performance while controlling for other factors requires further refinement, even in interdisciplinary fields. As a source of knowledge generation, combinative research accelerates learning by integrating a variety of approaches. Recent calls for research indicate a constraining force associated with normal science. This involves predetermined problem choices and methods, as well as the exclusive maintenance of communication silos within one's discipline (Roth and Rosenzweig 2020). Moreover, institutional barriers, including the entrenched nature of disciplinary specialization within academia, pose a significant challenge to the advancement of combinative research. This tendency to remain limited within one's field manifests in academic reward systems. Doctoral programs often prioritize quick completion and early publication, which does not incentivize multi-disciplinary efforts from the beginning of researchers' career journeys.

Additionally, differences in disciplinary traditions and geographical distance can exacerbate problems associated with understanding and synthesizing results (Siedlok and Hibbert 2014). Empirical evidence has shown that in the sciences, combinative research (despite playing a pivotal role in modern science) appears to have a lower chance of being funded. Therefore, it is disadvantaged, with review boards finding it challenging to review proposals of this nature, as many panels are predominantly composed of disciplinary majorities (Seeber et al. 2022).

The inability to understand the nuances of how combinative research equates to article performance may disincentivize scholars from pursuing such research directions, which may also have a negative reciprocal impact on broadening scholarly perspectives. To address this situation, this study examined the conceptual structure of combinative research in an operations management (OM) context. Specifically, we focused our efforts on an interdisciplinary field—OM and its integration with information systems (IS), knowledge management (KM), and supply chain management (SCM). This allowed us to examine a definitive context while maintaining an interdisciplinary focus on combinative research in divergent fields. The conceptual

structure was envisioned through the spatial representation of author keywords, research methods, and author affiliations, as well as author representation.

Co-word analyses use bibliometrics to compute keyword co-occurrences in a corpus (Castriotta et al. 2021). The use of keywords in co-word analysis allows researchers to investigate the relationships among key terms and the evolution of these relationships over time. We utilized a dataset of OM/IS/KM/SCM studies to examine the ways in which different forms of combinative research occur and the impact on article performance based on usage metrics, the number of days under review, and the number of revisions. We addressed the following two research questions by leveraging the aforementioned approach:

Research question 1. What are the patterns that exist within combinative research?

This question aims to delineate the prevalent paradigms in combinative research, focusing on thematic convergence, geographically diverse authorship, and methodological approaches. The study employed co-word analysis as a methodological framework to facilitate the examination of conceptual interconnections within the literature, thus elucidating the frequency and nature of thematic coalescence and unveiling common thematic groupings, less frequented topic clusters, and unexplored synergistic potential. This exploration aimed to broaden the existing understanding of diverse research combinations by enabling the identification of novel and emergent interdisciplinary synergies. In addition, an analysis of relevant research methodologies and their centrality within the literature revealed prevalent approaches while highlighting opportunities for innovation by employing underutilized techniques. While the significance of cross-border collaborations has been widely recognized, there is a critical need for a deeper understanding of the actual dynamics and centralities of existing and potential cross-national partnerships. By illuminating these factors, the study aspired to enhance the scope of combinative research by integrating more diversely represented topics, methods, and nations.

Research question 2. What is the impact of combinative research on combinative capabilities (in terms of academic article performance)?

This research question aims to evaluate the influence of combinative research, characterized by a wide array of topics, varied methods, and diverse author affiliations, on the performance metrics of academic articles. Combinative research presents an opportunity to enrich academic discourse by integrating diverse perspectives across topics, cultures, and methods. However, it also poses challenges for researchers, necessitating a comprehensive understanding and substantial time investment. This study aimed to ascertain the connection between combinative research practices and performance. This assessment was crucial for gauging scholarly investment and understanding how related approaches affect the visibility and influence of scholarly work.

Thus, this study makes several contributions to practice and research. Specifically, we utilized a systematic review to facilitate the systematic identification and broad

conceptualization (see Block and Brändle 2022) of the ways in which combinative topics can be leveraged to enhance interdisciplinary thinking processes. Second, this study provided co-occurring keywords and examined how these keywords cluster to determine the distinctiveness and relatedness of dimensions in the combinative literature. This approach generated ideas about trending combinative research and less explored areas that can be promoted to managers and researchers. This research also provided a breakdown of how different types of combinative capabilities (based on topics, methods, and author affiliations) are associated with research performance dimensions (i.e., article views, citation counts, the number of days under review, and the number of revisions) while also controlling for the time since publication and the journal outlet.

The remainder of this paper is organized as follows. First, a literature review outlining current research and gaps is provided. Subsequently, basic analyses, including word clouds, trend analysis, keyword frequencies and growth, co-word analyses, and generalized additive model regression, are conducted and the results discussed. Finally, the discussion and conclusion sections highlight several contributions and further research avenues related to replication studies, meta-analyses, and systematic literature reviews.

2 Prior literature on combinative research and capabilities

In this work, we defined combinative research as integrating differing topics and varied perspectives from varied backgrounds in terms of demographics and expertise. There are various methods for analyzing the evolution of topics and determining combinative capabilities in research. These methods can be divided into three categories—citation-based, text-based, and hybrid—as indicated by Jebari et al. (2021), who briefly summarized these methods and provided several examples. Specifically, various bibliometric traits can be utilized as citation-based methods to identify research trends. Some examples of these traits include the annual growth in the number of publications (Small et al. 2014), the relationships of publications with their direct citation relations (Shibata et al. 2009) and co-citation relationships (Upham and Small 2010).

Previous research has elucidated the many ways in which combinative research designs and perspectives can enhance performance. From a practical business-specific standpoint, Meredith and Pilkington (2018) emphasized the significance of knowledge exchange between different functional areas of OM, highlighting how collaboration can enhance innovative solutions and operational efficiency. Holweg and Singh Srari (2013) reaffirmed this significance by specifying that all business challenges are multidimensional and are, in some cases, best addressed by combining multiple lenses when solving problems. This is partly due to the combination of diverse skills, perspectives, and experiences that are key to solving complex problems and fostering innovation in process improvement strategies through design thinking and Lean Six Sigma, which requires varied stakeholder inputs. The field has benefited from the global expansion of research collaboration by incorporating

diverse international perspectives, leading to comprehensive and universally applicable operational strategies (Fry et al. 2015).

Lungeanu et al. (2014) utilized a dataset of 1103 National Science Foundation grant proposals, specifically assessing how individual characteristics and relational dynamics influence team assembly by examining recent examples of research studies identifying varied perspectives of combinative design on article performance. Subsequently, they identified key patterns in collaboration probability linked to factors such as academic tenure, institutional tier, and prior co-authorship, revealing that successful proposals often highlight distinct relational patterns compared to unsuccessful ones, providing insights into the dynamics of effective combinative collaboration. This study extends the insights of Lungeanu et al. (2014) by focusing on the mechanisms of team assembly within a research team's geographical dispersion, both in general and on article publication performance versus grants in particular.

Another, more focused example is the research conducted by Yegros-Yegros et al. (2015), which examined the impact of proximal and distal interdisciplinarity on citation impact. The researchers used bibliometric methods to analyze the effects of combinative research on the citation impact of individual publications across various fields. While their research presented a nuanced view of how distinct aspects of interdisciplinarity affect citation, emphasizing that disparate interdisciplinary approaches might not always yield higher citation rates, the study provided a broad perspective of combinative processes of interdisciplinary team formation, topic discussion, as well as methodological dispersions not only on citation counts but also other forms of performance.

Additionally, Moya-Anegon et al. (2018) presented a statistical analysis of the relationship between corresponding authorship, international co-authorship, and the citation impact of national research systems. The study used indicators at the country level, specifically exploring how these factors interact and influence each other, thereby uncovering complex relationships between authorship and citation-based indicators. While providing insights into authorship and citation has impacts at the macro scale, our study focused on a micro-level perspective specifically oriented toward team-formation processes and their implications for research success, focusing on citation impact, time under review, and number of revisions.

