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# Impacts of innovation and diversity on company value: a bibliometric analysis and systematic literature review

Carlos Henrique Firmino de Oliveira[1] and Michele Nascimento Jucá [2]

Mackenzie Presbyterian University, São Paulo, SP, Brazil[1]

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Corresponding author: Carlos Henrique Firmino de Oliveira – 10391343@mackenzista.com.br
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## Abstract

**Objective:** Analyze existing academic literature on the impacts of innovation and diversity on the creation of value and financial performance of companies
**Methodology:** Bibliometric analysis and systematic review. The final sample includes 34 articles, obtained from the Web of Science and Scopus databases.
**Originality/relevance:** The Article carries out a joint analysis of the proxies of innovation, intellectual capital, and diversity as determinants of companies' financial performance and value creation
**Main results:** Suggestion of a future research agenda that proposes i. analyzing the moderating effect of diversity in innovation on company performance, ii. explore the premises of social identity theory to support the study hypotheses, iii. verify the hypotheses using regression models with a binary dependent variable or structural equations, iv. consider alternative proxies for value creation, financial performance, and board diversity, v. analyze data from companies in Latin America with a long time series
**Theoretical contributions:** Literature review on the topics of innovation, board diversity, value creation, and financial performance of companies
**Social/management contributions:** The findings suggest that companies must invest in intellectual capital; product, service, and process innovation; and board diversity as a source of value creation and improvement of their financial performance.

*Keywords:* innovation, diversity, value creation, bibliometric analysis, systematic review

[1] PhD in Business Management at Presbyterian University Mackenzie with doctoral stage at University of Ljubljana. Doutor em Administação de empresas pela Universidade Presbiteriana Mackenzie com estágio doutoral na Universidade de Ljubljana.
[2] Professor at Mackenzie Presbyterian University- Graduate Program in Business Management. Professora Doutora do Centro de Ciências Sociais e Aplicadas. Programa de Pós-Graduação em Gestão de Negócios - da Universidade Presbiteriana Mackenzie. michele.juca@mackenzie.br

## Resumo

### Impactos da inovação e da diversidade no valor das empresas: uma análise bibliométrica e revisão sistemática da literatura

**Objetivo**: Analisar a literatura acadêmica existente sobre os impactos da inovação e da diversidade na criação de valor e no desempenho financeiro das empresas.
**Metodologia**: Análise bibliométrica e revisão sistemática. A amostra final contempla 34 artigos, tendo sido obtidos a partir das bases da Web of Science e Scopus.
**Originalidade/relevância:** O Artigo efetua uma análise conjunta das proxies de inovação, capital intelectual e diversidade como determinantes da performance financeira e criação de valor das empresas.
**Principais resultados**: Sugestão de uma agenda de pesquisas futuras que se proponha a: i. analisar o efeito moderador da diversidade na inovação sobre o desempenho das empresas, ii. explorar as premissas da teoria da identidade social para suportar as hipóteses dos estudos, iii. verificar as hipóteses por meio de modelos de regressão com variável dependente binária ou equações estruturais, iv. considerar proxies alternativas de criação de valor, desempenho financeiro e de diversidade do conselho. v. analisar dados de empresas na América Latina com longas séries temporais.
**Contribuição teóricas**: Revisão da literatura sobre os temas de inovação, diversidade do conselho de administração, criação de valor e performance financeira das empresas
**Contribuições sociais/de gestão**: As pesquisas sobre o tema apontam para a necessidade de as empresas investirem em capital intelectual, inovação de produtos, serviços e processos, assim como na diversidade dos seus conselhos como fonte de criação de valor e melhoria da sua performance financeira.

*Palavras-chave*: inovação, diversidade, criação de valor, análise bibliométrica, revisão sistemática

## Resumen

### Impactos de la innovación y la diversidad en el valor de la empresa: un análisis bibliométrico y una revisión sistemática de la literatura

**Objetivo:** Analizar la literatura académica existente sobre los impactos de la innovación y la diversidad en la creación de valor y el desempeño financiero de las empresas.
**Metodología**: Análisis bibliométrico y revisión sistemática. La muestra final incluye 34 artículos, obtenidos de las bases de datos Web of Science y Scopus.
**Originalidad/relevancia**: El artículo lleva a cabo un análisis conjunto de los indicadores de la innovación, el capital intelectual y la diversidad como determinantes del desempeño financiero y la creación de valor de las empresas.
**Principales resultados:** Sugerencia de una futura agenda de investigación que proponga: i. analizar el efecto moderador de la diversidad en la innovación sobre el desempeño de las empresas, ii. explorar las premisas de la teoría de la identidad social para sustentar las hipótesis de estudio, iii. verificar las hipótesis utilizando modelos de regresión con variable dependiente binaria o ecuaciones estructurales, iv. considerar sustitutos alternativos para la creación de

valor, el desempeño financiero y la diversidad de la junta directiva. v. analizar datos de empresas de América Latina con series de tiempo largas.
**Contribuciones teóricas:** Revisión de literatura sobre los temas de innovación, diversidad del directorio, creación de valor y desempeño financiero de las empresas.
**Contribuciones sociales/de gestión:** Las investigaciones sobre el tema apuntan a la necesidad de que las empresas inviertan en capital intelectual, innovación de productos, servicios y procesos, así como en la diversidad de sus directorios como fuente de creación de valor y mejora de su desempeño financiero.

*Palabras clave:* innovación, diversidad, creación de valor, análisis bibliométrico, revisión sistemática

## Introduction

The end of the 20th century marked the transition from traditional production models to the knowledge economy, where intangible assets became the main sources of wealth generation. This transformation continued into the 21st century, ultimately leading to the Fourth Industrial Revolution (Schwab, 2016). In this phase, connectivity, automation, and artificial intelligence took on an even more significant role in production processes, incorporating increasingly complex and creative activities (Sharma *et al.*, 2024).

The interaction between humans and machines has also intensified across various links in production chains – including customers, suppliers, governments, and financial intermediaries. Consequently, the role of humans in organizations has undergone a redefinition, shifting from complete replacement in repetitive tasks to a new synergy between human and artificial intelligence, generating immeasurable cognitive capabilities that persist today (Anthony *et al.*, 2023). This process creates value by integrating human knowledge and synthetic intelligence (Mudzar & Chew, 2022; Saha *et al.*, 2022; Anthony *et al.*, 2023).

However, measuring companies' ability to adapt and respond in this new environment remains challenging. Identifying a measurable characteristic that can be consistently observed across various organizations is difficult. Some studies consider the amount of investment in research and development (R&D) as a proxy for innovation (Dai *et al.*, 2023), while others develop metrics based on the number of patents a company holds (Pencipe *et al.*, 2023). These approaches

emphasize that innovation arises from the interaction between intellectual capital, organizational environments, and available technologies (Elberdin, 2017; Santos *et al.*, 2018).

Diversity within organizations is also recognized as one of the key determinants of value creation and improved financial performance (Riaz *et al.*, 2019). Most studies focus specifically on diversity within boards of directors (Basher *et al.*, 2022; Mgammal, 2022; Ponumareva *et al.*, 2022). Board diversity refers to variations in members' demographic characteristics – including age, gender, nationality, culture, ethnicity, and language (Mgammal, 2022). In theory, diversity broadens the spectrum of perspectives brought to board discussions, thereby strengthening governance processes (Jensen & Meckling, 1976).

Findings suggest that this variety of perspectives can enhance the development of a company's intellectual capital, positively impacting its reputation, social responsibility, financial performance, and overall value. There are different proxies for measuring diversity, with gender being the most readily available in secondary databases (Riaz *et al.*, 2019; Khatib *et al.*, 2020; Mgammal, 2022). Since 2015, Bloomberg has published a standardized diversity score assessing the composition of corporate boards worldwide. This index evaluates both gender and age diversity and assigns a score. Although relatively recent, this metric has already been used in academic research as a proxy for diversity (Foster *et al.*, 2023).

