Mapping Future Trends in Integrated Reporting, CSR and Business Sustainability Research: A Cluster-based Approach

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Abstract

This paper aims to investigate the dependence and independence between the variables inferred in the bibliometric analysis of the literature on corporate social responsibility (CSR), business sustainability (BS), and integrated reporting (IR). In this paper, we undertook a bibliometric analysis with statistical analysis to fulfill the proposed goal, based on scientific papers from 1975 to 2021 indexed by ISI Web of Science and SCOPUS databases on the abovementioned topics. The results are the development of a model for mapping future research directions on IR, CSR, and BS issues using the clustering method. The bibliometric and statistical analysis can help researchers by providing clear guidelines for future studies, depending on the behaviour of research clusters on the IR topic. Previous studies didn't attempt to analyze future research directions of IR from a bibliometric and statistical standpoint, which should be carefully tracked, because IR can offer support to companies by improving their communication with stakeholders.

Keywords: corporate social responsibility; business sustainability; integrated reporting; cluster method; bibliometrics analysis
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Introduction

The internationalisation of business, economic crises, informational requirements, and climate change have considerably altered the current business environment. Companies have reconfigured themselves because sustainability has become the focus of international business and plays an important role in the survival and success of any entity in today's highly competitive and evolving environment (Oncioiu *et al.*, 2018). At the same time, sustainability results from pressure from the business environment. It comes as companies respond to the information requirements of stakeholders, who increasingly focus on the effects of economic activities on the external environment. Since October 2011, the European Commission found that „many European companies have not yet fully integrated social and environmental concerns into their management structures and core strategies and that only fifteen of the twenty-seven Member States have implemented policies to promote CSR" (COM/2011/0681 final). In this context, the issue of communicating non-financial information related to the social, environmental, and economic dimensions to stakeholders has also been raised for these companies through IR as a common tool to ensure BS. In recent decades, the company's communication with external interlocutors was traditionally done through financial reporting, which was and still is mandatory, strongly regulated by accounting standards through annual reports; however, in the new globalized context that is increasingly unstable, this information, although it has become increasingly demanded by stakeholders, is no longer enough, which is why the responsibilities of reporting companies have grown exponentially according to their informational needs, both in terms of quantity and quality. That is why IR has become a necessity and an opportunity for companies that want to improve their relationships with stakeholders honestly.

In light of this, considering the interest of legislators, reporting companies, practitioners, and especially academics, our research aims to identify the relationships of dependence and independence between the variables determined in the bibliometric analysis of the literature on CSR, BS, and IR. To achieve this aim, the following main objectives were set: Objective (1) - to perform a bibliometric analysis of scientific papers indexed by Web of Sciences (WoS) and SCOPUS, with the topic above, using the cluster method and objective (2) – to employ a statistical analysis of the variables considered in the bibliometric analysis to establish correlations between key concepts that define BS, but which have been insufficiently researched or not researched at all.

The bibliometric analysis developed in this paper is noteworthy because it reveals new research streams that will address similar themes, thus representing real support in shaping the research strategy. Based on it, one can monitor the logical and coherent path of the links of different intensities created among the concepts of CSR, business model, multi-stakeholders, firm value, IR, and BS. Depending on the intensity of these linkages, it is possible to objectively assess the contribution of IR to ensuring the sustainability of the firm from the perspective of the three key dimensions, i.e., economic, social, and environmental. Essentially, one of the reasons for this approach has been to outline and highlight the possibilities of translating such means of improving the policies, vision, and mission adopted into firm practice. This is only possible if they consider the strength of the links among the six concepts explored as an essential basis for attracting and retaining stakeholders.

The findings are embodied in a statistical model to assess the frequency and linkages between the concepts/keywords most commonly used in the papers analyzed and obviously to identify new research niches on this topic but from the perspective of less well-defined clusters. The importance of these findings lies in the

fact that they can be particularly useful to researchers who want to address new research paths on the topic of CSR, sustainability, and IR, because, using the statistical model developed in our paper, the links between key variables influencing CSR, sustainability, and IR can be easily and reliably identified and new research insights into the sustainability of business models may be unveiled.

