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Investigating the Corporate Governance and Sustainability Relationship: A Bibliometric Analysis Using Keyword-Ensemble Community Detection

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Summary

Sustainability is a business strategy combining economic, social, and environmental issues. This paper examines the corporate governance and sustainability literature. So we consider a new bibliometric database focusing on the network of keywords appearing in the literature. The quantitative approach is also new: we combine the information from different community detection algorithms to find the most important results and relationships in the literature. The final results show that the literature on corporate governance and sustainability raises an essential strategic question: for long-term sustainability if there needs to be a strong link between stakeholders and corporate social responsibility (CSR). So, considering a company's actions' social, economic, and environmental effects can help figure out how much corporate responsibility is needed. Also, companies that consider CSR and sustainability in their businesses find it easier to keep long-term relationships with customers, employees, and other stakeholders, which can be considered vital. Last, a strategic view of corporate governance should emphasize the importance of intellectual capital and the Triple-Bottom-Line approach to sustainable growth in a strategic view of corporate governance. In this sense, a more wholesome view of value creation aims to provide companies with better financial results while also serving society's environment and social well-being. By addressing these issues, governments and other groups can make the business world more sustainable and responsible.

JELClassification: L21; G34; Q56; C19; C38

Keywords: Corporate Governance; Sustainability; Bibliometric Analysis; Community Detection; Ensamble Community Detection

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Abstract

Sustainability is a business strategy combining economic, social, and environmental issues. This paper examines the corporate governance and sustainability literature. So we consider a new bibliometric database focusing on the network of keywords appearing in the literature. The quantitative approach is also new: we combine the information from different community detection algorithms to find the most important results and relationships in the literature. The final results show that the literature on corporate governance and sustainability raises an essential strategic question: for long-term sustainability if there needs to be a strong link between stakeholders and corporate social responsibility (CSR). So, considering a company's actions' social, economic, and environmental effects can help figure out how much corporate responsibility is needed. Also, companies that consider CSR and sustainability in their businesses find it easier to keep long-term relationships with customers, employees, and other stakeholders, which can be considered vital. Last, a strategic view of corporate governance should emphasize the importance of intellectual capital and the Triple-Bottom-Line approach to sustainable growth in a strategic view of corporate governance. In this sense, a more wholesome view of value creation aims to provide companies with better financial results while also serving society's environment and social well-being. By addressing these issues, governments and other groups can make the business world more sustainable and responsible.

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1. Introduction

In recent years, many corporations, stakeholders, and shareholders have increasingly cared about environmental and social issues (Hall & Zingales 2022, Benn & Dumphy 2013; Naciti et al. 2022; Zeng & Hengsadeekul 2020; Sharma & Starik 2004). Generally, investors tend to invest in companies with sound business ethics, a good work environment (Hummels & Timmer 2004, Ansong 2017, Gringhuis & Pennink 2017), a commitment to environmental sustainability, and a commitment to corporate social responsibility with its stakeholders (Dwi et al., 2017).

In this regard, it is necessary to understand also the opposite phenomenon that a company may be constrained by its stakeholders to take actions that adversely affect its market value. (Gomez-Mejia & Werner 2008). One reason for this behavior is the lack of understanding of the long-term

consequences of social and environmental issues, which can be very relevant (Welford & Frost 2006, Stahl et al. 2020). Following Johnston et al. (2019), there is increasing evidence that shareholders exert pressure on company directors, and executive management tends to make them think that financial markets have a short-term perspective (Buckley 2021). Because of this, they have the same long-term perspective as the financial markets. Instead of considering long-term goals, they focus on meeting shareholders' immediate needs (EY 2020, Akin 2022). The phenomenon defined as the "tragedy of the horizon" (Carney 2015, 2019) comes here. It is characterized by the explicit failure of corporations and shareholders to consider long-term sustainability from economic and environmental points of view (see Davies et al. 2014).

It is widely believed that companies' reputations, brand value, and financial performance may suffer if they ignore environmental and social problems (Hammond & Slocum 1996). Following Aras & Crowther (2008) and Aguilera et al. (2021), environmental planning has become essential in recent years (see in this context OECD 2005). Businesses can improve their environmental management practices and strive for continuous improvement by involving stakeholders, doing life cycle assessments, taking precautions, planning contingencies, getting environmental training, and making policies (OECD 2005, Naciti et al. 2022). While environmental difficulties can present companies with physical, regulatory, reputational, and legal challenges, they can also negatively impact their competitive advantage and, as a result, their financial performance (Ben-Amar & McIlkenny, 2015). Furthermore, there is a growing belief that organizations focusing on their environmental and social obligations will be more sustainable and last longer (Masud et al., 2018). ESG (environmental, social, and governance) policies have increased performance among organizations with extensive ESG activities (Eccles et al. 2012). Stakeholders utilize ESG performance indicators to evaluate a business's operations and financial performance to determine the company's viability (Chen et al., 2022).

This point of view and the trend towards stressing ESG problems (see for a survey Rau & Yu 2023) has received much appreciation but has yet to receive unanimous approval. In this respect, some shareholders and industry stakeholders believe that governments, not businesses, should be responsible for tackling social and environmental challenges (Henderson 2004). Moreover, some contend that concentrating on ESG problems may detract from the fundamental objective of maximizing shareholder value (see Hart & Zingales 2022). Therefore, corporate governance plays a significant role because of its implications for the relationships between the relevant actors involved and for strategic considerations (Fortuna, 2010, 2001, Naciti et al., 2022, Freeman & Reed, 1983).

This article is organized into the following sections: the second section describes how corporate governance and sustainability interact and how corporate governance can be enhanced to increase long-term sustainability. The third section describes the bibliometric database used to analyze the data. The same section of the paper presents the methodology used for the bibliometric analysis of corporate governance and sustainability. We will discuss the results in the fourth section, and the effects, results, and policy implications will be discussed in the fifth section. As a final section, the conclusions are presented.

2. The Evolving Corporate Governance Enhancement for Sustainability

Environmental issues are a relevant aspect of corporate governance because these elements substantially influence a company's operations and reputation in the community (Masud et al., 2018). Therefore, a company strives for good governance (O'Boyle et al. 2011; Setyahadi & Narsa 2020). Companies eventually realize sustainability, create economic value, and can conform to their principles because of good governance (Al Hammadi & Nobanese 2019). Therefore, responsible corporate governance and concern for society and the environment are essential to a company's success (Fortuna, 2010; Setyahadi & Narsa, 2020). So all aspects of the organization are considered, and the corporate values can be developed that enable this governance. Companies must prioritize profit-making and act responsibly as corporate citizens to ensure long-term sustainability and mutually profitable growth in the future (Palacios 2004). In order to do that, the authors recommend that businesses care about their communities, protect the environment, collaborate with communities, and cooperate with them on an equal footing (Setyahadi & Narsa 2020). Hörisch et al. (2014) emphasize managing stakeholder relationships to enhance long-term sustainability. In this way, education, regulations, and value creation based on sustainability are crucial for tackling these challenges.

Following Naciti et al. 2022, this paper considers, a first extent, bibliometric methodologies to analyze the structure of the literature on the relationships between sustainability and corporate governance (Aria & Cuccurullo 2017; Van Eck & Waltman 2017). We will consider a different period and method than the Naciti et al. paper, which helps identify the literature's "semantic cores" (see Drago et al. 2021). In this respect, research and scientific publications are assessed according to their bibliometric impact through bibliometric analysis. It can also be used to evaluate possible innovations from a research program and find trends in research topics. In addition, these methodologies have proven to be an effective tool for identifying data structures, associations, and patterns within the scientific literature (Jarwar, 2022). In this respect, consider more in-depth the network analysis (see

Drago et al. 2021 and Jarwar 2022) of the different keywords considered and, more importantly, analyze the different communities of keywords occurring on the co-occurrence network.