Another ongoing debate in the literature concerns the distinction between metrics that measure companies' value creation and those that assess financial performance. The diversity of results in this area reflects the complexity of the concept of value, which is inherently linked to the observer's perspective. Some shareholders view value creation as the maximization of short-term dividends, while others emphasize the importance of retaining and reinvesting profits to ensure the distribution of greater dividends over the long term. Examples of value creation or market-based performance metrics include market-to-book value and Tobin's Q (Carton & Hofer, 2006; Hamdam, 2017).

In contrast, metrics derived from financial statements capture observed or historical financial performance. From an accounting perspective, these measures reflect a company's financial results and are often preferred due to their standardization, ease of collection, and comparability (Imam et *al.*, 2013). These metrics — such as return on assets (ROA) and return on equity (ROE) — are widely used by financial analysts (Imam *et al.*, 2013), creditors (Carton & Hofer, 2006; Salehi & Zimon, 2021), and researchers (Marzo, 2022). Even though they are

retrospective, some authors still view these metrics as proxies for value creation (Salehi & Zimon, 2021; Moura *et al.*, 2023), indicating that the separation between value creation and financial performance is an issue that deserves further research.

Therefore, the research problem addressed here is: What are the main characteristics of academic production regarding the impacts of innovation and diversity on companies' financial performance and value creation? In other words, this research aims to map the essential bibliometric aspects of the existing literature and propose a future research agenda on the topic.

This study includes a bibliometric analysis, followed by a systematic review. The bibliometric analysis identifies and counts the frequency and co-citation patterns of documents, authors, journals, and other objective data in the final sample. The systematic review highlights knowledge gaps and proposes future research directions related to the topic (Aria & Cuccurullo, 2017; Forliano *et al.*, 2021; Cicea *et al.*, 2022).

The examined sample includes 34 articles published between 1945 and May 22, 2023, retrieved from the Web of Science (WoS) and Scopus databases. Both methodologies used specialized software, such as RStudio, Biblioshiny, and Rank Words. Furthermore, primary bibliometric laws were observed – Lotka (1926), Bradford (1934), and Zipf (1949).

A distinguishing feature of this study is the examination of the following aspects, which have not been systematically analyzed in previous research using similar methodologies (Elberdin, 2017; Isola *et al.*, 2019; Riaz *et al.*, 2019; Nejjari & Aamoum, 2020; Basher, 2022; Mgammal, 2022; Paoloni *et al.*, 2023): i. The joint analysis of innovation, intellectual capital, and diversity proxies as determinants of companies' financial performance and value creation; ii. Mapping and distinguishing between value creation and financial performance metrics; iii. Analysis of the most common proxies for measuring innovation, intellectual capital, and diversity.

This study contributes to academic knowledge by providing a comprehensive mapping of literature and a systematic review of research on how innovation and diversity affect companies' financial performance and value creation. Companies, investors, and other stakeholders can use the findings to identify the most suitable innovation and diversity proxies for evaluating financial performance and value creation. Governments and regulators may also benefit from the study in designing innovation and diversity policies that align with market expectations.

## Literature review

Innovation and diversity have emerged as two highly valued objectives for organizations responding to market and societal demands. Exploring these two topics is linked to the expectation of generating future value while also enhancing financial performance in the present (Barney, 1991). However, the analysis of this relationship remains a subject of debate in academia. Some studies confirm the existence of a positive relationship (Boadi & Osarfo, 2019; Nawaz & Ohrlogge, 2022), while others find no statistically significant association (Ghafoor *et al.*, 2022; Cheikh & Noubbigh, 2019). Another point of contention concerns the definition of the metrics associated with these constructs, with some research linking innovation to intellectual capital (Li *et al.*, 2021; Nawaz & Ohrlogge, 2022).

### Inovation

Consequently, innovation is connected to the intellectual capital of companies, regarded as its main driver (Nejjari & Aamoun, 2020). According to Nadeem *et al.* (2018), intellectual capital comprises a collection of skills and the relationships between individuals and technologies that can generate wealth and tackle organizational challenges. Its primary components include human, structural, and relational capital. The first aspect represents the human intellect available to the organization, the second reflects the company's organizational knowledge, and the third captures its network of relationships (Quintero *et al.*, 2021). Considering these factors, Pulic (2000) developed a methodology for analyzing intellectual capital, which has since been widely regarded as a proxy for innovation in academic research – the value-added intellectual coefficient (Marzo, 2022; Paoloni *et al.*, 2023).

### Diversity

Diversity is a widely studied topic in the context of boards of directors (Mgammal, 2022). It refers to the composition of boards with members who vary in demographic characteristics such as age, gender, nationality, ethnicity, and phenotype. Academia has empirically examined the relationship between gender diversity in corporate governance and companies' financial and non-financial performance (Riaz *et al.*, 2019; Mgammal, 2022). Some studies also establish a direct link between diversity and innovation (Lahkal *et al.*, 2024). However, the implementation of

diversity on boards remains an ongoing process, with recent regulations introduced in emerging countries to accelerate this transition (B3, 2023).

## Finacial performance

Furthermore, researchers are free to choose between metrics that measure both accounting values – e.g., return on equity (Nawaz & Ohrlogge, 2022) and market values – e.g., Tobin's Q (Bouani & Hrichi, 2021). Thus, some proxies verify the relationship between companies' historical and future results – e.g., market-to-book value ratio and price-to-income ratio (Imam *et al.*, 2013; Erkilet *et al.*, 2022). For this study, metrics that analyze only accounting (historical) data are those that assess the financial performance of firms. Those that consider companies' (future) market value are proxies for value creation. Thus, the term financial performance corresponds to both the financial performance and the value creation of organizations.

## Related theories

From a theoretical viewpoint, the relationship between board diversity, innovation, and companies' financial performance is analyzed through different theoretical lenses. Among the most prominent are agency theory, the resource-based view (RBV), and upper echelons theory. Agency theory identifies that company owners (shareholders) delegate the management of the business to executives. However, managers do not always act in alignment with shareholders' interests, giving rise to natural agency conflicts. To mitigate these conflicts, companies implement corporate governance structures (Jensen & Meckling, 1976; Fama & Jensen, 1983; Eisenhardt, 1989).

Within these governance structures, the board of directors is responsible for defining the organization's strategic direction and monitoring managerial actions, ensuring the representation of different types of shareholders and balancing potential conflicts. The RBV emphasizes that each and every resource is oriented to profit generation, including human capital, whose intellectual capacity should be directed toward innovation (Barney, 1991). Finally, upper echelons theory posits that organizations reflect the personal characteristics of their senior leaders. Consequently, the diversity of these leaders' attributes serves as a predictor of companies' financial performance (Hambrick & Mason, 1984).

# Methodology

## Methods

This study adopts bibliometric analysis and a systematic literature review. Seven steps were implemented: Steps 1 to 4 refer to data collection procedures, step 5 focuses on bibliometric analysis, and steps 6 and 7 relate to the systematic review.

## Data collection procedures

Step 1 – Defining the database. The sample of articles was obtained from the Web of Science (WoS) and Scopus databases. These databases were selected because they are two of the most important and recognized academic data sources worldwide. Studies published in high-impact scientific journals were identified and classified in WoS using the Journal Citation Reports (JCR) index and in Scopus using the CiteScore index.

Step 2 – From the initial to the intermediate sample. The initial sample was obtained by searching for keywords related to the research topic, combined with Boolean operators. These terms were applied to the fields “title, abstract, keywords” in the Scopus database and “Topic” in the WoS database, using the following search string: {(“Intellect*” OR Innovati*) AND (diversity) AND (“value creation” OR “financial performance”) AND (econometr* OR determinan* OR “dependent variabl” OR regress*)}. Next, filters were applied to both WoS and Scopus, limiting the results to the category and document type, selecting only articles.

Step 3 – From the intermediate to the final sample. At this stage, the databases were combined, and duplicate articles were excluded using R Studio software. The main data presented in the unified file included: author names (AU), authors’ defined keywords (DE), keywords defined by WoS and Scopus, citations (CR), publication name (SO), abstract (AB), author addresses (C1), Digital Object Identifier (DOI) (DI), article title (TI), publication year (PY), and funding agency and grant number (FU).

Step 4 – Exclusion of articles unrelated to the defined theme. After defining the intermediate sample, the abstracts, introductions, and conclusions of these articles were reviewed. Articles that were not aligned with the main theme of the study were excluded, resulting in the final sample. The evolution of the final sample is presented in Table 1.