From a method standpoint, Vivek and Nanthagopan (2021) explored multi-method and mixed method approaches in research studies, emphasizing how integrating quantitative and qualitative data can significantly improve the accuracy and quality of research analysis and conclusions. Our research adds to the findings of the former study by investigating the robustness of methodological design and diversity in research approaches and by offering a detailed analysis of how these impact article performance from the three focal perspectives (time under review, citations and views, and the number of revisions).

In tandem with the rapid growth in research publications produced each year representing the collaboration of a variety of disciplines (Jebari et al. 2021), there is an ever-growing population of research topics, while certain topics have become obsolete. The increase in the volume of literature has been estimated at 8–9% annually (Jebari et al. 2021). In this context, it has become more important for researchers, funding bodies, institutes, and decision-makers to recognize the evolution and

proliferation of combinative research capabilities. While various research papers have provided insights into biomedical informatics (Kim et al. 2011), information retrieval (Chen et al. 2017), agriculture (Sagar et al. 2013), and transportation (Sun and Yin 2017), our analyses not only included usage in terms of citation counts, but also effort in terms of the average number of revisions and number of days under review. This approach helped assess how combinative research impacts research efforts from the review process standpoint. Additionally, we controlled for the factors of time from acceptance to data collection and the journal outlet. For this, we used bibliometrics and text-mining applications.

3 Data

3.1 Identification of studies

This study conducted a large-scale bibliometric analysis of articles published between January 2010 and January 2020. We utilized this period as the reference point, as it provided a large amount of data to examine combinative research and its impact on article performance. Additionally, it delineated a recent period from which to gather data. The journal list of the Australian Business Dean's Council (ABDC) was utilized to assess the relevance of the journals. The ABDC journal list provides a more extensive list of U.S.-based and international journals. Furthermore, we used the ABDC journal list, as it includes interdisciplinary journals. Specifically, we did not want to eliminate interdisciplinary journals, which would have narrowed the combinative research perspective, limiting the validity of the results.

We sought to engage with empirical papers in OM to develop a search string. In our search, the focus on one field aimed to reduce sampling bias to the best extent possible. First, our search yielded more results by utilizing OM and production keywords. The addition of IS/KM and SCM keywords would lead to the retrieval of overlapping data points. These overlaps can occur because related topics or research questions are often explored in different contexts across separate journals. For instance, a topic such as “inventory management” can be studied under OM and SCM, leading to redundant information and the challenge of distinguishing between differing fields. The addition of these data points would also yield reporting bias, which occurs when the same findings can be counted more than once by focusing on OM and including IS/KM and SCM. This required us to control for common field-related practices in combinative research. Moreover, it allowed us to understand paradigm changes in the combinative field. Our final search string was as follows: (“control variable” OR “controls”) AND (“operations management” OR “production”); “control variable” AND (“operations management” OR “production”).

3.2 Variables

To engage with empirical papers, we used control variables within the search string to include empirical methods and procedures. The search string was developed by

three researchers, one subject library, and a Ph.D. student. The initial search yielded approximately 174,000 articles. Approximately 39,900 articles remained after the exclusion criterion was applied based on the period. Utilizing the ABDC journal list and exclusion criterion yielded approximately 22 journals. These journals were then further narrowed down based on a review of their “aims and scope” to ensure a focus on empirical research. Journals were included based on reputable publishers, including Wiley–Blackwell, the American Psychological Association, the Emerald Group, Taylor and Francis, Elsevier, and INFORMS. Non-peer-reviewed articles were removed (including author biographies and special issue introductions). In summary, a total of 1026 articles were identified and used. Table 1 presents the data collected for each article.

The main approaches used in this study were based on the abovementioned control variables and organized according to the keywords of each article. Co-word analyses and word clouds based on keywords were provided holistically. Additionally, regression analyses were conducted to determine how combinative research (including combinative topics, author affiliations, and methods) influenced article performance. The latter, in turn, was assessed through usage metrics (i.e., article views and citations), the number of days under review, and the number of revisions. Figure 1 presents a flowchart of the methodology employed in this study.

Preprocessing was used to prepare the data for analysis. An author and a Ph.D. student manually corrected the misspelled keywords. To ensure consistency, British English spelling (e.g., *organisation*) was replaced by American English spelling (e.g., *organization*). Additionally, the preprocessing steps provided by Amiri et al.

Table 1 Variables and descriptions in the data sets

| Variable | Description |
|-----------------------------|---|
| Journal | Title of the journal in which the academic article was published |
| Title | Title of the academic article |
| Keyword | Keywords provided by the author(s) |
| Method | Method employed |
| Control | Control variables utilized |
| Dependent_variable | Dependent variable that the study assessed |
| Research_question | Research question(s) being addressed |
| Article_views | Number of views/reads that an article has from the time of publication to the time of data collection |
| Citations | Number of citations that an article has from the time of publication to the time of data collection |
| Received | Date the article was received ^a |
| Accepted | Date the article was accepted ^a |
| Number_of_days_under_review | Number of days the article was under review, calculated as Accepted–Received |
| Number_of_authors | Total number of authors of the academic article |
| Author_country | Country affiliations of the author(s) |
| Context | Sampling frame |

^aIf only the month and the year were provided, the date was recorded as the first day of the month

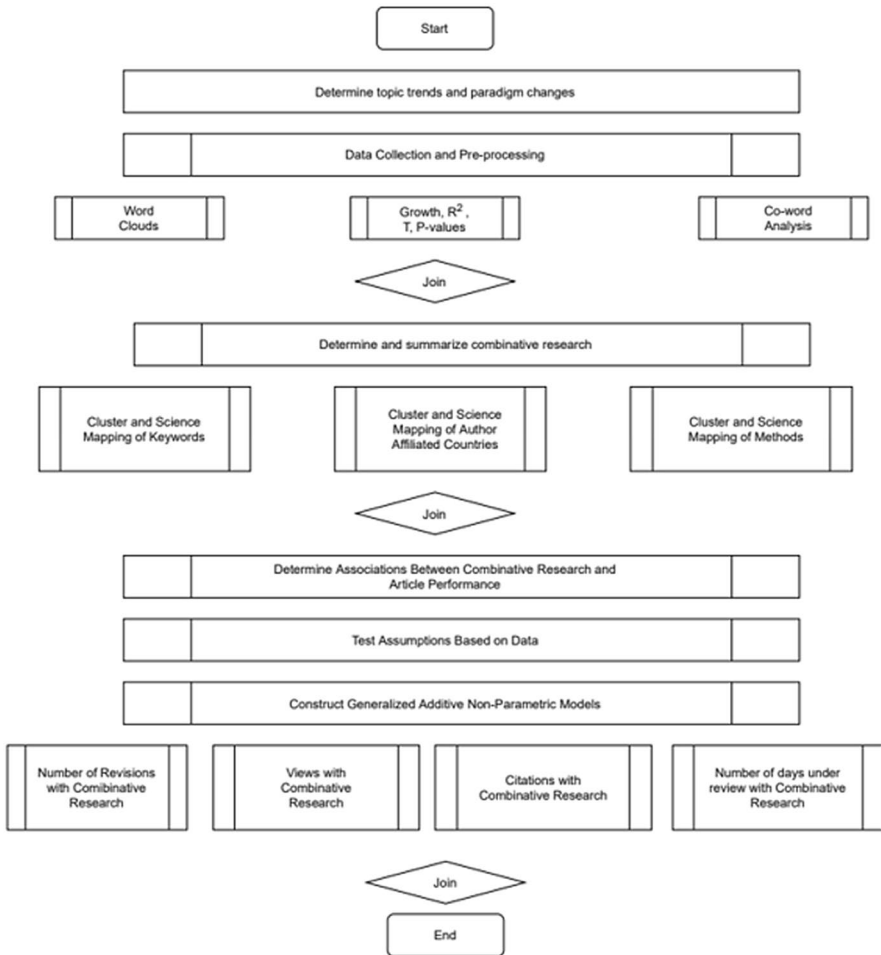


Fig. 1 Methodology flowchart

(2021) were followed. These steps included (1) correcting any misspelled keywords, (2) unifying variant formats of the same keyword, such as by adjusting acronyms (e.g., “OR” for “Operations Research” and “NPD” for “New Product Development”), and (3) grouping keywords with the same meaning to trace the development of different approaches (e.g., “TBL,” “Triple Bottom Line,” and “Sustainability”).