Network communities are groups of nodes highly connected to each other and weakly connected to other nodes belonging to different communities (Fortunato, 2010). In other words, within communities, the nodes are firmly connected but weakly connected between communities. A significant result is that algorithms can identify highly connected components within a network distinct from others. In these procedures and analyses, a consensus analysis obtained by considering different algorithms can be critical because different algorithms can return different results based on the biases of the various algorithms considered (Leskovec et al., 2010).

In order to avoid this possible problem, following the Drago (2018a) approach, we started with different algorithms in community detection (Lancichinetti & Fortunato, 2009) to construct a consensus matrix of the results returned applying alternative algorithms and methodologies. In particular, in the end, we have considered four different approaches and algorithms as community detection via short random walks (Pons & Latapy 2005), greedy optimization of modularity (Clauset et al. 2004), the community matrix leading eigenvector (Newman 2006) and finally the Louvain method based on the optimization of the multi-level modularity of the network (Blondel et al. 2008). The package to construct the consensus matrix considering the different algorithms is *igraph* (Csardi & Nepusz 2006).

This way, the approach is based on constructing an ensemble of different community detection approaches. Using this approach, it is possible to represent the results synthetically using the multiple correspondence analysis (Greenacre & Blasius, 2006). Then it is possible to consider a hierarchical cluster analysis on the different obtained keywords from the network to analyze in greater detail how corporate governance and sustainability are interconnected (see Köhn & Hubert, 2014, about this approach applied to bibliometric data; see also Gatto et al. 2022, and Park et al., 2023). The final aim is to consider the actions and strategies the system's actors consider identifying the relevant keywords as "semantic cores" (Drago et al. 2021). This approach allows the identification of key concepts and relationships connecting corporate governance and sustainability.

This work has several aims, including identifying the most relevant themes and elements, analyzing the literature's bibliometric structure, and identifying the relationships among actors and the strategic issues that may arise. Furthermore, by analyzing the literature trends, relevant new research opportunities can be identified (see also Naciti et al. 2022).

3. Data and Methodology

The data are collected by the bibliometric database Scopus. This bibliometric database was chosen for its reliability and use in scientific research (Pranckutė 2021, Harzing & Alakangas 2016. Zhu & Liu 2020). As part of constructing the bibliometric database, a search on Scopus was performed on September 20, 2022, and 1,209 documents were found. This search term will find all relevant articles to the research question in the Scopus database. Some criteria are keywords, author names, and others that help narrow the search results to the most relevant articles.

The query performed was:

TITLE-ABS-KEY ("Corporate Governance" "Sustainability")

So we covered the papers considering both the concepts of Corporate Governance and Sustainability considering the period coming from the year 1994 to the year 2022. However, first, we construct the bibliometric dataset from the initial helpful database to perform the quantitative analysis. The different phases of the analysis follow these different steps1. First, we consider a descriptive and exploratory analysis of our dataset. In this respect, table 1, table 2, and table 3 show us some interesting data structures in our database, which we can observe. Then we consider the analysis of the network of the co-occurrent keywords we can observe in our data. In this respect, we consider all keywords common to one or more papers jointly. These data show, in this sense, some relevant keywords considered in the different works continuously and relevant content on the papers. Using the co-occurrence network, we can identify the structure of the network (the degree distribution), the different characteristics of the nodes (which represent the keywords), and the degree of their centrality. A visual ranking of the two most significant centrality indices is also presented: the betweenness and the degree. In this context, the Freeman degree is used to measure the degree of local centrality within a network (see Zhang & Luo 2017; Wasserman, S., & Faust 1994, Isack et al. 2022), so given a network G based on $G := (N, L)$ where N can represent a group of elements that are connected. This group can be utilized to represent a network, for example, a computer network or a social network, in which each node is a member of the network. In this case, N represents the number of nodes (the different keywords that are being considered), and the L is the links (as the different connections in terms of co-existing keywords on different papers); we have :

[1] At a computational level packages used for the data analysis performed in R language was bibliometrix (Aria & Cuccurullo 2017), igraph (Csardi & Nepusz 2006), clValid (Brock et al. 2008).

$$\mathrm{Cd}(n) = \deg(n) \quad (1)$$

Betweenness measures global centrality in the co-occurrence network and how often a node is on the shortest path between two other nodes.

$$\mathrm{Cb}(n) = \sum_{s \neq n \neq t \in N} \frac{\sigma_{st}(n)}{\sigma_{st}} \quad (2)$$

By putting these two measures together, it is possible to identify the structure of the network and different functions in terms of the role of nodes on the co-occurrence network. This phase aims to identify the network's most central nodes. We then consider the different communities identified using different techniques combined and consider an ensemble approach to detect the final communities. In this respect, the different techniques are used to create a relevant data matrix which is analyzed considering a multiple correspondence analysis on the different columns representing the different memberships of the community detection performed using different algorithms. Based on Drago (2018), this approach allows us to better identify robust communities of keywords in the literature considered (see also for a different approach, Drago & Balzanella 2015). It is important to note that using different algorithms in community detection and their comparison (or use on an ensemble approach to obtain a solution) is needed because different methodologies in community detection can be biased and tend to return different solutions (Leskovec et al. 2010). As a result, the proposed approach is more robust.

We compare the different results obtained considering a classical approach in bibliometric analysis, which considers conceptual structure maps helpful to represent the different concepts extracted from literature to identify more relevant connections between the different concepts. Finally, we compare the different results obtained in both methodologies.

We perform hierarchical clustering using Euclidean distance and the Ward method based on the first two components extracted from the multiple correspondence analysis. This method properly clusters the different groups of observations validated using the silhouette criterion (see Brock et al. 2008). This criterion is also helpful to consistently represent and explore the dendrogram to obtain different clustered well, cutting the same dendrogram structure. In order to cut the dendrogram, we can use a valuable validation approach to determine the optimal cluster numbers (see Henning & Meila 2015).

The silhouette width, which indicates how thin a cluster is, indicates a cluster's network-based approach that focuses on the construction of different term algorithms in order to estimate its output quality. Following Brock (2008), the average of the silhouette values for each observation is what the Silhouette width metric measures. Silhouette value can range from -1 to 1. An oversized silhouette

width indicates that the sample strongly resembles its cluster while being far away from other clusters, thus indicating that the cluster is well-defined. On the other hand, a narrow silhouette width may indicate that the sample has been misclassified and is located near another cluster. In this respect, well-clustered data may be characterized by values close to 1 and observations with a poor clustering pattern by values near -1 (Brock et al. 2008).

The methodological approach innovates the fields of bibliometrics by considering a network-based approach that focuses on constructing different terms in the literature strongly connected to others and weakly connected with other groups of keywords. In this context, these statistical patterns are defined in the scientific literature as "communities" as groups of keywords strongly characterizing the literature we are trying to represent.