**Table 1**

*Development of the sample*

| Sign | Description | WoS | Scopus |
|---|---|---|---|
| (+) | Identification of the initial sample of articles, considering the following keywords in the fields: "title, abstract, keywords" from the Scopus database and "Topic" from the WoS database: = {("Intellect*" OR Innovati*) AND (diversity) AND ("value creation" OR "financial performance") AND (econometr* OR determinan* OR "*dependent variabl*" OR regress*)} | 71 | 27 |
| (-) | Exclusion of articles that do not consider the following categories: WoS - "Management, Business, Economics or Business Finance" Scopus - "Business, Management and Accounting" or "Economics, Econometrics and Finance" | 14 | 9 |
| (-) | Exclusion of articles not classified as "article" | 6 | 3 |
| (=) | Subtotal | 51 | 15 |
| (-) | Exclusion of duplicate articles in the WoS databases and Scopus | 11 | |
| (=) | Intermediate sample | 55 | |
| (-) | Exclusion of articles whose econometric models have explanatory variables that are not related to the constructs of interest – e.g.: diversity of strategies. | 10 | |
| (-) | Exclusion of articles whose econometric models have a dependent variable other than value creation, financial performance or innovation - e.g.: ESG index | 6 | |
| (-) | Exclusion of articles that address topics other than those of interest to this research – e.g.: macroeconomic growth, history of innovation, etc. | 5 | |
| (=) | Final sample | 34 | |

## Data analysis procedure

Step 5 – Bibliometric analysis. The final sample file was imported into Biblioshiny software, where the articles' metadata – including countries, authors, keywords, institutions, and more – was analyzed to generate and examine relationship/co-citation tables and maps. During this step, social network analysis was also conducted, focusing on the connections, density, and intensity of the keywords – see Figure 1. Additionally, the bibliometric analysis was complemented

by applying the main bibliometric laws, namely: a) Zipf's Law (1949) – categorization and estimation of keyword frequency, using RankWords software, b) Bradford's Law (1934) – verification of journal distribution, and c) Lotka's Law (1926) – identification of the researchers with the highest publication frequency on the defined topic.

Step 6 – Systematic review (part 1): Reading and coding of articles. In this step, the objectives, samples, methods, contributions, and other characteristics of the articles were identified. The articles were classified and coded into non-exclusive categories and subcategories – see Table 2. This non-exclusive classification means that the same article could be assigned to more than one subcategory, which allows the total frequency count to exceed 100%.

Step 7 – Systematic review (part 2): Frequency count and identification of knowledge gaps. After coding the final sample into the (sub)categorization matrix shown in Table 2, a frequency count of the subcategories was conducted to identify knowledge gaps. These gaps were then compared with the subcategories in Category 11 – Avenues for future studies, helping to identify aspects that could be explored in future research on the topic. It is important to note that the subcategories listed in Table 2 represent those with the highest incidence in the final sample. Subcategories with lower occurrences were grouped into the "others" subcategory.

**Table 2**

*(Sub)categorization matrix*

| Categories | Subcategories | Description |
|---|---|---|
| 1. Main theme | A. Impact of diversity on company results | Analysis of the relationship between diversity and value creation or financial performance |
| | B. Impact of innovation or intellectual capital on company results | Analysis of the relationship between innovation or diversity and value creation or financial performance financeiro |
| | C. Impact of diversity on innovation | Analysis of the relationship between diversity and intellectual capital or innovation |
| | D. Moderating effect of diversity on innovation on company results | Analysis of the moderating effect of diversity on innovation concerning value creation or financial performance of companies |
| | E. Other | Other themes not mentioned in subcategories 1A to 1D |
| 2. Theories related to the hypotheses | A. Resource-based view | Explanation of strategic behavior, based on the idea that the selection, acquisition, and disposal of resources and the development of unique competencies – or those that are difficult to imitate – result in differentiation and competitive advantage over competitors (Barney, 1991) |
| | B. Resource dependence theory | Based on the assumption that decisions are made by company leaders – directors and the board of directors – and that they must always consider the environment in which they operate. However, organizations can actively influence the environment to modify it in the most advantageous way possible for value creation (Pfeffer & Salancik, 1978). |
| | C. Upper echelon theory | Executives act based on their personal interpretations of the strategic situations they face. These individualized interpretations arise from their experiences, culture, and personalities. Therefore, organizational results are strongly influenced by the values and cognitive bases of senior leadership members (Hambrick & Mason, 1984) |
| | D. Agency theory | States that there is a conflict of interests between owners (shareholders) and agents (managers). Such conflicts are mitigated through agency costs - e.g., corporate governance mechanisms, debt, reduction of the company's discretionary cash (Jensen & Meckling, 1976) |
| | E. Stakeholder theory | Addresses the role of boards of directors vis-à-vis stakeholders involved in the company's activities (Freeman, 1984). |
| | F. Stewardship theory | States that company managers always seek to maximize their profits and maintain good relationships with their stakeholders. In addition, the theory states that directors are worthy of the role entrusted to them - to strategically manage the company's resources (Donaldson & Davis, 1994). |
| | G. Social identity theory | Clarifies that human beings express themselves according to their social identity and that heterogeneity among individuals can make decision-making difficult (Tajfel, 1978). |
| | H. Not applicable | Articles that do not mention a specific theory |
| | I. Other | Other theories not mentioned in subcategories 2A to 2H. |
| 3. Econometric models | A. Cross-section or pooled regression | This model analyzes differences between individuals at the same time, without considering the time dimension. |
| | B. Regression with static panel data | Model that considers a temporal and a spatial dimension. The same cross-sectional unit is monitored over time |
| | C. Regression with dynamic panel data | Panel data model, whose dependent variable is also an explanatory variable, lagged in time (Wooldridge, 2016). |
| | D. Regression with binary dependent variable | Technique used when there is an interest in verifying the probability of a phenomenon occurring, represented by a dummy variable (0 or 1) (Wooldridge, 2016). |
| | E. Structural equations | Multivariate statistical modeling technique - a combination of factor analysis and regression (Wooldridge, 2016). |
| | F. Other | Other econometric models not mentioned in subcategories 3A to 3E |
| 4. Value creation proxies | A. Market-to-book value | Ratio between the market value (quantity * share price) and the accounting value (net equity) of equity |
| | B. Tobin's Q | Ratio between the company's value and the replacement value of its assets. |