4 Results

4.1 Co-word analysis

Co-word analysis is a bibliometric approach that aids in interpreting the conceptual structure of scientific knowledge. This conceptual structure represents how elements

are related to one another as concepts and the relationships and roles of questions (Small 1999). Co-word analysis draws on various assumptions that keywords constitute an adequate description of the content of an article (Callon et al. 1983). A thematic connection is derived when two words co-occur within the same paper. A research theme is formed when there are many co-occurrences (Ding et al. 2001). Historically, the multidisciplinary approach of co-word analysis has been adopted in the realms of strategy, management, and innovation (Castriotta et al. 2021). In addition to detecting research topics, it can be used to extend the reflection of key concepts, determine the definitions of a research area, or offer an enhanced description and understanding of the conceptual differences between similar constructs (Castriotta et al. 2021). As our research sought to investigate what patterns exist within combinative research, not only from the perspective of topics but also from the standpoint of methods and international partnerships, we leveraged co-word analyses to analyze prevalent and burgeoning thematic relationships.

VOSviewer software provides a unified approach to mapping and clustering bibliometric networks. It computes the distance between nodes based on the degree of similarity and also performs a weighted variant of the Louvain method, which partitions keywords into clusters (Castriotta et al. 2021). This software can identify similarities among subgroups in an area and attempt to find a structure in proximity measurements by producing a map (Castriotta et al. 2021). Similar to the study conducted by Castriotta et al. (2021), we utilized the default parameters. Additionally, we corroborated the network results and strengthened the robustness of the cluster analysis by using ad hoc software developed with Python through a pathfinder algorithm. This, in turn, reduced the co-occurrence matrix to provide the most important links in a network.

4.2 Cluster analysis

Cluster analysis can identify patterns in combinative research by grouping similar data points or research findings based on shared characteristics. This helps discover underlying structures or themes within diverse research outcomes, revealing how different factors might lead to distinct patterns or trends (Aggarwal and Reddy 2014). Thus, we leveraged cluster analyses to address Research question 1, specifically exploring relationships and patterns within combinative research that may not be immediately apparent.

Clusters were determined through an iterative process using VOS viewer and performing a weighted and parameterized variant of the Louvain method. At the outset, the relatedness of publications was determined through direct citation relations, which are characterized by accuracy and the ability to reduce computational problems across work relations, bibliographic coupling relations, and co-citation relation techniques (Van Eck and Waltman 2017). Subsequently, the clustering technique assigned publication to clusters by maximizing a quality function based on a variant of the modularity function (Newman and Girvan 2004); however, it was adjusted to minimize the resolution limit problem. The clustering technique utilized a smart

local moving algorithm previously introduced by Waltman and van Eck (2013) to maximize the quality function. Our cluster analysis identified four clusters labeled using the embodied key terms. The clusters vary based on the terms and the topics addressed. Cluster 1 includes five keywords; Clusters 2 and 3 include three; and Cluster 4 includes two (see Table 2).

Cluster 1 concerned innovation, supplier relationship management/procurement, and knowledge. The keywords included “performance” and “outsourcing,” “new product development,” “KM,” and “buyer–supplier relationships.” Cluster 2 concerned behavioral and performance dimensions, including operational performance, supply chain integration, and behavioral operations. Cluster 3 was the broadest, incorporating the themes of supply chain and quality management. Finally, Cluster 4 focuses on issues of sustainability and project management.

Figure 2 provides a visual representation of the clusters and science mapping as well as the network results with regard to their cluster affiliation. A keyword’s centrality represents its interest in the surrounding clusters. Alternatively, the distance between terms or groups represents differentiation or dissociation. One interpretation of the distance is how researchers overlook or neglect these links. Figure 4 delineates the various centralities of each keyword and the connections overlooked by research.

As expected, “supply chain management” and “performance” had the highest degrees of centrality. “Behavioral operations” was the most distant, even though it is a growing area of research in OM. “Green supply chain management,” “project management,” “new product development,” “knowledge management,” “buyer–supplier relationships,” and “quality management” continued to remain on the periphery, closely followed by “supply chain integration” and “operational performance.” Most notably, keywords that occurred more frequently (e.g., “supply chain management” and “performance”) tended toward greater centrality, whereas keywords that occurred less frequently (e.g., “behavioral operations” and “buyer–supplier

Table 2 Cluster terms and statistics

| Cluster | Term | Frequency |
|---------|-------------------------------|-----------|
| One | Performance | 18 |
| | Outsourcing | 18 |
| | New product development | 16 |
| | Knowledge management | 12 |
| | Buyer–supplier relationships | 9 |
| Two | Operational performance | 19 |
| | Supply chain integration | 13 |
| | Behavioral operations | 10 |
| Three | Supply chain management | 49 |
| | Quality management | 15 |
| | Survey | 8 |
| Four | Project management | 17 |
| | Green supply chain management | 13 |

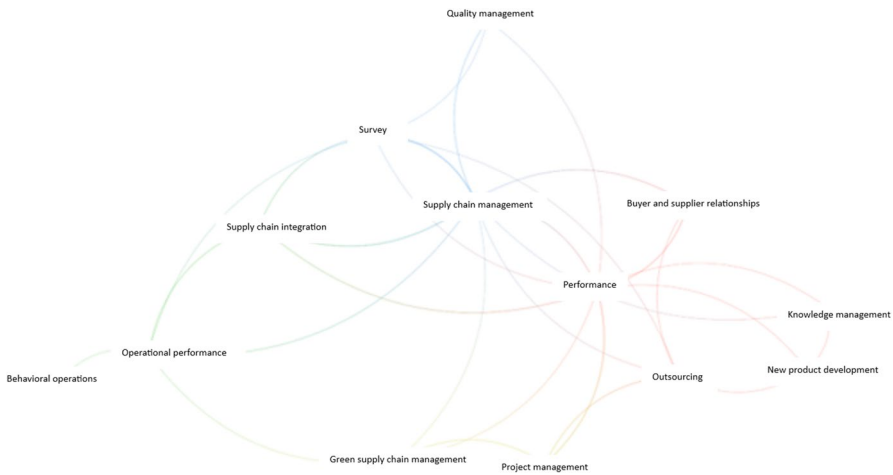


Fig. 2 Clustering results of co-occurred keywords

relationships”) tended toward reduced centrality. The keywords represented growing areas in OM, indicating various levels of potential for combinative research in behavioral operations, green SCM, project management, outsourcing, new product development, and KM.