4. Results

The different descriptive and exploratory results are represented in Tables 1, 2, and 3. In figure 1, we represent the visualization of the co-occurrence network. We consider the community detection approach and perform the ensemble clustering of the memberships obtained on the community detection algorithms. A description of the characteristics of each bibliometric database can be found in Table 1. Therefore, we can observe a 24.92 annual growth rate, indicating that the literature is growing. Among the works reviewed, the majority are articles (879) and book chapters (130), while the number of conference papers (85) is smaller. Figure 1 shows the network of co-occurrences of the keywords the authors chose. It is possible to observe relevant concepts in the literature by observing the most central concepts in the different keyword networks. As shown in figure 2, we can observe the degree distribution of the entire network. The result shows a group of nodes (keywords) showing a prominent centrality between the other nodes. These specific nodes on the network are the most relevant keywords in the entire literature. Then, to identify these terms, we can observe table 4, in which we visualize the main keywords in the literature according to two different indexes: the degree and the betweenness. The different approaches to the computation of centrality can be interpreted differently: the first concept is that the network degree is a local measure of centrality, whereas the betweenness can be considered a global measure of centrality (Das et al., 2018; Freeman, 1978). Our results indicate that corporate governance, sustainability, and social responsibility are the most relevant concepts for the Freeman degree. As the most central local concepts, these concepts have generated some relevant research, although they may not be multidisciplinary. Differently, the betweenness shows the most central concepts on the network globally: corporate sustainability, sustainability, corporate social responsibility, stakeholders, governance, performance, CSR, and sustainable development. These concepts have a different and more profound role than the last one

because it is possible to identify the capacity for these concepts to unify different multidisciplinary themes, which are essential in this literature.

For this reason, they are globally central in the network. Our cluster analysis is based on multiple correspondence analysis after we have computed the different algorithms for community detection. The results of the ensemble community detection are represented on a dendrogram showing the different groups of keywords considered. It is important to note that we are exploring the results to interpret them better. If we divide the cluster, we must consider the entire network structure (Naciti et al., 2022). In order to validate the clusters obtained, we considered the silhouette method to evaluate if the different clusters obtained seem adequate to the structure of the data observed on the dendrogram (see figure 3). The results also seem consistent with previous literature (Naciti et al., 2022). We observe the main 13 clusters and cut the dendrogram in that way. We decide on 13 groups validating our cluster analysis (see figure 4)

We interpret the results here because we observe the higher centrality and higher betweenness as the most considered concepts and central topics in this literature. The following should be noted: the different communities represent maximally related topics in this literature. Here is the general interpretation of the results listing the different relevant clusters in order of average betweenness (table 6):

Cluster 3: governance and corporate sustainability

Cluster 1: sustainability and corporate social responsibility

Cluster 6: social responsibility and environment

Cluster 2: board of directors and integrated reporting

Cluster 9: climate change and triple bottom line

Cluster 7: performance and intellectual capital

These 6 clusters are the most relevant ones in our analysis and represent the literature we are considering. In this respect, we need to analyze the contents of these different clusters. In order to observe the characteristics and the components of these clusters, we considered table 5 to analyze the different components of the clusters (in particular, the relevant keywords belong to every single

cluster) and table 6 with the aggregate characteristics of the different clusters in terms of centrality degree and betweenness.

As a sensitivity analysis, we provide a different approach based on multiple correspondence analysis directly on the initial matrix exploring the results as a representation obtained by clustering the different keywords (figure 5 and figure 6). The results obtained by the sensitivity analysis tend to confirm our general findings considering in one cluster the terms sustainability, governance approach, management practice, stakeholders, and corporate social responsibility. The other clusters are interesting because one is related to knowledge management (so it is confirmed their relevance for the sustainability in the long run of the firm) but also on corporate and social responsibilities and integrated reporting (which synthesize the consideration of different communities in the general analysis). Finally, the last cluster illustrates how investments, corporate governance, and social responsibility are interconnected (see also Jizi et al. 2004).

5. Discussion

Based on the ensemble community detection method based on multiple correspondence analysis, the results of this study suggest that the clusters are related to corporate governance and sustainability as well as relevant strategic points when examining corporate governance and sustainability relationships (see also Rahim et al. 2022).

Cluster 1, sustainability and corporate social responsibility, allows us to understand how significant corporate social responsibility (CSR) and sustainability are (see also Orlando ed. 2022). In this respect, following Latapí Agudelo et al. (2019) and Smith (2001), we can consider that companies are held accountable for their corporate social responsibility (CSR) by their stakeholders, those who are affected by their policies and practices (see also Dahlsrud 2008 and Crowther & Seifi 2021). In addition, companies are expected to consider the effects of their activities on the social, economic, and environmental environment as part of their CSR efforts (Frynas, 2009; Crowther & Seifi, 2021). Accountability is often exercised by companies' stakeholders, individuals, or groups whose policies and practices are affected by the company. In addition to legal obligations, these obligations extend to the company's shareholders. A company's long-term benefit to society is maximized when it meets these obligations and minimizes harm (Latapí Agudelo et al., 2019). Following Stahl et al. (2019), Corporate Social Responsibility should be treated differently, and a new social strategy should be implemented. First, however, it needs to be better understood how businesses contribute to social development. The consistent and robust development of social and sustainable environmental systems is highlighted by considering corporate responsibility. In cluster 1, it is possible to observe that two

relevant keywords are also corporate governance and sustainability. Following Shrivastava & Addas (2014) and Aras & Crowther (2008), quality corporate governance is required to foster a high degree of sustainable performance.

Shrivastava & Addas (2014) noted that corporate governance disclosure significantly impacts environmental and ESG disclosure (also see Almagtome et al. 2020). Strong company governance practices improve investor, consumer, and employee (stakeholders in general) views and trust. In contrast, poor corporate governance standards may reduce investor confidence and damage a company's brand, leading to lower stock prices and a reputation as a less trustworthy and transparent organization. Also, according to the same authors, board attendance is a strong predictor of sustainability performance and discipline; a more disciplined board might have better sustainability outcomes. The number of independent board directors is also associated with increased climate change and green supply chain management practices (Ong & Djajadikerta 2020). In this sense, board discipline and the proportion of independent board directors can impact a company's sustainability performance. Board meetings can be improved through increased discipline, a crucial predictor of board discipline and sustainability performance. The presence of a greater number of independent directors on a board is also linked to adopting climate change and green supply chain management practices. These findings suggest that companies with more vital board discipline and a more excellent representation of independent directors may have improved sustainability performance. It is part of the first cluster, also the word "stakeholder". In this sense, sustainability, corporate governance, and stakeholders are strongly interconnected (Kavadis & Thomsen, 2023 Antwi-Adjei et al., 2020). By also considering the results of the global centrality (the betweenness index), we can observe that the concept of stakeholders (and so, in this sense, "stakeholder theory" is very central in literature and have a significant relevance also as a part of their community (this result also confirms previous results by Naciti et al. 2022).

This approach is based on the concepts developed by Freeman (1984) and Parmar et al. (2010), which propose that stakeholders are individuals or groups affected by an organization's activities (see also Aggarwal & Saxena 2022 and Sila 2020). Improved board discipline and a more excellent representation of independent directors can enhance sustainability performance. So many implications for stakeholders may exist, including employees, suppliers, customers, and the community. These implications will depend on the individual stakeholders' specific context and interests. For example, shareholders may be interested in the company's financial performance, employees may be interested in job security, and customers may be interested in the company's commitment to sustainability. Corporate governance in this context can be essential to guarantee a

robustified relationship between the different stakeholders in the corporate (Al Hammadi & Nobanese 2019).

Cluster 2 depicts the role of the board and the role of integrated reporting. So this cluster refers to the board's role and integrated reporting. According to Lopes & Braz (2020), organizations should report their performance and impact to a broader audience to appeal to various stakeholders. Organizations are using integrated reporting to demonstrate value creation, responsibility taking, and sustainability promotion (Aguilera et al. 2021; Idowu & Del Baldo 2019). As part of integrated reporting, the members of the board of directors can play a pivotal role in providing an overview of the company's performance that is comprehensive, integrated, and sustainable (Naciti et al., 2022, Godos-Díez et al., 2018). Through integrated reporting, companies can better demonstrate how they create value, address stakeholder concerns, and contribute to broader corporate sustainability. In this context of sustainability, the board of directors' importance and the board's characteristics (e.g., the independent directors number but also the board size) should be considered (Masud et al., 2018).