| Categories | Subcategories | Description |
|---|---|---|
| | C. Cash flow | Cash flow Proxies based on the cash flow of companies – e.g., cash flow from operations to total assets (CFOTA); past 5 year volatility of CFOTA etc. |
| | D. Price-to-earnings | Ratio between the market price and earnings per share. |
| | E. Not applicable | Articles that do not use value creation proxies in their models. |
| 5. Financial performance proxies | A. Growth of financial metrics | Metrics that analyze the variation in financial performance of the current period, in relation to the previous one - e.g.: sales growth, profit margin, number of employees, earnings per share, etc. |
| | B. Return on assets | Metric that represents the ratio between the company's operating profit and its total assets |
| | C. Return on equity | Metric that represents the ratio between a company's net income and equity |
| | D. Profit | Metrics that consider the company's profit. Ex. profit before tax, earnings per share (EPS). |
| | E. Other | Other financial performance proxies not mentioned in subcategories 5A to 5D |
| | F. Not applicable | Articles that do not use financial performance proxies in their models. |
| 6. Innovation proxies | A. Value-added intellectual coefficient and its components | Metric based on the premises of the resource-based view, obtained by adding the efficiency indexes of intellectual, structural, and allocated capital. These indexes are obtained from data in the companies' financial statements (Pulic, 2000). |
| | B. Extensions of the value-added intellectual coefficient and its components | Metrics inspired by the value-added intellectual coefficient, which preserves its essence. They should consider other elements of value, such as, for example, the companies' relationship capital |
| | C. Patents | Quantity or variety of patents officially registered by companies |
| | D. Research and development | Expenditures made by companies on research and development of new products and services |
| | E. Customized indexes | Quantitative indexes constructed by the authors - based on (non) financial data - obtained from companies or research entities |
| | F. Other | Other innovation proxies not mentioned in subcategories 6A to 6E |
| **7.** Diversity proxies | A. Gender dummy | Presence of women on the executive board and/or board of directors of companies |
| | B. Gender Index | Ratio between the number of women on the board of directors and the total number of directors |
| | C. Experience | Number of years of experience of executives and/or members of the board of directors performing this function in the company |
| | D. Education | Level of formal education - e.g.: (post)graduate, Ph.D. etc. - or type of training - e.g.: engineering, administration, accounting, technology etc., - of executives and/or members of the board of directors of companies |
| | E. Age | Age of executives and/or members of the board of directors of companies |
| | F. Other | Other diversity proxies not mentioned in subcategories 7A to 7D |
| 8. Data source | A. Global | Data from companies operating in countries located on multiple continents |
| | B. North America | Data from companies operating in the United States, Canada, or Mexico |
| | C. Europe | Data from companies operating in Europe |
| | D. Oceania | Data from companies operating in Oceania |
| | E. Asia | Data from companies operating in Ásia |
| | F. South or Central America | Data from companies operating in South or Central America. |
| | G. Africa or the Middle East | Data from companies operating in Africa or Middle Eastern countries. |
| 9. Period of analysis | A. Up to one year | Period of analysis of up to one year |
| | B. From 2 to 5 years | Period of analysis from 2 to 5 years |
| | C. From 6 to 10 years | Period of analysis from 6 to 10 years |
| | D. From 11 to 15 years | Period of analysis from 11 to 15 years |
| | E. From 16 to 20 years | Period of analysis from 16 to 20 years |
| | F. Other | Other Period of analysis not mentioned in subcategories 9A to 9E |

| Categories | Subcategories | Description |
|---|---|---|
| 10. Results | A. New perspectives | Studies that expand the frontiers of knowledge by presenting a new theory, variable/proxy, research method, or econometric model |
| | B. New conclusions | Studies that bring new conclusions on topics already discussed |
| | C. Conclusions similar to previously presented works | Studies that do not present new perspectives |
| | D. Other | Other results not related to subcategories 10A to 10C |
| 11. Avenues for future research | A. Expansion or regrouping of the sample | Expansion of the sample by including different countries or extending the period of analysis. Regrouping of the sample by industry types, (non) Islamic countries, etc. |
| | B. Moderating effect of governance or diversity | Analysis of the moderating effect of corporate governance or diversity on the innovation capacity of companies - e.g. diversity of nationality, ethnicity, etc. on the boards of directors and senior management of the company |
| | C. Analysis of alternative proxies of intellectual capital or innovation | Analysis of alternative proxies of intellectual capital, such as lagged expenditures on research and development, marketing, etc. |
| | D. Analysis of alternative proxies of financial performance or value creation | Analysis of alternative proxies of financial performance or value creation - e.g. Economic value-added (EVA). |
| | E. Use of other econometric methods | Use of other econometric methods - e.g. Dynamic panel, Structural equations, etc. |
| | F. Use of other theoretical or methodological approaches | Regression models with longitudinal data, qualitative methods, etc. |
| | G. Other | Other future avenues not mentioned in subcategories 11A to 11F |

## Results analysis

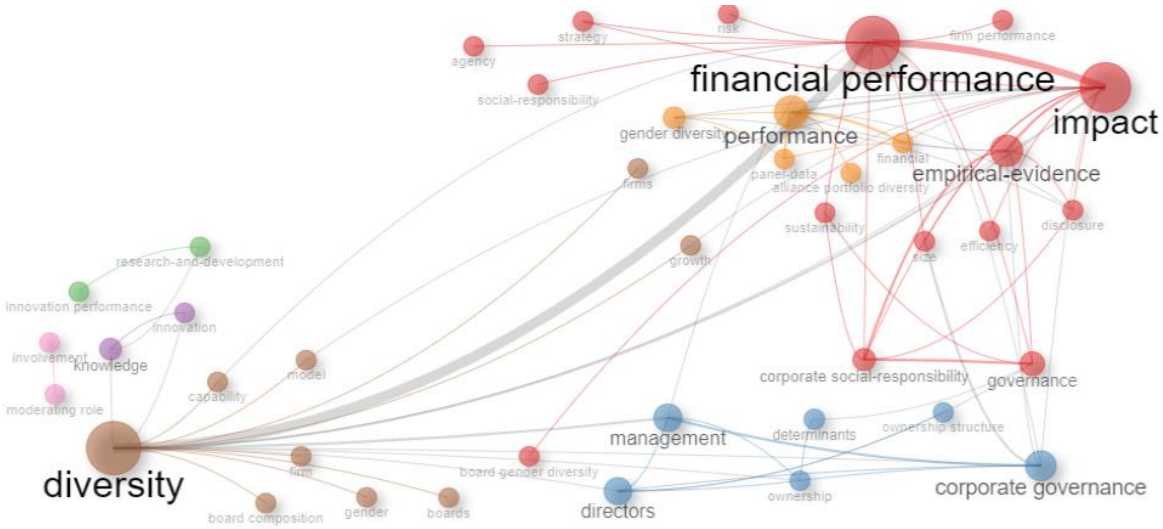
Item 4.1 presents the analysis results and the main bibliometric laws mentioned in Steps 1 to 5. Item 4.2 presents the systematic review results described in Steps 6 and 7.

### Bibliometric analysis

The final sample includes 34 articles, with 33 sourced from the WoS database and 1 from the Scopus database. While the collection period started in 1945 and concluded on May 22, 2023, the oldest article in the sample was published in 2017. Between 2017 and 2023, the number of publications increased, with 8 articles published in 2022. Figure 1 presents the most representative keywords from their thematic groupings or clusters. Regarding the sociobibliometric relationships of the keywords, a network emerges between “financial performance,” “impact,” and “diversity,” highlighting researchers’ concerns about understanding how diversity affects the financial performance of companies.

**Figure 1**

*Occurrence map of the main keywords*




*Source:* Biblioshiny
*Note:* The diameter of each node indicates the relevance of the corresponding term. The thickness of a line reflects the strength of the connection between the linked nodes. Lastly, each color means a thematic cluster.

Regarding bibliometric laws, Zipf’s Law (1949) analyzes and quantifies the distribution of words in a given text. According to this law, the frequency of any word is inversely proportional

to its classification in the frequency table. Thus, the most frequent word is written about twice as often as the second most common word in the text, three times more often than the third most repeated word, and so on. Equation 1 describes Zipf's first law:

$$r \times f = C \quad (1)$$

Where:
r = order of the series
f = frequency of occurrence
C = constant for any text

Zipf (1949) also highlighted that many words appear only a few times, while a few words are repeated frequently. This law was later revised and modified by Booth (1967), who proposed that low-frequency words occur with the same number of occurrences. Equation 2 illustrates this:

$$I_n = 2I_1 / n\,(n+1) \quad (2)$$

Where:
$I_1$ = number of words with frequency 1
$I_n$ = number of words with frequency n
n = Goffman point, or the transition point between low- and high-frequency words

The two laws mentioned – Zipf and Booth – define the extremes of the word frequency distribution in the text. Therefore, it is reasonable to expect the existence of a region within this distribution where the transition from low to high frequency occurs. Goffman (1970) proposed the hypothesis that the words with the greatest semantic content in the text could be found in this region – known as Goffman's transition region. When testing this hypothesis, Pao (1978) established Equation 3.

$$T = \left(-1+\sqrt{1+8I_1}\right) / 2 \quad (3)$$

Where:
T = Goffman's transition point
$I_1$ = number of words with a frequency of 1

The Goffman T point is identified by sorting the words in descending order using the Rank Words software. Those that are repeated only once are identified to calculate Goffman's T point. Then, the words above the classification indicated by this point are located. For the final sample of 34 articles, the maximum and minimum frequencies of word repetition vary between 53.30 and 32.15, respectively.