Figure 3 represents combinative capabilities based on keywords and topics. However, other facets of combinative research, such as multi-country author-affiliated articles, can also be considered. Furthermore, Fig. 3 presents the centrality and links between author-affiliated countries—with a country’s minimum number of documents set at five; 16 of the 40 countries are presented in the figure. According to the results presented here, the US holds the highest degree of centrality, as it is linked with all the countries presented in the model (Denmark, France, Germany, Hong Kong, Turkey, China, Spain, the UK, Italy, the Netherlands, Switzerland, Brazil, Ireland, Chile, Sweden, Australia, Taiwan, South Korea, Canada, and Finland). The US is followed by the UK, which is linked to all the countries except Finland. Spain ranks third, with links to every country except Turkey, Taiwan, and Finland. The least centralized countries include Finland (with connections to Canada and the US) and Denmark (with connections to the US, the UK, and Spain). However, these findings are likely to be highly associated with population. One important finding is the disassociation of China, which has the same number of links as Sweden and Switzerland (11).

Finally, we identified multi-method research as combinative research. As shown in Fig. 4, surveys and secondary data analysis are the most frequent and centralized methods employed. Qualitative data analysis was found to be loosely linked to both methods and indirectly associated with theory development. The most commonly linked combinative research areas for OM are secondary data analysis, behavioral research, and field experiments.

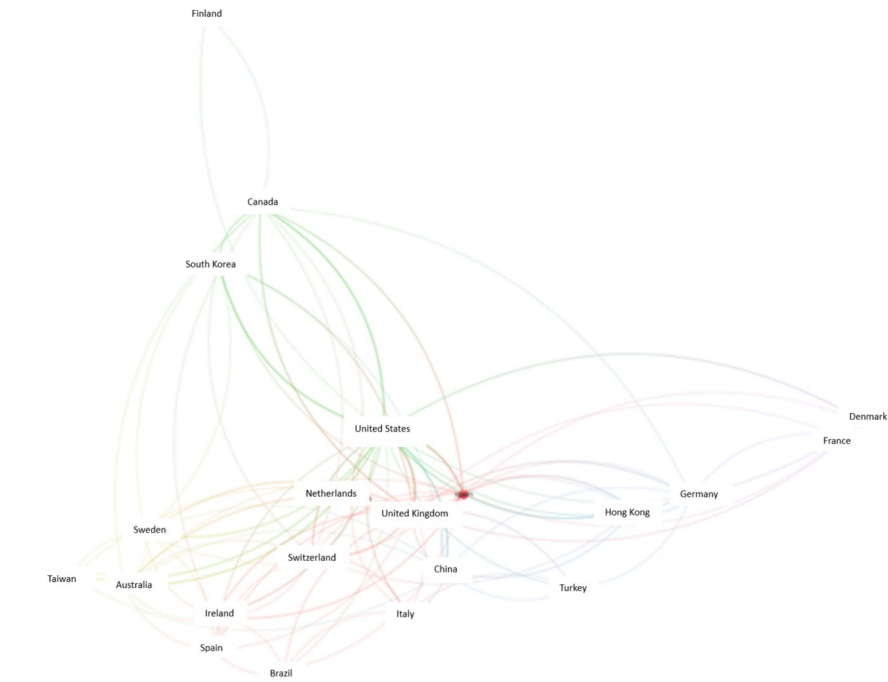


Fig. 3 Centrality of author-affiliated countries

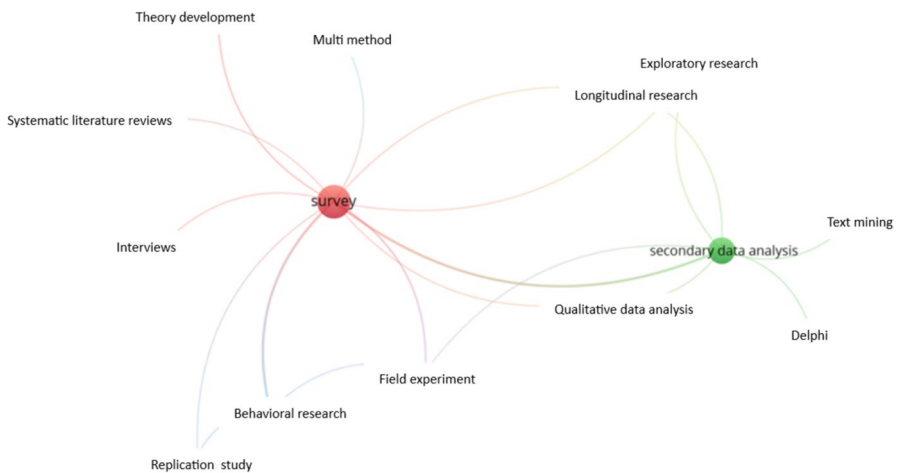


Fig. 4 Centrality of research methods

4.3 Relationships presented between performance and combinative research

This study also addresses Research question 2: *What is the impact of combinative research on combinative capabilities (in terms of academic article performance)?*

To address this question, regression analysis allowed us to quantify the relationship between combinative research efforts and the impact on article outcomes. This allowed us to estimate the strength and direction of this relationship through coefficient analysis, and control for other variables.

Several assumptions were examined to determine the appropriate regression analysis for use. First, the assumption of multivariate normality was determined through an overview of each variable's skewness and kurtosis values and a Q-Q plot. Two variables did not meet the assumption of normality—article views (skewness: 2.57; kurtosis: 9.36) and citations (skewness: 4.31; kurtosis: 28.38). The Shapiro–Wilk and Kolmogorov–Smirnov tests were statistically significant ($p < 0.01$ level). Based on these results, a nonparametric analysis was deemed appropriate. Given the distribution of the response variables, a generalized additive nonparametric regression model was utilized.

4.3.1 Variables

Analyses were conducted at the article level. Therefore, several performance and usage proxies were used. Specifically, this study assessed the number of article revisions $a(Y_{1a})$, the number of article views between the date on which article a was published and February 2020 (Y_{2a}), the total number of citations of article a through February 2020 (Y_{3a}), and the number of days article a was under review (Y_{4a}). These values are represented as $\in \{0 \leq n\}$, where n is the total number of revisions (Y_{1a}), the total number of article views (Y_{2a}), the total number of citations (Y_{3a}), and the total number of days under review (Y_{4a}) for article a .

Three combinative research proxies were utilized. Specifically, this study assessed combinative topics (x_{1a}), that is, the sum of the keywords (i.e., Cluster 1—“performance,” “outsourcing,” “new product development,” “KM,” and “buyer–supplier relationships”; Cluster 2—“operational performance,” “supply chain integration,” and “behavioral operations”; Cluster 3—“SCM,” “quality management,” and “survey”; and Cluster 4—“project management” and “green SCM”) for each article a ; combinative methods (x_{2a}), that is, the sum of the number of methods employed in article a ; and combinative affiliations (x_{3a}), that is, the sum of the number of author affiliations by country in article a .

Finally, based on theory and previous research (e.g., Tahamtan et al. 2016), the following two variables were controlled for the journal in which article a was published (C_{1aj}) and the age of article a (C_{2aj}), that is, the number of years from article publication to February 2020. Previous research has identified that age can play a key role in citations, as citations per year tend to rise quickly within the first few years. While older papers may have more citations, it has also been shown that the discovery of an article can diminish over time (Ayres and Vars 2000; Lynn 2014). We included these two control variables in each regression analysis for these reasons. In total, 11 dummy variables were used for C_{1aj} , which has been represented as follows:

$\in \{0, 1\}$ for every article a published in journal j .

Where $\{1, \text{when } a \text{ is published in } j, 0, \text{when } a \text{ is not published in } j$.

where a is the article, and j is the journal publication.

Time $(\mathbb{C}_{2aj}) \in \{0 \leq n\}$, where n is the total number of years between article a publication and February 2020. The definitions, symbols, and descriptions have been provided in Table 5.