Cluster 3 can represent the role of corporate sustainability and governance. Cluster 3 can be explained following Wilshusen & MacDonald (2017) and Orlando (Ed.) (2022). Sustainability in business refers to the accord between economic, social, and environmental factors. Historically, the emphasis has been on maximizing profits, but it is acknowledged that economic expansion should not be at the price of the environment or society (see Jakob et al. 2020). This good economic development decreases negative consequences and helps to achieve long-term sustainability by producing value (Horisch et al. 2014). Beyond profit, a complete approach to value creation is anchored in the logic of corporate sustainability. Companies must evaluate their activities' effects on all parties involved. By adopting a comprehensive value-creation strategy, companies can enhance their financial performance and contribute to the environment's and society's well-being (Eccles et al. 2012; Aguilera et al. 2021, Stahl et al. 2020).

Cluster 6 refers to social responsibility and the environment. So, in addition to pollution and natural resource depletion, corporations are also responsible for habitat loss and climate change (Hassan et al., 2022; Roberts et al., 2021; Gatto et al., 2022). Companies are accountable for mitigating these harmful effects and safeguarding the environment. So, a company's CSR goals are managing economic, social, and environmental impacts (see Dahlsrud 2008).

In this respect, reducing greenhouse gas emissions, assisting local communities, and encouraging diversity and inclusion are examples of CSR efforts. Companies may commit to environmental preservation and sustainability by engaging in CSR (Pham & Tran, 2020). Consequently, the company's reputation, trust, and credibility may be boosted. CSR may help both the firm and the environment in the long run (for a different approach, see on CSR see Freeman & Liedtka 1991).

Cluster 9: climate change and triple bottom line. Several businesses and organizations utilize the triple bottom line to determine their sustainability from an environmental perspective (Blowfield & Murray, 2019). In this context, the triple bottom line helps businesses determine their sustainability in climate change. Following Suroso et al. (2021), according to Elkington (2018), the Triple Bottom Line (also defined as "profit, people, and planet") is the best approach to managing society's economic, social, and environmental challenges. There is also a connection between corporate sustainability and the sustainability of the environment. It is important to note that even in the case of corporate sustainability actions, this method analyzes the impact on a company's economy, environment, and society when assessing and making decisions (see Wang & Lin 2007).

Cluster 7 performance and intellectual capital. The company's intellectual capital consists of knowledge, skills, and expertise, which are influenced by different aspects, such as human and structural capital (Irawan et al., 2019). The company's human capital comprises its employees' knowledge and skills, and its structural capital comprehends the non-physical assets used to create value (processes and procedures). Developing sustainable technologies and processes is how intellectual capital can contribute to sustainability (see Dumay 2013). In addition, it is essential to ensure that businesses are sustainable long-term to adapt to changing markets and regulations. Investing in intellectual capital through training and education significantly contributes to social sustainability (Lock & Seele 2016). In addition to providing a competitive advantage, intellectual capital can also contribute to economic sustainability. The company's long-term sustainability and success depend on its intellectual capital. It can be leveraged in corporate governance and sustainability efforts to create value and accomplish long-term objectives. At the same time, the point is considered by Hörisch et al. (2014), which considers the stakeholder theory relevant to education as a tool to reach sustainability based on value creation. Overall, the different critical elements of the literature seen as relevant in the different clusters are related to the behaviors of the different corporations to maintain the equilibrium on profit maximization while also protecting the environment. In this context, the equilibrium is toward having higher sustainability. In this context, it is essential to realize the relevance of concepts such as corporate governance, sustainable business models, corporate social responsibility, and regulations related to the environment (Orlando Ed.

2022). In this context, the critical role of the board of directors and integrated reporting. To keep its competitive edge, the company must develop a sustainable economic and environmental strategy (Hichri, 2021).

6. Conclusions

Businesses and society are increasingly interested in corporate governance and sustainability because of their relevant implications. Therefore, exploring their characteristics and implications for businesses and society is essential. In this respect, we conducted a bibliometric analysis of the literature on corporate governance and sustainability to identify the most relevant key concepts and elements in this literature. In addition, this work has various elements of innovation; specifically, focusing on co-occurrence networks of keywords identifying some relevant concepts in literature and their implied analyses is very relevant.

So this work innovates the existing literature by considering a methodology based on bibliometric analysis - considering bibliometric network data useful to identify the different communities and then combining the results for different algorithms for community detection.

Another contribution of this work is related to an improved comprehension of corporate governance issues and sustainability. In particular, it seems very relevant to observing and interpreting the cluster structure and the entire co-occurrence network. In this way, we were able to better put light on the complex theme of the role of the stakeholders and sustainable strategies (in this sense, we have expanded the previous results by Naciti et al. 2022).

The strategies toward sustainability and the stakeholder's role should be contextualized in concrete business dynamics. In this respect, the different clusters can be interpreted as concrete strategic themes which can be considered for the entire corporate toward long-term sustainability. As a result, it is possible to determine a corporate responsibility strategy that considers social, economic, and environmental activities (for example, to increase a company's reputation, see Sanchez-Torné et al. 2020). Regarding voluntary actions companies take, corporate social responsibility (CSR) and sustainability are intertwined concepts. The benefits of focusing on sustainability include lowering costs, managing risks, and establishing a positive reputation with consumers. According to Freeman & Dmytriyev (2017), CSR can be seen as part of corporate responsibilities that include all the stakeholders. In this sense, it can be used to develop concrete strategic options based on observations of stakeholder centrality.

Furthermore, the global co-occurrence network regarding stakeholder and corporate social responsibility keywords can be explicitly analyzed. Hence, corporate social responsibility and stakeholders play a central role in this literature, resulting in long-term sustainability with appropriate strategies (which can also be found in other communities). Another relevant strategic element that arises from the analysis of the single communities identified is the board's primary role in integrated reporting (Hichri 2021; Mahmood et al. 2008) is to provide a specific overview of the company's financial and non-financial performance within a single report (in this sense also the environmental impact). Integrated reporting allows a company the capacity to provide a more comprehensive picture of its risks and opportunities and global performance and impact on stakeholders (Adhariani & de Villiers 2018). In addition, the management board is responsible for reviewing the company's strategic direction (Wommack, 1979) and ensuring that financial and non-financial performance reports are transparent and accurate.

The two final clusters are possibly the most innovative because they are less expected than the first. In this sense, the role of intellectual capital is very relevant. Intellectual capital's role in the corporate (see Dumay 2013; Alvino et al. 2020; Dal Mas 2019) leads to a better sustainability impact. On the other hand, human capital is a critical factor in the successful long-term sustainability of the firm, so corporate governance should consider these processes (for a connection between corporate governance and human resource management, see Martin et al. 2016).

At the same time, the Triple Bottom Line approach (allowing the corporate to focus on both environmental and also social issues where they continue to generate profits see Hussain et al. 2018) should be considered as an approach to measure the progress toward sustainability and enhanced by adequate corporate governance leading to obtaining specific results on this field. So in this sense, this methodology can be crucial to identify adequate practical approaches to allow corporate progress toward sustainability. Sustainability refers to economic, social, and environmental issues that must be balanced as part of a comprehensive corporate or business strategy (Gavana et al., 2018). This strategy aims to take a broader perspective on value creation in a business, as opposed to a narrow focus on profit accumulation. A company must always consider how its activities impact all stakeholders, such as employees, clients, suppliers, investors, and community members (see Freeman 1984). A more wholesome view of value creation aims to provide companies with better financial results and serve society's environment and social well-being.