Literature review

The importance of CSR is growing in the face of doubts about the real value of CEOs due to numerous international financial frauds or scandals (Vlad et al., 2011) or financial imbalances caused by global crises. CSR plays a central role in ensuring the long-term sustainability of the business and in consolidating these companies on the reference market (Grosu et al., 2017; Socoliuc et al., 2020), becoming at the same time a way to differentiate themselves and obtain the social license to operate in these markets, which is valid not only for companies characterized by a higher risk exposure but also for all the others. Subsequently, a more pragmatic phase was reached, in the sense that the issue of integrating all information, whether financial or non-financial, into a stakeholder communication format (Cosmulese et al., 2019) that would meet their information needs in the most effective way possible was considered. Thus, over time, there has been a growing interest in non-traditional and non-financial reporting practices that take into account the social and environmental impact of companies, as well as their contribution to sustainable development, as this type of reporting is a useful tool in managing, planning and controlling activities (Unerman et al., 2007, Socoliuc et al. 2018). The names used for stakeholder communication tools have been numerous, ranging from Social Report, Social and Environmental Report, Social Responsibility Report, Corporate Social Responsibility Report, and Sustainability Report (Paternostro, 2013; Mihaila et al., 2020). This is probably also the reason why, in the last decades, international literature has seen an increase in studies aimed at detecting the need for additional reporting tools, compared to traditional financial statement reporting, as it is believed that the value of additional information reduces the information asymmetry between stakeholders and stimulates companies to disclose such information, as it is the only way to strengthen their relationships with stakeholders (Ackerman, 1975; Grossman et al., 1980; Milgrom, 1981; Verrecchia, 1983, 1990, 2001). The need for integration between the traditional perspective and the most innovative reporting tools led to further development through the promotion of integrated financial statements (or IR) by researchers (Serafeim, 2014; De Villiers et al., 2017) and by international bodies concerned with environmental, social and economic issues (IoSDA, 2009; GRI, 2020; IIRC, 2021).

In recent years, we can observe that it needs necessary and increasingly called for by reference markets and stakeholders to promote an integrated vision of an economic company's behavior. This need for non-financial information has been identified in recent years due to the increased volume of sustainability reports published by Global Fortune 250 (KPMG, 2015). In this context, Eccles et al. (2010) identified two main reasons that could determine companies to implement IR, the first being that IR is considered a key element when it comes to seriously reflecting business sustainability through a durable strategy that allows the management of risks and opportunities of a sustainable company. The second reason is that communication, by simplifying it to a single message in a single report, increases the transparency of corporate disclosure (Aboody et al., 2000; Botosan et al., 2002; Heflin et al., 2005). Effective and robust IR involves exploring stakeholder perspectives on the volume and quality of non-financial information and the willingness of companies to adopt such a

view voluntarily. Most research studies developed to date on the topic of IR have focused primarily on entities that have adopted IR and less on the users of these reports (Jensen et al., 2012; Higgins et al., 2014; Cheng et al., 2014; Hess, 2014; Flower, 2015; Cho et al., 2015; Tanasă (Brînzaru), 2020). Of course, when considering IR, we must remember that the main beneficiaries are stakeholders, which is why so much has been written and continues to be written about this group, even substantiating well-known theories such as ownership theory, stakeholder theory, multi-stakeholder theory, etc. Given that the range and numbers of stakeholders and the interests they encompass can be very broad, the reporting company needs to be careful in decision-making directly related to the strategic demands of stakeholders, so the importance of these stakeholders has expanded significantly (Ackoff, 1970; Freeman, 1984; Argandoña, 1998; Freeman et al., 2001; Ackermann et al., 2011). Ignoring these key issues may inevitably be detrimental to the overall value of the reporting company (Dragu et al., 2013; Harjoto et al., 2018).