4.3.2 Regression

With γ as the response variable and X_1, \dots, X_p as a set of predictor variables, $\beta_0, \beta_1, \dots, \beta_p$ are obtained. The additive model generalizes a linear model by modeling the expected value of Y as follows:

$$E(Y) = f(X_1, \dots, X_p) = s_0 + s_1(X_1) + \dots + s_p(X_p)$$

where $s_i(X), i = 1, \dots, p$ are smoothing functions that are not given a parametric form and are estimated nonparametrically. This model extends linear regression by allowing a link between $f(X_1, \dots, X_p)$ and the expected value of Y , which allows for an alternative distribution for the underlying random variation without relying on the normal distribution. Hence, we utilized this model in our analyses.

Four different regression models were assessed. Model 1 has been defined as follows:

$$E(\gamma_{1a}) = s_0 + s_1(X_{1a}) + s_2(X_{2a}) + s_3(X_{3a}) + \gamma \mathbb{C}_{daj} + \varepsilon_{dj}$$

Model 2 has been defined as follows:

$$E(\gamma_{2a}) = s_0 + s_1(X_{1a}) + s_2(X_{2a}) + s_3(X_{3a}) + \gamma \mathbb{C}_{daj} + \varepsilon_{dj}$$

Model 3 has been defined as follows:

$$E(\gamma_{3a}) = s_0 + s_1(X_{1a}) + s_2(X_{2a}) + s_3(X_{3a}) + \gamma \mathbb{C}_{daj} + \varepsilon_{dj}$$

Finally, model 4 has been defined as follows:

$$E(\gamma_{4a}) = s_0 + s_1(X_{1a}) + s_2(X_{2a}) + s_3(X_{3a}) + \gamma \mathbb{C}_{daj} + \varepsilon_{dj}$$

Table 3 presents each model's estimates, standard errors, and p values. The standard errors and chi-square values are available upon request.

The generalized additive regression results yielded implications for further analysis. Combinative affiliations were found to be significant across all proxies of article performance. Specifically, combinative affiliations were significantly negatively associated with the number of revisions ($p=0.0061$) and the number of days under review ($p=0.0293$). Combinative affiliations were positively associated with the number of views ($p<0.0001$) and the number of citations ($p<0.0001$). No significant association was found between combinative topics and combinative methods,

Table 3 Results

| | Model 1-number of revisions (Y_{1d}) | | | Model 2-views (Y_{2d}) | | | Model 3-citations (Y_{3d}) | | | Model 4-days under review (Y_{4d}) | | | | | | |
|--------------------------|--|---------|----------|----------------------------|---------|----------|--------------------------------|---------|----------|--|----------|---------|----------|---------|----------|---------|
| | Estimate | p value | Estimate | Estimate | p value | Estimate | Estimate | p value | Estimate | p value | Estimate | p value | | | | |
| | Estimate | p value | Estimate | Estimate | p value | Estimate | Estimate | p value | Estimate | p value | Estimate | p value | | | | |
| Intercept | -0.2287 | 0.4603 | 0.2379 | 0.4629 | 3.3386 | <0.0001 | 3.3071 | <0.0001 | 1.7962 | <0.0001 | 1.6012 | <0.0001 | 327.8043 | <0.0001 | 379.9435 | <0.0001 |
| J1 (C_{1d}) | 1.5061 | <0.0001 | 1.3576 | <0.0001 | 0 | - | 0 | - | 1.1315 | <0.0001 | 1.2239 | <0.0001 | 209.4279 | 0.0041 | 240.4763 | 0.0016 |
| J2 (C_{1d}) | 3.2095 | <0.0001 | 3.3676 | <0.0001 | 1.1650 | <0.0001 | 0 | - | 1.6814 | <0.0001 | 1.6940 | <0.0001 | 56.5833 | 0.3951 | 95.7139 | 0.1676 |
| J3 (C_{1d}) | 0.6191 | 0.0476 | 0.4444 | 0.1447 | 2.1946 | <0.0001 | 2.2884 | <0.0001 | 2.2572 | <0.0001 | 2.4035 | <0.0001 | 20.5331 | 0.7297 | 22.4000 | 0.7142 |
| J4 (C_{1d}) | 0.2365 | 0.5905 | -0.0450 | 0.9233 | 3.2919 | <0.0001 | 3.3774 | <0.0001 | 1.3665 | <0.0001 | 1.5011 | <0.0001 | -18.8221 | 0.7706 | -32.0541 | 0.6337 |
| J5 (C_{1d}) | 1.2317 | 0.0002 | 1.0651 | 0.0010 | 2.7714 | <0.0001 | 2.8248 | <0.0001 | 2.3442 | <0.0001 | 2.3909 | <0.0001 | -64.5960 | 0.3546 | -80.9559 | 0.2700 |
| J6 (C_{1d}) | 1.2939 | <0.0001 | 1.0831 | 0.0005 | 2.4281 | <0.0001 | 2.3738 | <0.0001 | 2.2943 | <0.0001 | 2.3082 | <0.0001 | 82.0533 | 0.2023 | 87.3492 | 0.1862 |
| J7 (C_{1d}) | 0 | - | 0 | - | 2.8723 | <0.0001 | 2.9316 | <0.0001 | 2.5631 | <0.0001 | 2.6820 | <0.0001 | 318.2597 | 0.0008 | 316.9278 | 0.0011 |
| J8 (C_{1d}) | 0.4721 | 0.2847 | 0.2394 | 0.6066 | 2.6070 | <0.0001 | 2.6138 | <0.0001 | 1.9671 | <0.0001 | 1.9025 | <0.0001 | 92.2229 | 0.4817 | 179.2537 | 0.2552 |
| J9 (C_{1d}) | 3.0180 | <0.0001 | 2.8119 | <0.0001 | 0 | - | 0 | - | 1.1743 | <0.0001 | 1.2695 | <0.0001 | 380.5290 | <0.0001 | 373.0072 | <0.0001 |
| J10 (C_{1d}) | 0 | - | 0 | - | 3.1998 | <0.0001 | 3.2158 | <0.0001 | 1.2418 | <0.0001 | 1.3492 | <0.0001 | 0 | - | 0 | - |
| Time (C_{2d}) | -0.0003 | <0.0001 | -0.0003 | <0.0001 | 0.0003 | <0.0001 | 0.1524 | 0.0292 | 0.0007 | <0.0001 | 0.0008 | <0.0001 | -0.0082 | 0.4563 | -0.0151 | 0.2075 |
| Topic (X_{1d}) | - | - | -0.0660 | 0.2983 | - | - | -0.0663 | <0.0001 | - | - | -0.1750 | <0.0001 | - | - | 0.3226 | 0.9885 |
| Method (X_{2d}) | - | - | 0.0242 | 0.7115 | - | - | -0.0993 | <0.0001 | - | - | -0.0376 | 0.0061 | - | - | 1.9001 | 0.9346 |
| Affiliation (X_{3d}) | - | - | -0.1328 | 0.0061 | - | - | 0.0777 | <0.0001 | - | - | 0.2352 | <0.0001 | - | - | -37.6335 | 0.0293 |

the number of revisions, or the number of days under review. However, combinative topics and combinative methods were significantly negatively associated with the number of views (for combinative topics, $p < 0.0001$; for combinative methods, $p < 0.0001$) and the number of citations (for combinative topics, $p < 0.0001$; for combinative methods, $p = 0.0061$).