In this respect, the role of corporate governance is also essential (see Fortuna 2010, Shrivastava & Addas 2014). According to Freeman & Reed (1983), a stakeholder can be a shareholder, an employee,

a consumer, a supplier, or a community member. These individuals or groups can influence or be affected by an organization's activities (Freeman 1984; Freeman & Reed 1983; Pesqueux & Ayadi 2005). So, in general, every agent is interested in the company's growth and success (Mercier 1999). Although a greater involvement of independent directors and an improved board discipline could lead to improved sustainability performance (Shristava & Addas 2014), it may vary depending on the perspective of different stakeholders.

Shareholders, for example, might be concerned about the company's long-term financial success and see an increase in sustainability as evidence that the company is making efforts to manage its environmental and social impacts responsibly. This could lead to better financial performance for the company, boosting investor confidence. Improvements in sustainability can also benefit employees by promoting a more favorable work atmosphere and increasing job security. Commitment to sustainability can also strengthen consumer loyalty and lead to better sales for companies with a strong environmental commitment.

However, the impact of a company's sustainability initiatives on suppliers and the local community can vary. It is conceivable that a company's improved sustainability performance could have a detrimental impact on its suppliers. On the other hand, it is possible to suppose a company's sustainability initiatives positively affect the local community, for example, by reducing pollution or increasing spending on social programs. In that case, this can be considered a positive outcome for the community. Stakeholders' reactions to a project are generally determined by their circumstances and interests. Several instruments have been identified to advance long-term sustainability in corporate governance, considering the different actors in the process (first and foremost, the stakeholders). As a result, integrated reporting, triple bottom line, and intellectual capital can be critical to long-term sustainability. This work has limitations due to its focus, which can include stakeholder activity directly in future work. Future work should explore stakeholders' roles in the explicit context relationship between corporate governance and sustainability. In this respect, it may be necessary to go a step further from analyzing the actor roles and the different business and corporate strategies toward sustainability (see also Naciti et al. 2022).

As for policy issues, environmental standards can be introduced to address environmental protection and sustainability. To significantly impact the environment, environmental standards must also achieve high adoption rates (see Papyrakis & Tasciotti 2021). Sustainability can also be promoted through transparent and accountable corporate reporting. Accountability and transparency are essential in this regard (see, for example, Karagiannis et al. 2009). In this respect, policy measures

such as financial incentives can be considered a tool to encourage and promote sustainable practices. However, more importantly, stakeholders must be actively involved to ensure the success of this process. This could be a key point because the success of creating more sustainable, economically valuable, and growing business sit on stakeholder engagement.

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Query performed

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Query performed on Scopus 20/9/2022

1,209 document results
TITLE-ABS-KEY ("Corporate Governance" "Sustainability" )
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Table 1. Descriptive Results

MAIN INFORMATION ABOUT DATA

Timespan	1994 : 2022
Sources (Journals, Books, etc)	566
Documents	1209
Annual Growth Rate %	24.92
Document Average Age	4.61
Average citations per doc	17.07
Average citations per year per doc	2.779
References	74271

DOCUMENT TYPES

article	879
book	37
book chapter	130
conference paper	85
conference review	2
editorial	4
erratum	2
letter	1
note	1
review	67
short survey	1

DOCUMENT CONTENTS

Keywords Plus (ID)	1325
Author's Keywords (DE)	2686

AUTHORS

Authors	2601
Author Appearances	3063
Authors of single-authored docs	272

AUTHORS COLLABORATION

Single-authored docs	309
Documents per Author	0.465
Co-Authors per Doc	2.53
International co-authorships %	22.66

Annual Scientific Production

Year	Articles
1994	1
2000	2
2001	4
2002	3
2003	6
2004	5
2005	13
2006	12
2007	9
2008	19
2009	19
2010	17
2011	29
2012	31
2013	36
2014	53
2015	63
2016	65
2017	78
2018	87
2019	143
2020	163
2021	184
2022	167

Annual Percentage Growth Rate 20.05569

Most Productive Authors

	Authors	Articles	Authors	Articles Fractionalized
1	KOCMANOVÁ A	13	VELTE P	8.83
2	VELTE P	11	CAMILLERI MA	6.00
3	KOCMANOVA A	10	SJÅFJELL B	6.00
4	SJÅFJELL B	8	KOCMANOVÁ A	5.00
5	NEMECEK P	7	NA NA	4.00

6	REZAEE Z	7	CLARKE T	3.33
7	CAMILLERI MA	6	KOCMANOVA A	3.33
8	DOČEKALOVÁ MP	6	REZAEE Z	3.03
9	GENNARI F	6	GALBREATH J	3.00
10	SALVIONI DM	6	LIYANAGE SIH	3.00

Top manuscripts per citations

	Paper	DOI	TC	TCperYear	NTC
1	LAZONICK W, 2000, ECON SOC	10.1080/030851400360541	1201	52.2	2.00
2	MICHELON G, 2012, J MANAGE GOV	10.1007/s10997-010-9160-3	417	37.9	13.90
3	KOLK A, 2008, BUS STRATEGY ENVIRON	10.1002/bse.511	406	27.1	8.02
4	KRÜGER P, 2015, J FINANC ECON	10.1016/j.jfineco.2014.09.008	398	49.8	11.05
5	ALI W, 2017, CORP SOC RESPONSIB ENVIRON MANAGE	10.1002/csr.1410	358	59.7	15.83
6	FRIAS-ACEITUNO JV, 2013, CORP SOC RESPONSIB ENVIRON MANAGE	10.1002/csr.1294	341	34.1	13.95
7	HUSSAIN N, 2018, J BUS ETHICS	10.1007/s10551-016-3099-5	311	62.2	16.09
8	BEN-AMAR W, 2017, J BUS ETHICS	10.1007/s10551-015-2759-1	281	46.8	12.43
9	NEUBAUM DO, 2006, J MANAGE	10.1177/0149206305277797	255	15.0	3.83
10	CHATTERJI AK, 2016, STRATEGIC MANAGE J	10.1002/smj.2407	230	32.9	6.51

Corresponding Author's Countries

	Country	Articles	Freq	SCP	MCP	MCP_Ratio
1	ITALY	67	0.0809	58	9	0.1343
2	UNITED KINGDOM	61	0.0737	42	19	0.3115
3	USA	61	0.0737	49	12	0.1967
4	AUSTRALIA	57	0.0688	43	14	0.2456
5	SPAIN	57	0.0688	46	11	0.1930
6	CHINA	52	0.0628	34	18	0.3462
7	MALAYSIA	45	0.0543	35	10	0.2222
8	KOREA	32	0.0386	26	6	0.1875
9	SOUTH AFRICA	32	0.0386	29	3	0.0938

10	GERMANY	29	0.0350	23	6	0.2069

SCP: Single Country Publications

MCP: Multiple Country Publications

Total Citations per Country

	Country	Total Citations	Average Article Citations
1	USA	1856	30.43
2	SPAIN	1832	32.14
3	UNITED KINGDOM	1698	27.84
4	ITALY	1467	21.90
5	AUSTRALIA	1395	24.47
6	FRANCE	1340	121.82
7	GERMANY	856	29.52
8	PAKISTAN	637	42.47
9	CANADA	634	39.62
10	CHINA	624	12.00