In other words, a company has certain direct obligations towards all stakeholders who take into account its decisions and actions, providing the company with valuable resources, and expecting, in return, their interests to be satisfied, requesting, in this sense, information regarding the conduct of that company, but at the same time information regarding society as a whole, contributing in this sense to its sustainable development (Tiron Tudor et al., 2020). Sustainable business implies that those companies that have adopted the development vision will become sustainable entities only if they promote and carry out actions and projects that include social and environmental objectives focused on creating concrete solutions for the future (Niță et al., 2014; Mion et al., 2019). As an inevitable conclusion emerging from the reviewed literature, we can note that IR is more than just a research topic, as the direct correlations with CSR policies, stakeholder interests, the overall value of a company, and sustainable business are directly and deeply intertwined. This is supported by the results of the bibliometric analysis, in the sense that almost every cluster with one of the key concepts listed above as its theme automatically contains the other terms (these were the prerequisites for setting Objective 1 of the paper).

However, what is interesting is the growing body of studies published in recent years on bibliometric analysis of the literature on the topics such as "Corporate Social Responsibility", "Integrated Reporting", "Business Model", "Multi stakeholders", "Business Sustainability," "Firm value,". For example, Di Vaio et al. (2020), using bibliometric analysis of literature on IR and integrated thinking, identified how companies communicate and create value, facilitating process integration and better allocation of resources and capital. In other studies, the authors are interested in exploring how sustainability or IR addresses socio-ecological issues and business development through bibliometric analysis. In general, at least three different levels of analysis can be distinguished; the first includes elementary papers in which institutions or nations are classified or papers that study the existing global or national trend in scientific output, with only the number of articles published in selected groups of journals being presented (Rahman et al., 2002); other different examples focus on rankings of institutions and countries according to the percentages of each publication (Willett, 2007; André, 2009; Vinkler, 2010) while several papers address the long-term trend in scientific output in this area (Glänzel, 2003; Biondi et al., 2018; Tettamanzi et al., 2019). These were the prerequisites for setting the second objective of the research.

Research Methodology

This section describes how the most relevant research papers in Economics or other related fields, such as Environmental Sciences, Social Sciences, etc., have been selected, geographically located, and evaluated. The selection of these papers was performed in an objective, systematic manner and took into account the quality of the journals in which they were published.

The research strategy was developed in two main directions, namely: (1) selection of research papers on the topic of CSR indexed by WoS between 1975 and July 2021 and those indexed by SCOPUS between 1975 and 2021 and (2) selection of research papers on the topic of IR, indexed by WoS, between 1975 and July 2021 and those indexed by SCOPUS, for the same period. The cluster method was employed to perform the bibliometric analysis of the selected papers on the two research directions using VOSviewer software, where data were processed only according to the initially selected research areas, publication years, publication sources, citation index, and regions. The items derived from the bibliometric analysis are the frequency of occurrence of key concepts, the number of clusters, citations, normalized citations, links, and total links strength. The logarithmic function included these six variables in the statistical multiple linear regression model. While from the point of view of the depth of the research, the traditional method of structured literature review can provide more information on the subject studied, the bibliometric analysis allows the management of all existing studies, resulting in comprehensive research.

Data collection

Following the review of the main literature published in journals indexed by the two databases, the top five highly cited CSR and IR research papers were reviewed. The following keywords were identified for data collection: "Corporate Social Responsibility", "Integrated Reporting", "Business Model", "Business Sustainability", "Multi stakeholders", and "Firm value". The reason for selecting the CSR topic was also the development in parallel with the multi-stakeholders theory, according to which it was also possible to identify the need and opportunity of implementing IR as a determining factor in ensuring BS. Based on these keywords, six combinations as search terms were generated: (1) CSR and stakeholders, (2) stakeholders and BS, (3) IR and CSR, (4) stakeholders and IR, (5) IR and business model, (6) CSR and BS. The reason for choosing these combinations was to cover as much as possible the subject of IR from the perspective of the factors that determine a company's choice of communication with its external environment. As a result of searching the WoS and SCOPUS databases looking for papers according to queries such as title, abstract, and keywords, 55841 articles were retrieved.