4.3.3 Robustness checks

Several different robustness checks were performed, including alternative model specifications and bootstrapping simulations, to ensure the robustness and reliability of our findings under different conditions. Partial least squares structural equation modeling (PLS-SEM), a popular variance-based structural equation modeling (SEM) approach, was employed. Given the non-normality of our data as well as the relatively small sample sizes, PLS-SEM was deemed the most appropriate analytical approach, given its ability to deal with small sample sizes and non-normal data distributions (Queiroz et al. 2022; Fosso Wamba and Akter 2019). Utilizing SmartPLS software, we re-employed the four models, which, compared with bootstrapping techniques, tend to perform with higher statistical power for small sample sizes (Fujita et al. 2020). Four control variables created issues when reassessing the models: Y_{1a} , Y_{1a} , Y_{1a} , and Y_{1a} . In addition, four variables—J1 (C_{1aj}), J2 (C_{1aj}), J7 (C_{1aj}), and J10 (C_{1aj})—had minimal variance, which caused a singular matrix problem. These variables were identified and subsequently removed from the model. PLS-SEM was employed, utilizing a percentile bootstrap confidence interval method with 5000 subsamples. Only one issue arose in Model 2 (Y_{1a}), where directionality and significance differed ($\beta = 0.016$; $p = 0.733$). Thus, the finding that combinative topics were significantly negatively associated with several views was not replicable when utilizing PLS-SEM; therefore, this finding should be investigated further.

5 Interpretation of results and implications for management research

5.1 Summary of main results and interpretations

In bibliometric research, as metadata of a study, author keywords are basic elements that represent conceptual themes (Amiri et al. 2021). Therefore, author keywords are commonly used to identify the knowledge structure of research and can be used to perform trend analysis (Chen 2006). This study employed bibliometric methods to understand the ways in which different forms of combinative research occur as well as the impact of combinative research on article performance based on usage metrics, the number of days under review, and the number of revisions. Our co-word analyses provided an understanding of how combinative research occurs. A cluster analysis identified four distinct clusters based on key terms, each addressing different topics in the domain. Cluster 1 intersected innovation, supplier relationship management, and knowledge; Cluster 2 focused on behavioral and performance aspects; Cluster 3 incorporated supply chain and quality management themes; and Cluster

4 concerned sustainability and project management. In terms of centrality, the keywords that appear more frequently include items such as “SCM” and “performance.” Keywords that occur less frequently, such as “behavioral operations,” are more peripheral but represent growing research areas. The presented figures highlight the clustering results of co-occurring keywords, centrality, links between author-affiliated countries, and centrality of the research method. While the US holds the highest centrality in author affiliations, China’s limited links were unexpected. With regard to research methods, surveys and secondary data analyses appear to be the most common. Four regression models were assessed and presented in terms of the impact of combinative research on article performance based on usage metrics, the number of days under review, and the number of revisions. The analyses revealed that combinative affiliations significantly impacted all proxies of article performance, whereas combinative methods affected views and citations. Specifically, more affiliations were related to fewer revisions and review days but increased views and citations.

5.2 Implications for management research

While this study used an OM/IS/KM/SCM context, management researchers can leverage the results from varied perspectives. By understanding the patterns of combinative research, management researchers can integrate interdisciplinary methods, frameworks, and perspectives to foster richer insights and novel contributions to their chosen domain. For example, combining topics such as innovation, supplier relationships, and knowledge might lead to fresh perspectives in strategic management or organizational behavior. Additionally, the identified peripheral keywords, including “behavioral operations,” might indicate emerging research areas that can guide interdisciplinary researchers to further explore niche areas to establish their own domains and embark on related research as early adopter experts. Our results suggest the importance of cross-institutional collaboration in management research, potentially leading to enhanced article performance. In this regard, recognizing the centrality of certain countries in author affiliations suggests that collaborations with these countries may be beneficial in obtaining additional insights into OM/IS/KM/SCM areas.

Conversely, underrepresented countries could also signal opportunities for unique research collaborations or studies focusing on under-explored regions. Future research may also identify the logic behind related findings, specifically focusing on the reasons behind the centrality of some countries over others. For example, addressing the academic reputation of institutions in enhancing international attendance may play a pivotal role in enhancing international collaboration (Kwiek 2020). Additionally, government and private-sector funding may enhance international collaboration more than smaller or less diversified economies (Kwiek 2020). Academic institutions that provide incentives to produce research internationally may also incentivize participation (Yemini 2021). Moreover, geopolitical factors such as political relations and foreign policies can influence collaborations and the accessibility and mobility necessary for international travel. Alternative controls may also

be introduced, including specialization in certain research areas. An understanding of these possibilities could, in turn, promote international collaboration through institutional incentives and possible public policy revisions. Moreover, examining commonly utilized methods can offer valuable insights, whereas underutilized methods warrant further consideration. Finally, by understanding the factors that influence article performance, researchers can strategically design their studies to optimize these metrics, enhancing the visibility and impact of their work.

Combinative research can be used as a basis for additional meta-analyses and systematic reviews that provide diverse combinations of results from multiple studies to assess the consistency, quality, and overall strength of evidence. Meta-analyses and systematic reviews, which are combinative in nature, can be used to evaluate competing theoretical assumptions or to identify varied moderators (Aguinis et al. 2011; Bergh et al. 2016; Hansen et al. 2022). With the use of multiple fields and author insights from different affiliations, creative pursuits and combinations can be leveraged for additional insights that may influence findings, including but not limited to methodological variations, publication biases, and other sources of systematic error.

The cluster analyses revealed connections between seemingly disparate areas through the continuity in the most utilized keywords. This finding indicates the emergence of combinative research focusing on building upon traditional concepts. In this context, the new focus on Industry 4.0 (see “[Appendix](#)”) might evolve into a consistent theme for the future, as these fields will inevitably undergo development with emerging technological shifts toward artificial intelligence, robots, and augmented reality (AR). Therefore, we anticipate that OM research will increasingly depend upon and be operational alongside information technology research, further creating combinative research capabilities. The cluster analysis attests to the diversity of linkages among emergent themes, including green SCM, project management, new product development, and so on. The keywords with larger frequencies (e.g., “SCM” and “performance”) still tended toward greater centrality, indicating temporal continuity. Additionally, similar to other fields [i.e., e-learning (Bai et al. 2021)], OM shows temporal continuity and rapid evolution in topics. Based on these results, concepts may emerge and re-emerge under interdisciplinary themes, such as risk management, technology, and hard and soft skill integration (e.g., design thinking and Industry 4.0).

With respect to combinative author affiliations, the US was the most centralized, followed by the UK, which was linked to all countries except Finland. Finally, Spain ranked third, with links to all countries except Turkey, Taiwan, and Finland. Previous research has suggested that the increasing trend toward collaboration among institutions could be attributed to various policies that encourage research collaboration (e.g., the EU Framework Program for Research and Innovation). As global viewpoints allow for multiple perspectives, combinative author affiliations have become an apparent driver of article performance.

Finally, in terms of combinative methods, surveys and secondary data analyses were the most centralized methods employed. The most commonly used multi-method analyses were secondary data analyses, followed by behavioral research and field experiments. In recent years, secondary data analysis has emerged from

survey methods. In this context, there seems to be continual encouragement for multi-method combinative research.

The mixed results reflect the associations among combinative topics, methods, and affiliations. One important finding from these results was the significant associations between combinative affiliations and the number of revisions, views, citations, and days under review. When authors from different countries combine their efforts, they introduce diverse perspectives and cultural insights, which can enhance the research through greater innovation and appease multiple readers from a broader audience. This also helps to expand the network and reach of the research, with the inclusion of multiple professional networks, increasing the visibility and accessibility of the research across different regions and, at times, disciplines. From a social network theory perspective (Granovetter 1973), the context of international combinative research expands to multiple networks that influence the project's outcomes (Haines et al. 2011). In this regard, including multiple authors from different geographical institutions may also enhance the reach of the audience and the relevance of addressing global issues that plague larger geographical regions.