Most Relevant Sources

	Sources	Articles
1	SUSTAINABILITY (SWITZERLAND)	123
2	CSR SUSTAINABILITY ETHICS AND GOVERNANCE	32
3	BUSINESS STRATEGY AND THE ENVIRONMENT	29
4	CORPORATE GOVERNANCE (BINGLEY)	28
5	JOURNAL OF CLEANER PRODUCTION	28
6	CORPORATE SOCIAL RESPONSIBILITY AND ENVIRONMENTAL MANAGEMENT	23
7	JOURNAL OF BUSINESS ETHICS	23
8	THE CAMBRIDGE HANDBOOK OF CORPORATE LAW CORPORATE GOVERNANCE AND SUSTAINABILITY	21
9	CORPORATE OWNERSHIP AND CONTROL	16
10	CORPORATE GOVERNANCE: AN INTERNATIONAL REVIEW	14

Most Relevant Keywords

	Author Keywords (DE)	Articles	Keywords-Plus (ID)	Articles
1	CORPORATE GOVERNANCE	550	SUSTAINABILITY	161
2	SUSTAINABILITY	260	SUSTAINABLE DEVELOPMENT	156
3	CORPORATE SOCIAL RESPONSIBILITY	191	GOVERNANCE APPROACH	109
4	SUSTAINABILITY REPORTING	70	CORPORATE GOVERNANCE	85
5	CORPORATE SUSTAINABILITY	64	CORPORATE STRATEGY	69
6	SUSTAINABLE DEVELOPMENT	55	CORPORATE SOCIAL RESPONSIBILITY	53
7	BOARD OF DIRECTORS	35	INDUSTRIAL MANAGEMENT	43
8	ESG	35	STAKEHOLDER	41
9	FINANCIAL PERFORMANCE	34	FINANCE	25
10	GOVERNANCE	34	DECISION MAKING	24

Table 2. The 20 most cited articles

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HANIFFA, R.M., COOKE, T.E., THE IMPACT OF CULTURE AND GOVERNANCE ON CORPORATE SOCIAL REPORTING (2005) JOURNAL OF ACCOUNTING AND PUBLIC POLICY, 24 (5), PP. 391-430	29
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MCWILLIAMS, A., SIEGEL, D., CORPORATE SOCIAL RESPONSIBILITY: A THEORY OF THE FIRM PERSPECTIVE (2001) ACADEMY OF MANAGEMENT REVIEW, 26 (1), PP. 117-127	22

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Table 3. The 20 most cited authors

	[,1]
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SERAFEIM G	299
SHLEIFER A	265
CARROLL A B	248
GARCÍA SÁNCHEZ I M	248
GRAY R	243
MICHELON G	239
DEEGAN C	224
MECKLING W H	222
DE VILLIERS C	203
IOANNOU I	187
PORTER M E	186
ECCLES R G	184
JO H	184
FAMA E F	175
KOLK A	173

PATTEN D M	173
ELKINGTON J	169
BERRONE P	154

Figure 1. Co-occurrence of the keywords network

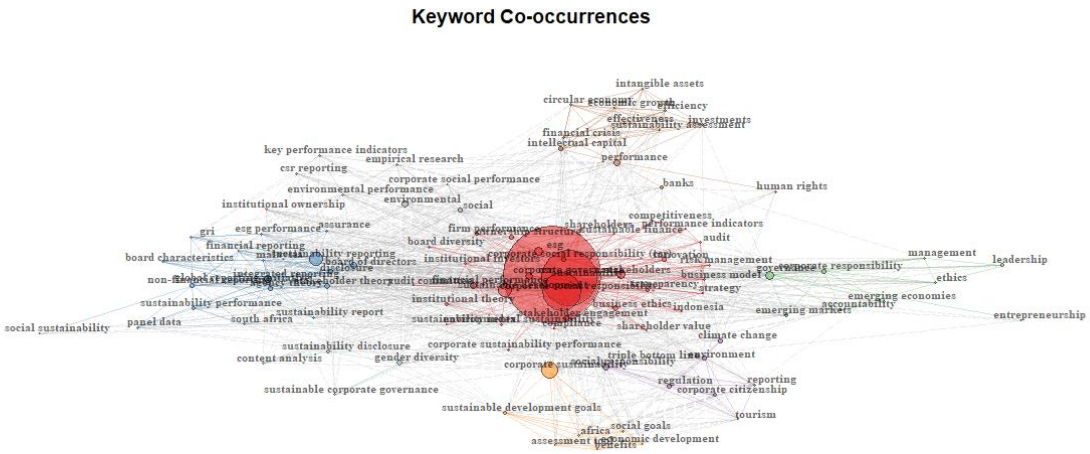

Figure 2. Network degree distribution

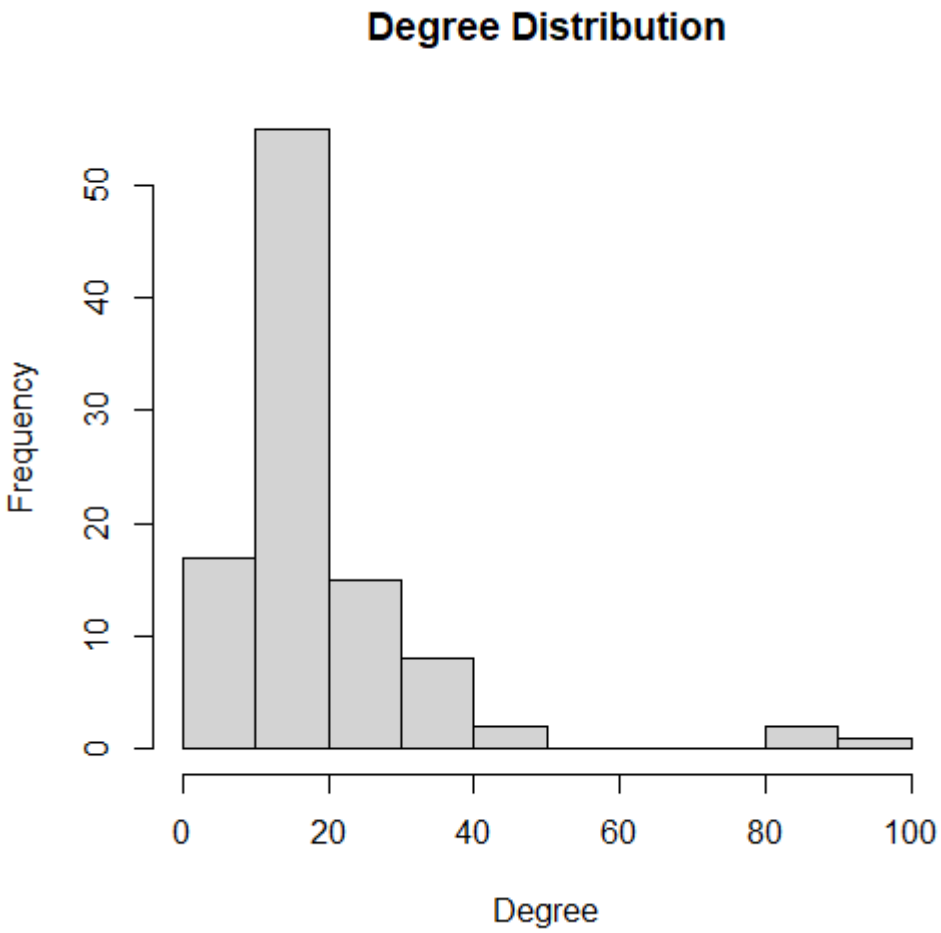

Table 4 Network Node centrality

```
degree
```

corporate governance	97
sustainability	89
corporate social responsibility	82
corporate sustainability	48
sustainable development	45
sustainability reporting	40
board of directors	39
integrated reporting	38
governance	35
financial performance	32

	betweenness
corporate sustainability	334.3498
sustainability	269.1736
corporate social responsibility	246.0455
stakeholders	228.8161
governance	219.3421
performance	207.3055
csr	204.4091
sustainable development	197.3184
board of directors	128.5152
integrated reporting	120.7785

	closeness
corporate sustainability	0.005917160
corporate social responsibility	0.005649718
governance	0.005649718
sustainable development	0.005524862
board of directors	0.005524862
csr	0.005524862
performance	0.005494505
disclosure	0.005464481
social responsibility	0.005434783
environment	0.005434783