Table 3 displays the top 10 articles in descending order of Goffman's T-point. The transition point of the words ranges from 53.30 to 41.48, with an average of 45.19. In the case of the article by Garcia-Sanches *et al.* (2020), the one with the highest Goffman's T-point, there are 1,447 words whose repetition frequency is equal to 1 – e.g.: "usefulness," "tobit," "sensibility." The calculation of Equation 3 results in the value of 53.30 = ("-1+" $\left(-1+\sqrt{1+8*1447}\right)$ / 2). The word that comes closest to this frequency is "directors."

Garcia-Sanches *et al.* (2020) aim to identify the profile of board members who may be favorable to eco-innovation strategies, focusing on the aspects of independence, gender diversity, and environmental specialization. The high-frequency words – repetition above Goffman's T point – identified in the text are: "eco," "innovation," "environmental," "strategies," "design," "companies," and "directors." Not by chance, these words coincide with those defined as keywords by the authors, namely: "board of directors," "CSR committee," "eco-design," "eco-innovation," "environmental innovation," "environmental policy," "female directors," and "independent directors."

**Table 3**

*Goffman's T*

| Position | Author | Goffman's T |
|---|---|---|
| 1 | Garcia-Sanches *et al.* (2020) | 53.30 |
| 2 | Hoskins and Carson (2022) | 47.42 |
| 3 | Smriti & Das (2022) | 45.61 |
| 4 | Dai *et al.* (2023) | 45.48 |
| 5 | Prencipe *et al.* (2023) | 45.11 |
| 6 | Zhang *et al.* (2022) | 44.80 |
| 7 | Nicolò *et al.* (2023) | 43.53 |
| 8 | Gangi *et al.* (2023) | 43.32 |
| 9 | He *et al.* (2023) | 41.88 |
| 10 | Farooq and Ahmad (2023) | 41.48 |
| | Average | 45.19 |

*Source:* RankWords

Next, we performed an analysis of the region where the most frequently occurring words related to the main theme were found for each of the 34 articles in the final sample. RankWords

classifies the words in descending order of frequency. Words deemed irrelevant to the study were excluded, such as (in)definite articles, prepositions, adverbs, and pronouns. We then identified the remaining words with the highest occurrence.

Table 4 displays the first 10 articles from each study in descending order based on the frequency of the most repeated word. For instance, He *et al.* (2023) mention "generation" 278 times. The total frequency of the highest words in these 10 articles reaches 1,939. "Generation" represents 14.34% (278/1.39) of this total, the word repeated the most in this subsample. He *et al.* (2023) investigate whether the presence of generation "X" as members of the board of directors has a positive relationship with the company's performance. They analyze the issue of board diversity from the demographic aspect of belonging to a certain age generation of its members.

**Table 4**

*Zipf's law*

| Position | Author | Work | Quantity | Frequency |
|---|---|---|---|---|
| 1 | He *et al.* (2023) | Generation (GEN) | 278 | 14.34% |
| 2 | Azeem *et al.* (2022) | Innovation | 233 | 12.02% |
| 3 | Hoang *et al.* (2020) | Environmental | 199 | 10.26% |
| 4 | Zhang *et al.* (2022) | University-industry alliance portfolio (UIAP) | 196 | 10.11% |
| 5 | Farooq and Ahmad (2023) | Board | 196 | 10.11% |
| 6 | Vincenzi and Cunha (2021) | Innovation | 184 | 9.49% |
| 7 | Dai *et al.* (2023) | Entrepreneurial | 179 | 9.23% |
| 8 | Oware and Appiah (2023) | Innovation | 159 | 8.20% |
| 9 | Smriti and Das (2022) | Board | 158 | 8.15% |
| 10 | Garcia-Sanches *et al.* (2020) | Ecological (ECO) | 157 | 8.10% |
| **Total** | | | **1.939** | **100.00%** |

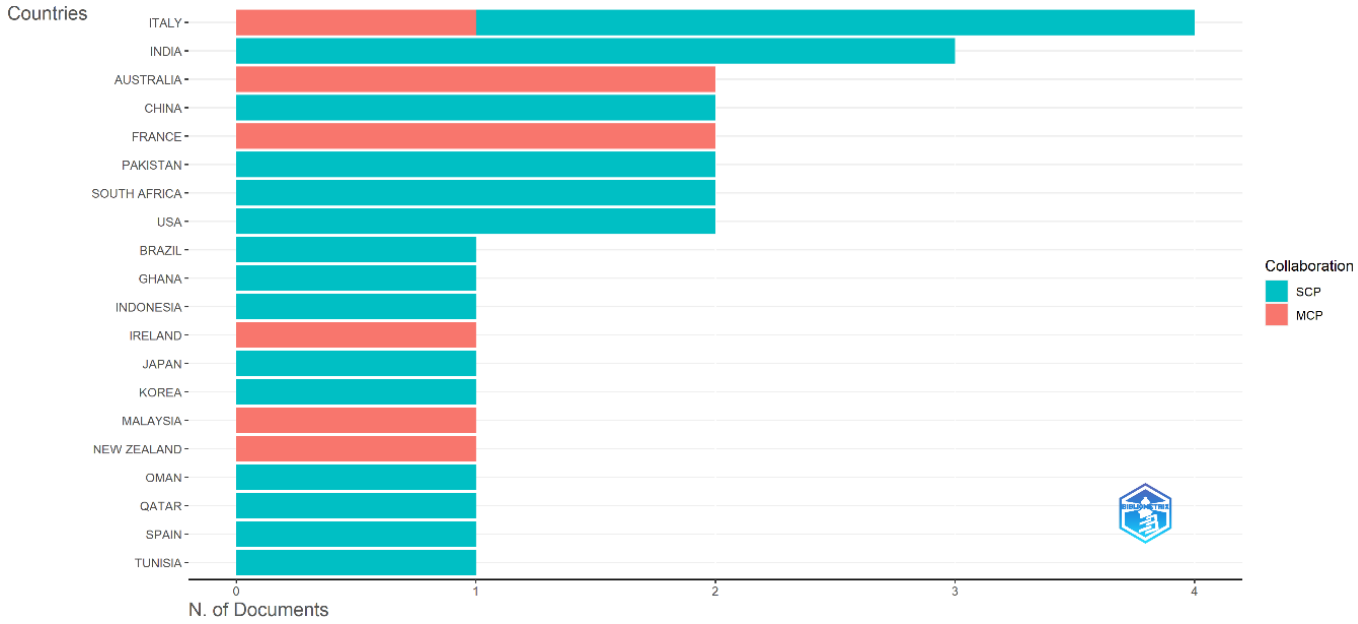
*Source:* Rankwords

Regarding the analysis of the authors, all of them contributed only a single article to the final sample. This fact makes it impossible to investigate Lotka's Law (1926), which states that a small number of authors produce a large number of articles, and that the output of this small group of researchers equals the combined output of all other authors. However, Figure 2 allows us to observe the collaboration between the host countries of the universities with which the authors are affiliated. There is a predominance of collaboration among authors from the same country – single-country publications (SCP) – and fewer works involving authors from different countries –

multiple-country publications (MCP). A possible explanation for this is the greater ease of communication between researchers from the same institution and/or country.