Additionally, cross-cultural communication and input, especially through the effective exchange of information, can enhance the quality and relevance of output from a communication theory standpoint, introducing diverse cultures to solve more impactful problems and enhancing the immediacy of the need for research and intellectual contribution (Neuliep et al. 2001). Previous research (Lee and Bozeman 2005) has elucidated the benefits of combinative author affiliations, such as that scientific productivity is correlated with multi-institutional authors. Additionally, studies investigating the impact of cross-institutional groups have confirmed that cross-institutional authored papers have higher citation rates than papers produced by a single research group; moreover, those with international co-authorship have even higher impact factors (Thonon et al. 2015). The results of this study provide support for and enhance this contribution by suggesting that combinative affiliations may also be linked to a reduced number of days under review and a reduced number of revisions while controlling for time and the journal outlet. This indicates that combinative affiliations have broader implications for study performance, regardless of the outlet.

Our findings also show significant negative associations between combinative methods and views and citations, indicating that while multi-method approaches may lead to further interdisciplinary and innovative research, they do not necessarily lead to more scholarly attention or usage. From a social network theory perspective, this is counterintuitive, as it would stand to reason, based on social network theory, that the multi-method approach should bridge barriers between different networks of users who leverage different theories. Several possible theoretical explanations exist for these conflicting findings derived from social network theory and complexity theory (Anderson 1999). We attempted to understand the results by breaking down the complexity of combinative research into smaller parts. In this case, complexity is interwoven in the connections of article performance with combinative methods and combinative authorship affiliations.

By studying these in isolation from the network perspective of complexity, we were able to better understand the impact of combinative research on article

performance. First, authors proficient in various methodological approaches within a field domain contribute to reduced variability in methodological choices compared to the variability seen in networks with regard to readership.

Second, bridging networks and cultural backgrounds may present less complexity in a research question than bridging methodological approaches. Most complex systems can be modeled through networks (Anderson 1999). Geographical networks may be more or less centralized than methodological networks. Consequently, approaches to enhancing readership within these different networks may differ based on the complexity within each network, thus underpinning the differing findings associated with combinative methods versus combinative author affiliations.

There is another avenue for future inquiry that may also identify the weakness of ties associated with authors from different methodological interest backgrounds versus diverse cultural backgrounds. Granovetter's (1973) strength of network ties perspective may contribute to an understanding of the information flow between these different networks. Weaker ties may be more prevalent among geographical networks than methodological networks, highlighting the extensive dissemination of research throughout one's network.

Our findings also offer a distinct commentary on the field of OM/SCM. Despite calls for action involving combinative methods, scholarly attention has not fully embraced this approach. The results of this study suggest that combinative research, as defined by the dimension of multi-country author affiliations, surpasses other dimensions, including multi-method and topic research, in terms of its impact on article performance, including both usage (i.e., citations and view counts) and effort and time expenditures (i.e., the number of days under review and the number of revisions), even controlling for the journal outlet and time.

As an avenue for inclusive research employing different methods, replication studies are of growing interest in management, as recently stressed in several fields and subdisciplines of management (Block et al. 2022). Replication is foundational to empiricism through its fostering of greater certainty among established theories and models for future research. Our study sought to contribute in a manner that furnishes researchers with robust frameworks to enhance the novelty of their contributions. This is because in the past, replication has been criticized for its contribution to scientific rigor (Block et al. 2022). However, our study indicates that this can be addressed through several avenues.

We can perceive the contributions through the lens of literal replication (Block et al. 2022). The combinative synthesis enabled by insights from different fields and author affiliations can continuously improve the rigor of the results by using multiple independent studies that consistently replicate the same results. Through constructive replication (Block et al. 2022), combinative research provides a framework for the identification of factors that may influence the effects of the original study, thereby refining the understanding of the phenomenon and, through the combination of different fields, identifying the specific circumstances in which the findings persist or do not persist, as confirmation bias exists in management and replication research (Block et al. 2022).

5.3 Implications for management professionals

While this study primarily focuses on research implications, there are indirect implications for corporations. First, this research underscores the merit of integrative scholarly inquiry, specifying diverse research domains, methodologies, and international collaborations. This combinative approach is poised to foster innovative solutions through applied research that enhances problem-solving and decision-making efficacy in many managerial contexts. Second, this study sheds light on the influence of various research strategies on scholarly article metrics, including readership, citations, review durations, and revision frequencies. Given the complexity of modern scientific questions, collaborative efforts that combine diverse expertise are often necessary to generate highly novel findings (Raasch et al. 2013). While many scholars advocate for increased combinative collaborations, it has been widely recognized that this can be more costly than research within a discipline (Raasch et al. 2013). In this regard, the hope is that the provision of a context in which combinative research can be readily pursued will enhance the innovation derived from this research area, thereby improving the insights gleaned for management.

Furthermore, fostering an understanding among researchers regarding the role of combinative research offers a broader, more comprehensive approach to problem-solving and decision-making. This approach facilitates the integration of diverse perspectives and expertise from various disciplines, enhancing management's ability to gain deeper insights and develop more comprehensive solutions to complex business challenges by drawing on combinative research. The combinative approach encourages innovation and adaptability, allowing management to navigate rapidly changing environments more effectively.

The limitations of this study constrain the generalizability of the results. First, the time frame covered and the journal list from which the articles were identified may introduce inherent biases. Nevertheless, this study can be replicated by considering the criteria and choices reported in the Methods section. The cluster analyses and keywords leveraged were also limited to only the most frequent keywords. Keywords utilized less frequently, or more novel topics were not included. While this certainly hindered the breadth of our data, the focus on more frequently used keywords enhanced our knowledge of more frequently leveraged topics. Future research ought to consider identifying trends among less frequently leveraged topics. Despite these limitations, the study's findings underscore the importance of analyzing how different combinative elements of research relate to various dimensions of article performance.

Appendix

See Tables 4 and 5.

Table 4 Correlations

| Variable | N | Mean | SD | Sum | Minimum | Maximum | DSJ | IUOPM | IJPE | IJPR |
|-------------------------|-----|------|------|-----|---------|---------|--------------------|--------------------|--------------------|--------------------|
| J1 | 363 | 0.06 | 0.24 | 23 | 0 | 1 | 1.0000 | -0.09153 0.0816 | -0.19661 0.0002 | -0.08762 0.0955 |
| J2 | 363 | 0.11 | 0.31 | 40 | 0 | 1 | -0.09153 0.0816 | 1.0000 | -0.26602 <.0001 | -0.11856 0.0239 |
| J3 | 363 | 0.36 | 0.48 | 132 | 0 | 1 | -0.19661 0.0002 | -0.26602 <.0001 | 1.0000 | -0.25467 <.0001 |
| J4 | 363 | 0.10 | 0.30 | 37 | 0 | 1 | -0.08762 0.0955 | -0.11856 0.0239 | -0.25467 <.0001 | 1.0000 |
| J5 | 363 | 0.06 | 0.24 | 23 | 0 | 1 | -0.06765 0.1985 | -0.09153 0.0816 | -0.19661 0.0002 | -0.08762 0.0955 |
| J6 | 363 | 0.14 | 0.35 | 52 | 0 | 1 | -0.10635 0.0429 | -0.14390 0.0060 | -0.30910 <.0001 | -0.13776 0.0086 |
| J7 | 363 | 0.00 | 0.05 | 1 | 0 | 1 | -0.01367 0.7952 | -0.01850 0.7254 | -0.03973 0.4505 | -0.01771 0.7367 |
| J8 | 363 | 0.02 | 0.14 | 7 | 0 | 1 | -0.03647 0.4885 | -0.04935 0.3485 | -0.10600 0.0436 | -0.04724 0.3695 |
| J9 | 363 | 0.01 | 0.07 | 2 | 0 | 1 | -0.01936 0.7132 | -0.02619 0.6189 | -0.05627 0.2850 | -0.02508 0.6339 |
| J10 | 363 | 0.09 | 0.29 | 33 | 0 | 1 | -0.08225 | -0.11128 0.0340 | -0.23905 <.0001 | -0.10653 0.0425 |
| J11 | 363 | 0.04 | 0.19 | 13 | 0 | 1 | -0.05013 0.3409 | -0.06782 0.1973 | -0.14569 0.0054 | -0.06493 0.2172 |
| Combinative_Topic | 363 | 1.47 | 0.51 | 535 | 0 | 2 | -0.01990 0.7055 | 0.13875 0.0081 | -0.00612 0.9075 | -0.00949 0.8570 |
| Combinative_Method | 363 | 0.57 | 0.50 | 208 | 0 | 1 | 0.09554 0.0690 | 0.05478 0.2979 | 0.00421 0.9363 | -0.04052 0.4415 |
| Combinative_Affiliation | 363 | 1.46 | 0.66 | 530 | 1 | 5 | -0.06135 0.2436 | 0.14125 0.0070 | 0.05442 0.3011 | -0.01410 0.7889 |