Selecting results

In the first stage of selecting the results, we defined a series of inclusion and exclusion criteria to process the information needed in the bibliometric analysis and ensure the most accurate analysis possible. More precisely, only papers on CSR, IR, business models, multi-stakeholders, BS, and firm value were selected. Also, only research areas such as Management, Business Finance, Business, Environmental Studies, Economics, Social Sciences Interdisciplinary (WoS) and Business, Management, Accounting, Economics, Econometrics and Finance, and Social Sciences (SCOPUS) were included. All publication years (1975- July 2021), all geographical regions, and all article types (i.e., articles, proceedings papers, review articles, books, book reviews, and book chapters) were considered. Furthermore, for the analysis of the WoS results, only

papers included in the Social Science Citation Index were selected. Regarding the exclusion criteria, research areas not included in the list above have been excluded. Editorials, notes, reviews, and meeting abstracts published on the above topics have not been considered.

Table 1
Summary of research results in Web of Sciences and SCOPUS

Topics searched on WoS	Research results	Topics searched on SCOPUS	Research results	Total
CSR	5146	CSR	10955	16101
IR	180	IR	422	602
Business Model	1273	Business Model	5360	6633
Multi stakeholders	18	Multi stakeholders	65	83
BS	101	BS	310	411
Firm value	2285	Firm value	3222	5507
Total	**9003**	**Total**	**20334**	**29337**

Source: developed by the authors

As shown in Table 1, after selecting records from the two databases, a total of 29337 entries resulted, including articles removed because of the lack of author names or other information such as JEL classification, keywords, and journal. We also removed those papers that, in our opinion, did not provide rigorous scientific contributions. Using these datasets, we built bibliometric indicators of quantity, quality, and structure to map scientific knowledge in the field. Also, in table 2, we presented the results of the keyword combinations used based on WoS and SCOPUS. We can observe that the most used keyword combination is CSR and Stakeholders.

Table 2
Frequency-based keyword association ranking - Web of Sciences and SCOPUS

Topics searched on WoS	Research results	Topics searched on SCOPUS	Research results	Total
CSR and Stakeholders	922	CSR and Stakeholders	1980	2902
Stakeholders and BS	20	Stakeholders and BS	47	67
Stakeholders and IR	43	Stakeholders and IR	127	170
IR and CSR	43	IR and CSR	47	90
IR and Business model	13	IR and Business model	28	41
CSR and BS	31	CSR and BS	35	66
Total	**1062**	**Total**	**2264**	**3326**

Source: developed by the authors

Statistical analysis

In an attempt to draw a profile of future IR research, we considered it useful to model the clusters generated by VOSviewer software using the keywords with the highest frequency and the intensity and total links between them. To this purpose, we employed the Cobb-Douglas production function model to compare the behavior of the research clusters. To test the correlations and interdependence between the main bibliometric indicators shaping these clusters, we have selected citations, links, total links, occurrences, and normalized citations as independent variables.