**Figure 2**

*Collaboration between countries in the publication of articles*



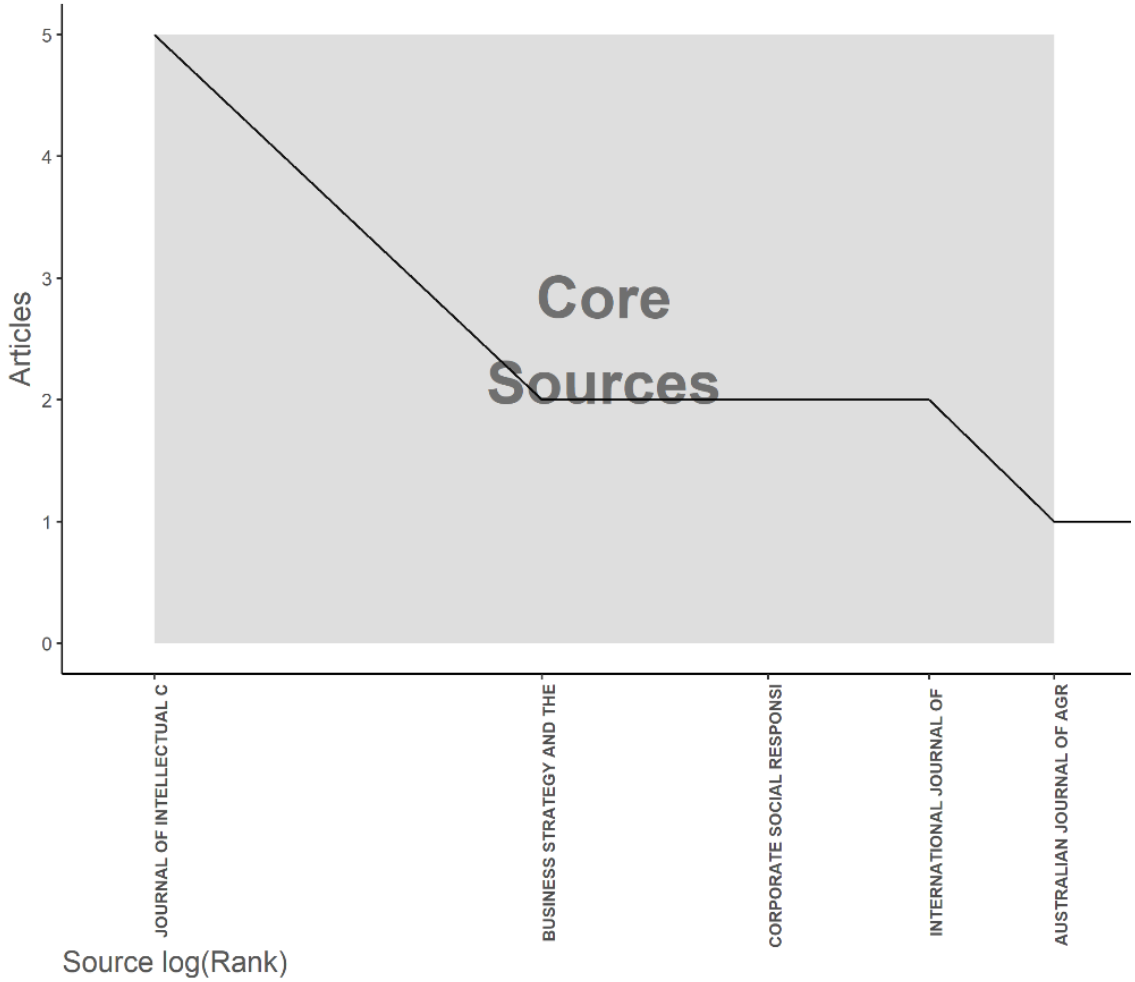

*Source*: Biblioshiny

Figure 3 shows the application of Bradford's Law (1934) to journals. It predicts that few journals produce many articles, while many journals produce few articles on a given topic. Brookes (1969) states that Bradford's Law estimates the degree of relevance of academic journals in specific areas of knowledge. Thus, if journals are classified in descending order of productivity, they can be distributed into zones with a variation of 1: n: $n^2$, and so on. These zones are formed by dividing the total number of articles published into three parts.

In Zone 1, out of a total of 34 articles and 27 journals, 4 (14.8%) journals publish 11 (32.3%) articles. In this zone, the journals range from publishing 2 articles – Business Strategy and the Environment, Corporate Social Responsibility and Environmental Management, and International Journal of Innovation Management – to 5 articles – Journal of Intellectual Capital. Zone 2 overlaps with Zone 3 because all the other journals in the sample published only one article each. Therefore, there are few journals that are notable for publishing articles on the subjects of this research, which confirms Bradford's Law.

**Figure 3**

*Bradford's Law on journals*

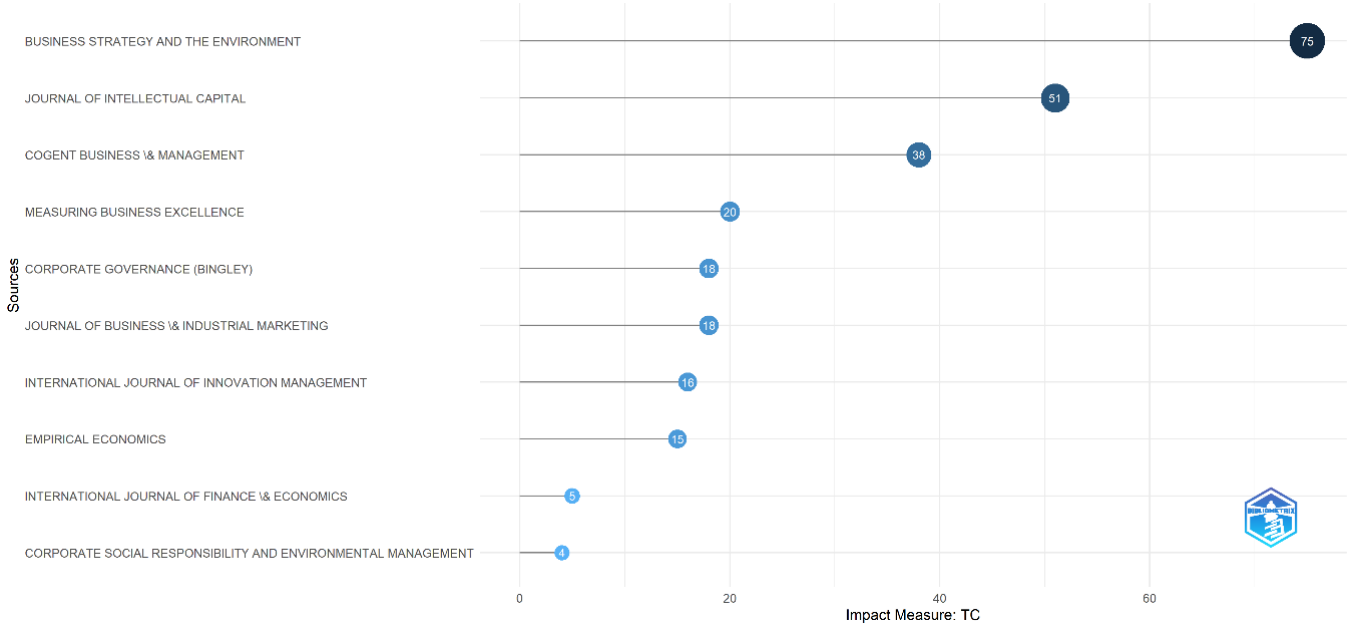



*Source*: Biblioshiny

Figure 4 displays the total citations (TC) received by a specific journal. These citations – also known as global citations – reflect the overall number of citations that an article included in the final sample has garnered from other articles indexed in the WoS and Scopus bibliographic databases. Among the 10 most cited journals, there is a cumulative total of 260 citations. The following journals stand out: Business Strategy and the Environment (75 citations or 28.8%), Journal of Intellectual Capital (51 citations or 19.6%), and Cogent Business & Management (38 citations or 14.6%).

**Figure 4**

*Total citations per journal - TC index*




*Source:* Biblioshiny

In summary, the bibliometric analysis reveals that the terms “financial performance,” “impact,” and “diversity” have the highest densities, representing the points with the most centrality in the social network presented in Figure 1. Regarding Zipf’s Law, the words “generation,” “innovation,” and “environmental” are repeated in the articles listed in Table 4. Regarding Lotka’s Law, its analysis could not be performed since all authors in the final sample published only one article each. Furthermore, Figure 2 highlights that most of the universities to which the authors are affiliated tend to collaborate with co-authors from other institutions within the same country. Regarding Bradford’s Law, Journal of Intellectual Capital stands out, having published five articles in the final sample. The journal with the highest number of citations is Business Strategy and the Environment.

## Systematic review

The systematic review identifies knowledge gaps and points out future research avenues. In this study, the aspects to be examined in greater depth are related to the impacts of innovation and diversity on the creation of value and the financial performance of companies. Steps 6 and 7 of item 3 clarify that, initially, a (sub)categorization matrix is defined (Table 2). After reading the

34 articles in the final sample, they were classified and coded into non-exclusive categories and subcategories. Each article can be classified into up to three subcategories per category. Subsequently, we counted the frequency of the subcategories. The least frequent combinations of subcategories potentially point to knowledge gaps. Figure 5 summarizes these results.