Table 4 (continued)

| Variable | IJPM | JOM | JORS | MS | POM | PPC | OMC | Combinative_Topic | Combinative_Method | Combinative_Affiliation |
|-------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|-------------------------|
| J1 | -0.06765 0.1985 | -0.10635 0.0429 | -0.01367 0.7952 | -0.03647 0.4885 | -0.01936 0.7132 | -0.08225 0.1178 | -0.05013 0.3409 | -0.01990 0.7055 | -0.09554 0.0690 | -0.06135 0.2436 |
| J2 | -0.09153 0.0816 | -0.14390 0.0060 | -0.01850 0.7254 | -0.04935 0.3485 | -0.02619 0.6189 | -0.11128 0.0340 | -0.06782 0.1973 | 0.13875 0.0081 | 0.05478 0.2979 | 0.14125 0.0070 |
| J3 | -0.19661 0.0002 | -0.30910 <.0001 | -0.03973 0.4505 | -0.10600 0.0436 | -0.05627 0.2850 | -0.23905 <.0001 | -0.14569 0.0054 | -0.00612 0.9075 | 0.00421 0.9363 | 0.05442 0.3011 |
| J4 | -0.08762 0.0955 | -0.13776 0.0086 | -0.01771 0.7367 | -0.04724 0.3695 | -0.02508 0.6339 | -0.10653 0.0425 | -0.06493 0.2172 | -0.00949 0.8570 | -0.04052 0.4415 | -0.01410 0.7889 |
| J5 | 1.0000 0.0429 | -0.10635 0.0429 | -0.01367 0.7952 | -0.03647 0.4885 | -0.01936 0.7132 | -0.08225 0.1178 | -0.05013 0.3409 | -0.01990 0.7055 | 0.06449 0.2203 | -0.07848 0.1356 |
| J6 | -0.10635 0.0429 | 1.0000 0.0429 | -0.02149 0.6832 | -0.05734 0.2759 | -0.03044 0.5633 | -0.12931 0.0137 | -0.07881 0.1340 | -0.04067 0.4398 | -0.02855 0.5876 | 0.00092 0.9861 |
| J7 | -0.01367 0.7952 | -0.02149 0.6832 | 1.0000 0.8887 | -0.00737 0.8887 | -0.00391 0.9408 | -0.01662 0.7523 | -0.01013 0.8475 | -0.04881 0.3538 | 0.04537 0.3887 | -0.03663 0.4866 |
| J8 | -0.03647 0.4885 | -0.05734 0.2759 | -0.00737 0.8887 | 1.0000 0.8887 | -0.01044 0.8429 | -0.04434 0.3996 | -0.02702 0.6078 | -0.05170 0.3260 | 0.04005 0.4468 | -0.00669 0.8990 |
| J9 | -0.01936 0.7132 | -0.03044 0.5633 | -0.00391 0.9408 | -0.01044 0.8429 | 1.0000 0.8429 | -0.02354 0.6549 | -0.01434 0.7853 | -0.06912 0.1889 | -0.01099 0.8348 | 0.00450 0.9318 |
| J10 | -0.08225 0.1178 | -0.12931 0.0137 | -0.01662 0.7523 | -0.04434 0.3996 | -0.02354 0.6549 | 1.0000 0.8429 | -0.06094 0.2468 | -0.01195 0.8205 | 0.07925 0.1318 | -0.10426 0.0472 |
| J11 | -0.05013 0.3409 | -0.07881 0.1340 | -0.01013 0.8475 | -0.02702 0.6078 | -0.01434 0.7853 | -0.06094 0.2468 | 1.0000 0.6429 | 0.02441 0.6429 | -0.10337 0.0491 | 0.00043 0.9934 |
| Combinative_Topic | -0.01990 0.7055 | -0.04067 0.4398 | -0.04881 0.3538 | -0.05170 0.3260 | -0.06912 0.1889 | -0.01195 0.8205 | 0.02441 0.6429 | 1.0000 | 0.03759 0.4753 | 0.06438 0.2211 |

Table 4 (continued)

| Variable | IJPM | JOM | JORS | MS | POM | PPC | OMC | Combinative_Topic | Combinative_Method | Combinative_Affiliation |
|-------------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|-------------------|--------------------|-------------------------|
| Combinative_Method | 0.06449 0.2203 | -0.02855 0.5876 | 0.04537 0.3887 | 0.04005 0.4468 | -0.01099 0.8348 | 0.07925 0.1318 | -0.10337 0.0491 | 0.03759 0.4753 | 1.0000 | -0.02271 0.6663 |
| Combinative_Affiliation | -0.07848 0.1356 | 0.00092 0.9861 | -0.03663 0.4866 | -0.00669 0.8990 | 0.00450 0.9318 | -0.10426 0.0472 | 0.00043 0.9934 | 0.06438 0.2211 | -0.02271 0.6663 | 1.0000 |

Table 5 Operationalization of variables

| Variable | Description | Sym- bol | Operationalization |
|------------------------------|--|-------------|--|
| Control variables | The journal in which the article is published | C_{1aj} | $\in \{0,1\}$ for every article a published in journal j . Where $\{1, \dots, n\}$ when a is published in j , 0 , when a is not published in j . |
| Time | The number of years from article publication to February 2020 | C_{2aj} | $\in \{\leq n\}$, where n is to total number of years between article a publication and February 2020. |
| <i>Independent variables</i> | | | |
| Combinative topics | The sum of the thirteen keywords that occur in the article | x_{1a} | $\in \{0 \leq n\}$, where n is to total number of the thirteen keywords occurring in article a . |
| Combinative methods | The sum of the number of methods employed in the study | x_{2a} | $\in \{0 \leq n\}$, where n is to total number of the method employed in article a . |
| Combinative affiliations | The sum of the number of author affiliations in the article | x_{3a} | $\in \{0 \leq n\}$, where n is to total number of author affiliations in article a . |
| <i>Dependent variables</i> | | | |
| Number of revisions | The number of revisions of the article | Y_{1a} | $\in \{0 \leq n\}$, where n is to total number of revisions for article a . |
| Article views | The number of views of the article between the date of article publication and February 2020 | Y_{2a} | $\in \{0 \leq n\}$, where n is to total number of views between date of article publication for article a to February 2020. |
| Citations | The number of citations of the article as of February 2020 | Y_{3a} | $\in \{0 \leq n\}$, where n is to total number off or article a on February 2020. |
| Number of days under review | The difference between the date of the article's acceptance and the article's reception | Y_{4a} | $\in \{0 \leq n\}$, $D_{\text{acceptance}} - D_{\text{reception}}$ where n is to total number of days, $D_{\text{acceptance}}$ is the date of article a acceptance and $D_{\text{reception}}$ is the date of article a reception |

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Data availability The data set analyzed in the study are available from the corresponding author on reasonable request.

Declarations

Conflict of interest The authors declare that they have no conflict of interest.

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