Figure 3. Topic Dendrogram of the Ensamble Community Detection

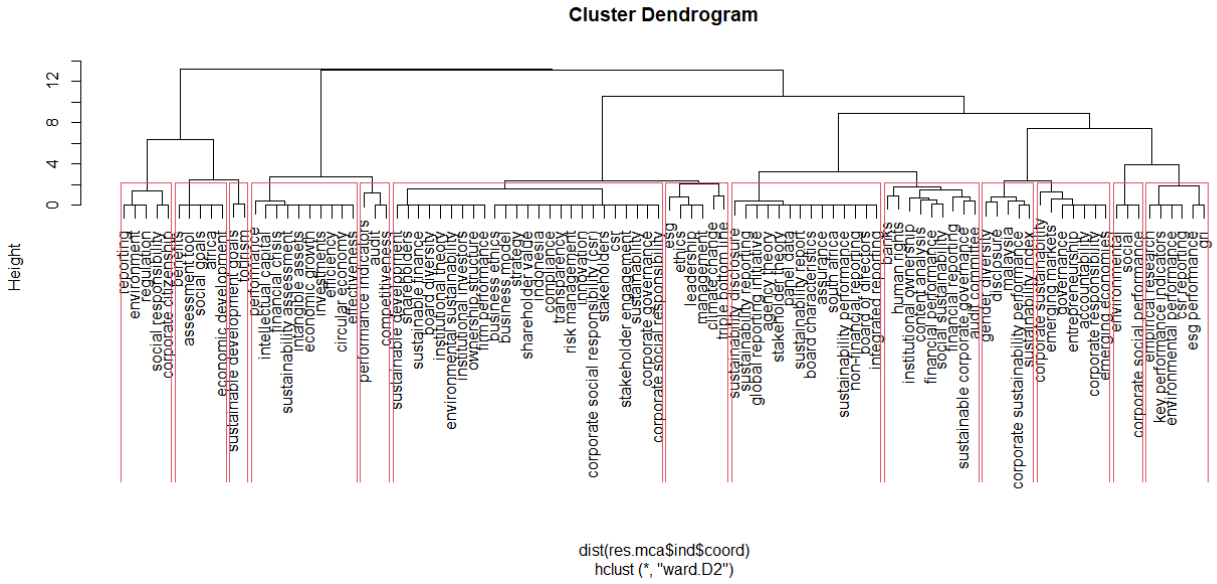

Figure 4. Silhouette plot – validation of the clustering obtained

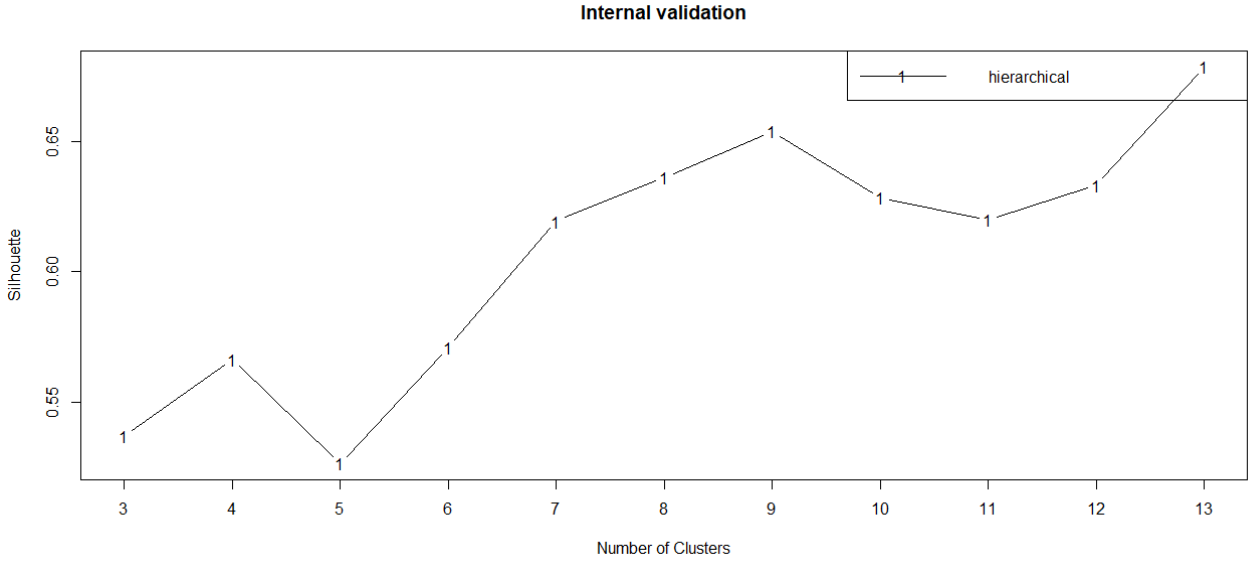

Figure 5. Concptual Structure Map – method considered MCA

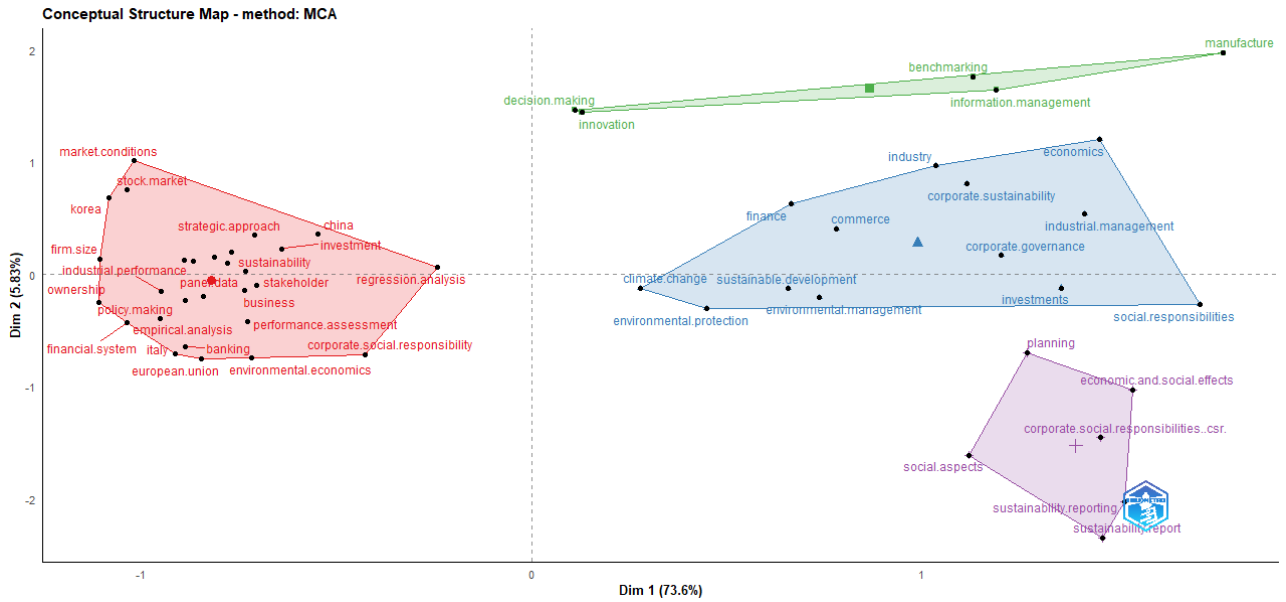

Figure 6. Topic Dendrogram

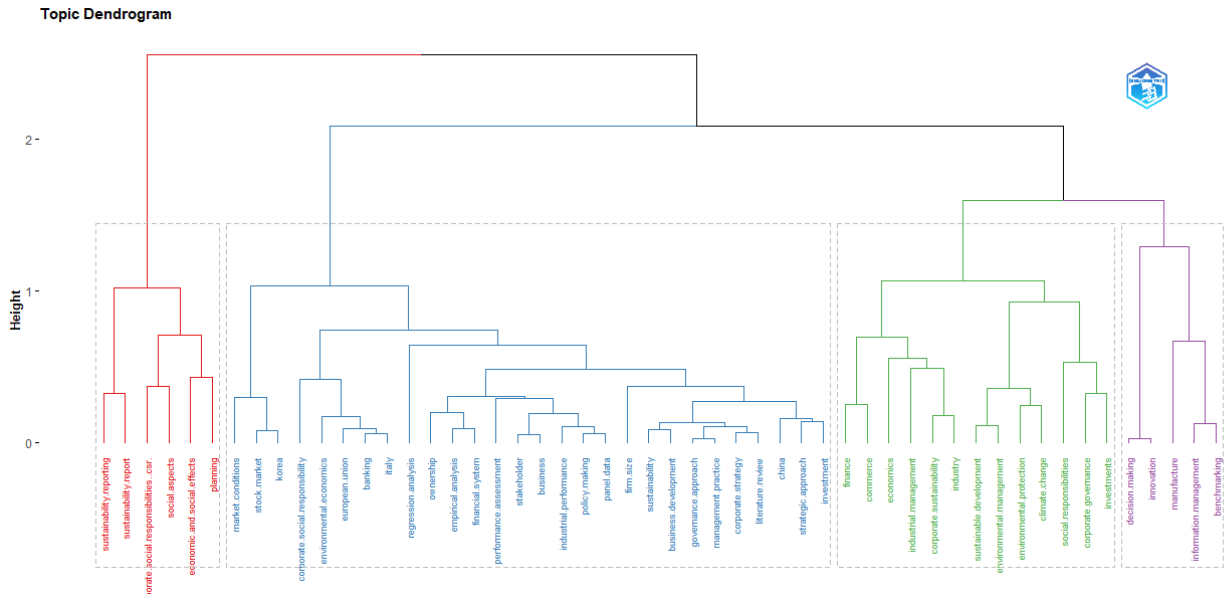

Table 5. The keywords and their memberships for each cluster

Keyword	Cluster	Betweenness	Degree
corporate governance	1	18.91042018	97
sustainability	1	269.1736284	89
corporate social responsibility	1	246.0454806	82
sustainable development	1	197.3183805	45
stakeholders	1	228.8161182	31
Csr	1	204.4091226	31
stakeholder engagement	1	50.31616444	23
business ethics	1	69.25761033	19
innovation	1	11.19928082	12
ownership structure	1	77.52745537	19
corporate social responsibility (csr)	1	82.03686309	16
firm performance	1	25.35118527	12
institutional investors	1	34.95363365	15
environmental sustainability	1	37.50581746	12
risk management	1	17.95773845	11
transparency	1	54.52855316	17
board diversity	1	9.02061611	9
indonesia	1	3.62452691	7
shareholder value	1	6.02913195	8
sustainable finance	1	8.76434344	8
strategy	1	11.3985149	8
business model	1	22.81454034	11
shareholders	1	25.24380965	11
sustainability reporting	2	107.6307929	40
board of directors	2	128.5151642	39
integrated reporting	2	120.7785194	38
stakeholder theory	2	93.3392755	29
global reporting initiative	2	34.67400946	18
agency theory	2	35.67032068	24
sustainability disclosure	2	21.82973133	18
sustainability performance	2	11.45421928	16
non-financial reporting	2	97.28297593	24
south africa	2	45.73969139	16
assurance	2	17.66143257	15
sustainability report	2	38.88509316	14

financial reporting	2	56.24255518	18
panel data	2	30.95998477	11
corporate sustainability	3	334.3498282	48
governance	3	219.3421022	35
corporate responsibility	3	77.43176299	24
emerging economies	3	2.6317645	10
accountability	3	30.19499333	16
entrepreneurship	3	0.73952964	4
esg	4	74.22912092	28
leadership	4	1.08225108	8
malaysia	4	29.86656652	15
institutional theory	4	33.41799958	15
emerging markets	4	33.60273852	14
compliance	4	8.8155065	10