Category 1 presents the main themes of the articles. Subcategory B – Impact of innovation or intellectual capital on company results – has the highest frequency, 41.2% (14/34), followed by Subcategory C – Impact of diversity on innovation – with 32.4% (11/34). Among the subcategories with the lowest frequency are Subcategory A – Impact of diversity on company results (26.5% or 9/34) and Subcategory D – Moderating effect of diversity on innovation and company results – present in only 11.8% (4/34) of the articles. This indicates academic interest in analyzing the interaction between innovation, diversity, and performance constructs, which presents a research opportunity (Khan *et al.*, 2019).

Category 2 analyzes the theories that support the hypotheses of the studies. Subcategory A – Resource-based view – stands out in 32.4% (11/34) of the studies, followed by Subcategory D – Agency theory (29.4% or 10/34) and Subcategory B – Resource dependence theory (26.5% or 9/34). Other theories are less frequent, ranging from 14.7% to 8.8%: Subcategories C – Upper-echelon theory, E – Stakeholder theory, F – Stewardship theory, and G – Social identity theory. This analysis reveals a fragmentation of corporate finance theories associated with the theme of this study. Upper-echelon and agency theories are associated with corporate governance mechanisms, while the resource-based view and resource dependence theory relate board characteristics to the creation of value for companies (Garcia-Sanches *et al.*, 2020; Nawaz & Ohrlogge, 2022).

Category 3 deals with the econometric models used by the articles. In this category, the authors most commonly cite Subcategories B – Regression with static panel data – and A – Cross-section or pooled regression to test their hypotheses – with 38.2% (13/34) and 32.4% (11/34), respectively. This suggests that, despite the natural organization of the data in panel format, the authors resort to non-temporal regression as a viable methodological alternative. In some cases, both methodologies are considered (Churchill *et al.*, 2017; Dalwai & Mohammadi, 2020). Subcategory C – Regression with dynamic panel data – also presents a high frequency in 23.5% (8/34) of the articles. As for the subcategories with the lowest incidence, 5.9% (2/34) of the articles cite Subcategory D – Regression with a binary dependent variable – and Subcategory E –

Structural equations. These percentages indicate that identifying the determinants of the chances of occurrence or simultaneity of an event – such as the high or low probability of value creation or profitability – is promising (Prencipe *et al.*, 2023).

Regarding Category 4 – Value creation proxies – it is worth noting that the most frequently used variable in the articles, at 20.6% (7/34), is Subcategory B – Tobin's Q. The versatility of this proxy is confirmed by the fact that it incorporates market expectations about the company analyzed (Dai *et al.*, 2023). The other proxies represented by Subcategories A – Market-to-book value (5.9% or 2/34), C – Cash flow, and D – Price-to-earnings (2.9% or 1/34) are much less frequently considered in the articles in the final sample. The data reveal that the use of value-creation proxies is already a differentiator, as most articles consider only accounting measures. Only 20.6% (7/34) of the studies in the final sample employ value creation proxies alongside accounting financial performance proxies (Faroouq & Ahmad, 2023).

Category 5 identifies the most used financial or accounting performance proxies. Subcategory B – Return on assets – appears in 44.1% (15/34) of the articles, followed by Subcategory C – Return on equity – with 23.5% (8/34). Subcategories A – Growth of financial metrics – and D – Profit – each appear in 8.8% (3/34) of the articles. Therefore, it is clear that the growth of financial metrics is a proxy that could be further investigated in future research (Zhang *et al.*, 2022).

Category 6 analyzes innovation proxies. A balance is found between the variables, with the most frequent being Subcategory C – Patents (23.5% or 8/34), Subcategory E – Customized indexes (20.6% or 7/34), and Subcategory D – Research and development (17.6% or 6/34). Subcategories A – Value-added intellectual coefficient and its components, and B – Extensions of the value-added intellectual coefficient and its components, appear 11.8% (4/34) and 14.7% (5/34) of the time in the articles, respectively. These results indicate that there is no hegemony in using patents as a proxy for innovation, as companies may focus on other approaches, such as industrial secrets (Hoskins & Carson, 2022). In this sense, intellectual capital efficiency models are adaptable in representing the company's intangible resources (Mardini & Lahiani, 2020).

Category 7, presents the proxies for board diversity. Subcategories B – Gender index and A – Gender dummy – are present in 38.2% (13/34) and 26.5% (9/34) of the articles in the final sample. Subcategories C – Experience – and D – Education appear with a frequency of 8.8% (3/34). Finally, Subcategory E – Age – occurs in only one article (2.9%). This suggests that,

although the issue of gender is extremely relevant to the discussion of diversity, there are other aspects to be tested. Therefore, various age groups, generational affiliations, and the backgrounds of board members can provide fresh insights into the analysis of this topic (Dalwai & Mohammadi, 2020; Dai et al., 2023). In this regard, Bloomberg's diversity assessment of boards shows promise, as it includes factors beyond gender and adheres to a globally recognized and applied methodology. Nonetheless, it is only accessible from 2015 onward.

Category 8 identifies the source of the data in the articles, with 38.2% (13 out of 34) focusing on Asian companies (Subcategory E). Other notable subcategories include G – Africa and the Middle East (17.6% or 6/34), C – Europe (14.7% or 5/34), and A – Global (11.8% or 4/34). Therefore, there is an opportunity to investigate data from companies in Subcategories F – Latin America (5.9% or 2/34) and D – Oceania (2.9% or 1/34) in future studies. The predominance of data from Asia, at the expense of countries traditionally more intensive in academic research, can be justified by the fact that some countries in this region require companies to disclose aggregated information on employee compensation. This information is essential for articles that employ the VAIC methodology. On the other hand, research in underrepresented regions is relevant since these areas have growth potential, enjoy relative institutional stability, and are increasingly integrated into global value chains (Azeem *et al.*, 2022; Moura *et al.*, 2023).

Category 9 shows the period considered in the sample of articles analyzed. The most frequent period is 6 to 10 years (Subcategory C, 29.4% or 10/34), followed by intervals of 2 to 5 years (Subcategory B, 23.5% or 8/34) and 11 to 15 years (Subcategory D, 17.6% or 6/34). Longer periods, between 16 and 20 years (Subcategory E), and cross-sectional data from a single year (Subcategory A), are present in only 11.8% (4/34) of the studies. This suggests that researchers prefer to work with data covering periods longer than five years. This preference is justified by the need for an adequate number of observations that support econometric studies, especially when considering the temporal effect.

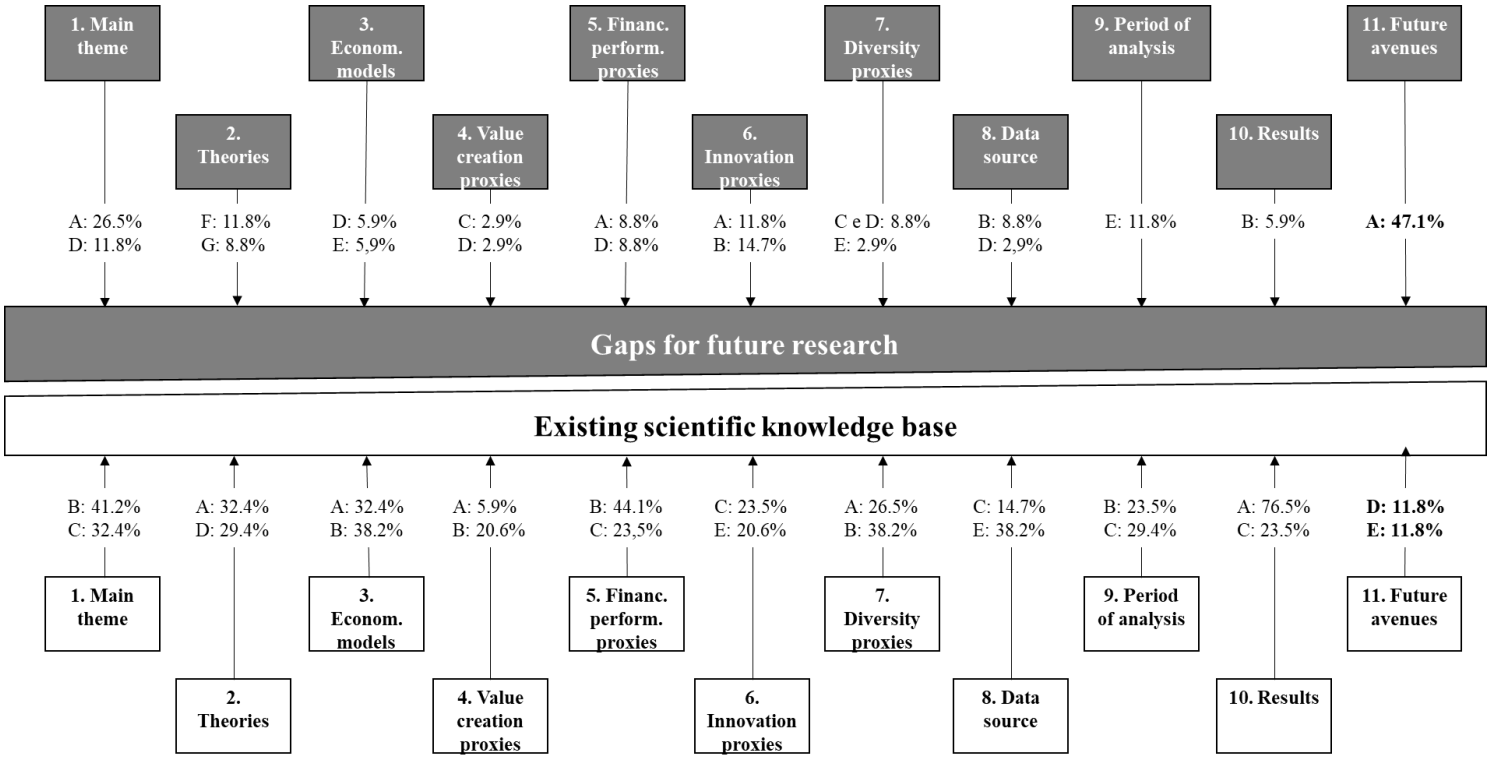
Category 10 analyzes the potential contribution of each article. The most common subcategory is the one that presents new research perspectives (Subcategory A, 76.5% or 26/34). In contrast, 23.5% (8/34) of the articles (Subcategory C) have conclusions similar to previously presented works. This result exposes the opportunity for research that tests different methodologies, samples, and proxies, for example (Steyn & Bruin, 2020; Hermanto *et al.*, 2021).

Category 11 reflects the authors' recommendations for future studies on the topic of their investigations. The most frequent suggestion refers to the expansion or regrouping of the sample (Subcategory A, 47.1% or 16/34). This result corroborates the findings presented in Category 8, where there is a concentration of studies with samples from a single country and several countries on the Asian continent (Subcategory E). On the contrary, there are few studies conducted with companies located in Latin America (Subcategory F), Oceania (Subcategory D), or with global data (Subcategory A). Some authors recommend the analysis of alternative proxies for intellectual capital or innovation (Subcategory C, 23.5% or 8/34). This suggestion aligns with what was observed in Category 6, as such variables are intangible in nature and any representation of them has limitations (Prencipe *et al.*, 2023).

Finally, there is an incentive for studies on moderation variables involving governance or diversity – Subcategory 11B (17.6% or 6/34) and other theoretical or methodological approaches – Subcategory 11F (14.7% or 5/34). These results corroborate those observed in Subcategory 1D, which points to a few studies that analyze the interaction between both explanatory variables. Furthermore, Subcategories 3D and 3E indicate the low frequency of regression models with binary dependent variables and structural equations, respectively (Churchill *et al.*, 2017; Gangi *et al.*, 2023).

**Figure 5**

*Analysis of (sub)categories to identify knowledge gaps*




*Note*: The subcategories at the top are those with the lowest frequency and are subject to future analysis by researchers – with the exception of Category 11 – Future avenues. In this case, the most frequent subcategories suggest avenues for a future agenda.

In summary, the study highlights the opportunity to investigate the moderating effect of diversity on innovation and its impact on the financial performance of companies. This can be explored through frameworks such as upper-echelon or stewardship theories, for example. The study also proposes a research agenda incorporating binary econometric models or structural equations to examine Latin American companies. Among the suggested proxies for diversity and innovation, the education and age of the board of directors stand out, as well as the value-added intellectual coefficient and its extensions. Regarding proxies for financial performance and value creation, the study encourages the analysis of metrics related to the growth of financial results, as well as market-to-book value or price-to-earnings ratios.

## Conclusion

This study investigates the relationship between value creation, innovation, and diversity through bibliometric analysis and a systematic review. The final sample comprises 34 articles, selected from the Web of Science and Scopus databases, based on a search covering the period from 1945 to May 22, 2023. Notably, the first article identified was published only in 2017.

The bibliometric analysis reveals the following key findings: (i) the topic is of contemporary and growing interest, which may explain the limited number of selected articles; (ii) “diversity” and “financial performance” are the most frequent keywords, aligning with the established selection criteria; (iii) no author stands out in terms of the number of publications, as each contributes only a single article in the final sample; (iv) the most cited articles are affiliated with institutions in France, a country traditionally engaged in research on social diversity; (v) Business Strategy and the Environment – a journal focusing on eco-innovation, governance, and other contemporary issues – has the highest number of citations; and (vi) researchers from the University of Teramo have the highest number of publications.

The systematic review indicates that the most frequently investigated topics include: (i) the impact of innovation or intellectual capital on company performance; (ii) the resource-based view as the most cited theoretical framework; (iii) static panel regression as the most widely used econometric model; (iv) Tobin’s Q as the primary proxy for value creation; (v) ROA as the most commonly used proxy for financial performance; (vi) the number of patents as the usual proxy for innovation; (vii) the proportion of women on corporate boards as the main diversity proxy, due to the greater availability of this data compared to other metrics; and (viii) a concentration of studies on Asian companies, attributed to the region’s broader data availability for calculating innovation proxies such as intellectual capital.

The study outlines a research agenda for future studies, suggesting: (i) an examination of the moderating effect of diversity on innovation and its impact on company performance; (ii) the application of social identity theory to support research hypotheses; (iii) the use of regression models with binary dependent variables or structural equation modeling; (iv) the adoption of alternative proxies for value creation (e.g., price-to-earnings ratio, market-to-book value), financial performance (e.g., variation in financial measures), innovation (e.g., value-added intellectual coefficient), and board diversity (e.g., experience, education, combined age and gender metrics); and (v) the analysis of Latin American companies using long time series data.

While other systematic reviews examine the bilateral relationships between the variables of interest, this study distinguishes itself by jointly analyzing diversity, innovation, and intellectual capital as key determinants of financial performance and value creation. Moreover, few empirical studies have explored the moderating effect of diversity on innovation as a factor influencing financial performance and value creation, highlighting the research gaps identified in this study.

This research contributes to academia by providing a comprehensive literature survey and systematic review of studies on the effects of innovation and diversity on financial performance and value creation. The findings can also inform market participants by identifying the most appropriate proxies for assessing these factors. Additionally, governments and regulators can use these insights to develop policies that better align with market needs regarding innovation and diversity.

Regarding its limitations, the study is based on articles from journals that meet the established selection criteria and are indexed in the Web of Science and Scopus databases. Moreover, by focusing exclusively on empirical studies, it may have excluded research using mathematical modeling, surveys, or theoretical essays that offer valuable insights. However, this restriction was necessary to ensure the viability of categories 3 to 7 (Table 2).

## CRediT - Authorship Contribution Statement

| Contribution | Oliveira, C.H.F. | Jucá, M.N. |
|---|---|---|
| Conceptualization | X | - |
| Methodology | X | X |
| Software | X | - |
| Validation | - | X |
| Formal analysis | X | - |
| Investigation | X | - |
| Resources | X | X |
| Data Curation | X | - |
| Writing - Original Draft | X | - |
| Writing - Review & Editing | X | X |
| Visualization | X | X |
| Supervision | - | - |
| Project administration | X | X |
| Funding acquisition | X | X |

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