management	4	22.57532032	13
ethics	4	12.08038791	13
sustainability index	4	14.55508388	9
performance indicators	4	14.04234324	10
financial performance	5	104.4547683	32
gender diversity	5	52.52967401	20
disclosure	5	104.7502178	28
board characteristics	5	22.56722296	13
corporate sustainability performance	5	4.68453803	8
sustainable corporate governance	5	18.97936501	10
audit committee	5	13.52494122	11
content analysis	5	20.38533252	13
institutional ownership	5	49.24924635	17
social sustainability	5	1.27732517	5
social responsibility	6	110.9554116	30
environment	6	101.7969768	28
regulation	6	53.78880138	23
reporting	6	37.77394605	20
corporate citizenship	6	53.00615513	22
performance	7	207.305499	31
intellectual capital	7	91.05422791	23
financial crisis	7	58.09218308	19
circular economy	7	20.76745313	12
effectiveness	7	32.90014655	14
efficiency	7	36.74598114	14
investments	7	18.09193383	13
economic growth	7	36.74598114	14
intangible assets	7	0.07692308	10
sustainability assessment	7	36.56082924	12
environmental	8	46.57216629	23
social	8	59.33769931	23
corporate social performance	8	13.12510112	15
climate change	9	64.02986998	18

triple bottom line	9	46.56787269	16
environmental performance	10	40.11579082	19
esg performance	10	21.44877387	19
gri	10	18.44960876	15
csr reporting	10	41.54308282	16
key performance indicators	10	3.5758185	12
empirical research	10	26.01211272	16
banks	11	13.19905106	12
human rights	11	19.3896472	8
audit	11	31.93721722	11
competitiveness	11	19.1637148	9
sustainable development goals	12	67.49821301	22
tourism	12	8.36784282	15
africa	13	12.03679048	15
economic development	13	5.46998658	15
social goals	13	10.30034078	16
assessment tool	13	12.03679048	15
benefits	13	12.03679048	15

Table 6. Average Betweenness and Degree for each cluster considered in the analysis

Cluster	Betweenness	Degree
1	74.44360591	25.7826087
2	60.04741184	22.85714286
3	110.7816635	22.83333333
4	24.42673185	13.5
5	39.24026314	15.7
6	71.46425818	24.6
7	53.83411581	16.2
8	39.67832224	20.33333333
9	55.29887134	17
10	25.19086458	16.16666667
11	20.92240757	10
12	37.93302792	18.5
13	10.37613976	15.2

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