Results and discussions

Results and discussion related to bibliometric analysis

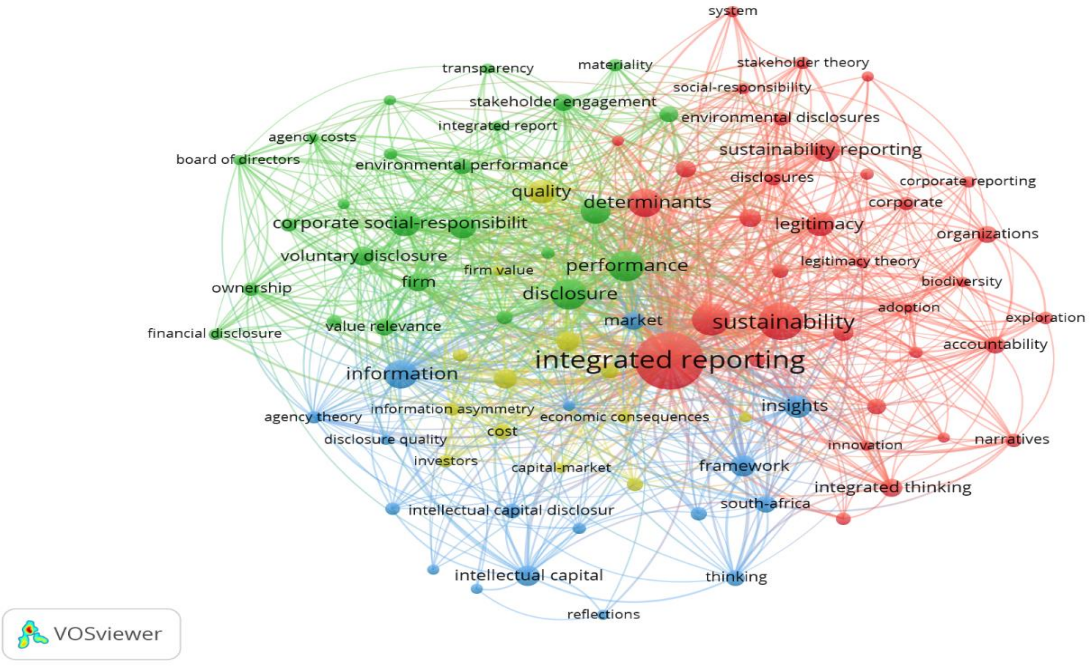
IR is a corporate reporting approach developed later due to increasing demands of stakeholders to report financial and non-financial information that provides the most comprehensive and accurate picture of the company's business and, in particular, its impact on the environment in which it operates. As a result, there is less research on IR than in other areas of interest, such as CSR but enough to establish a trend in developing this topic. Also, publication sources, organizations, countries, and authors are relevant in setting IR research trends.

In the top ten of these entries, according to the number of papers published, we see that there are similarities between the data provided by WoS and SCOPUS, such as the top ten of organizations involved, where the same universities are in first and second place, the authors Maroun W. and Dumay J. are in the top ten and Italy is in the top ten of the most productive countries. Differences can also be observed in the case of publication sources, where the first place is ranked by Business Strategy and the Environment for WoS and Meditari Accountancy Research for SCOPUS. And in terms of the most productive publication years, we note that 2019 is at the top of WoS, and 2020 records the most IR publications in SCOPUS, considering that the data was collected until July 2021. However, there has been a notable increase in IR research after 2014. Finally, comparing the two databases, we observe a significantly higher number of papers on this topic indexed in SCOPUS.

Based on the search protocol applied to the WoS database, described in section 1.2, 180 papers for the selected period were returned and imported into the VOSviewer software. VOS selected 737 terms, of which only 89 reached the threshold of at least five frequencies.

Figure 1

Network of keyword co-occurrences for IR research from WoS (1975- July 2021);



Source: developed by the authors using VOSviewer software

The frequency network of keywords or terms related to IR (Figure 1) suggests that this concept is closely related to sustainability (where it registers a frequency of 56 with a link strength of 355 according to VOSviewer), management (frequency of 41 with a strong link strength of 266), performance (frequency of 39 with a link strength of 285), etc. From Figure 1, we observe that the network groups the 89 terms into four clusters according to their relevance, where the size of the circles highlights their frequency. The first and largest cluster comprises 34 terms (red). It is focused on IR, including terms such as corporate reporting, sustainability, integrated thinking, CSR, sustainable development, environmental disclosures, management, etc. We note here the stage of IR development through terms such as IIRC, innovation, exploration, adoption, value creation, stakeholders, challenges, legitimacy theory, and stakeholder theory; South Africa has played an important role in the development of IR by introducing the mandatory adoption of IR since 2010 for companies listed on the Johannesburg Stock Exchange. The second cluster of 25 elements brings to the fore the concepts of disclosure, CSR, and performance, as well as corporate governance, investor protection, IR, transparency, stakeholder engagement, financial or voluntary disclosure, etc. The third cluster (green - figure 1) contains 17 topics, emphasizing the term disclosure and other terms such as corporate disclosure, intellectual capital disclosure, quality of disclosure, accounting disclosure, etc. And the last cluster (yellow - Figure 1) contains 13 terms more concerned with IR effects, such as impact, economic consequences, costs, capital market, investors, quality, etc.

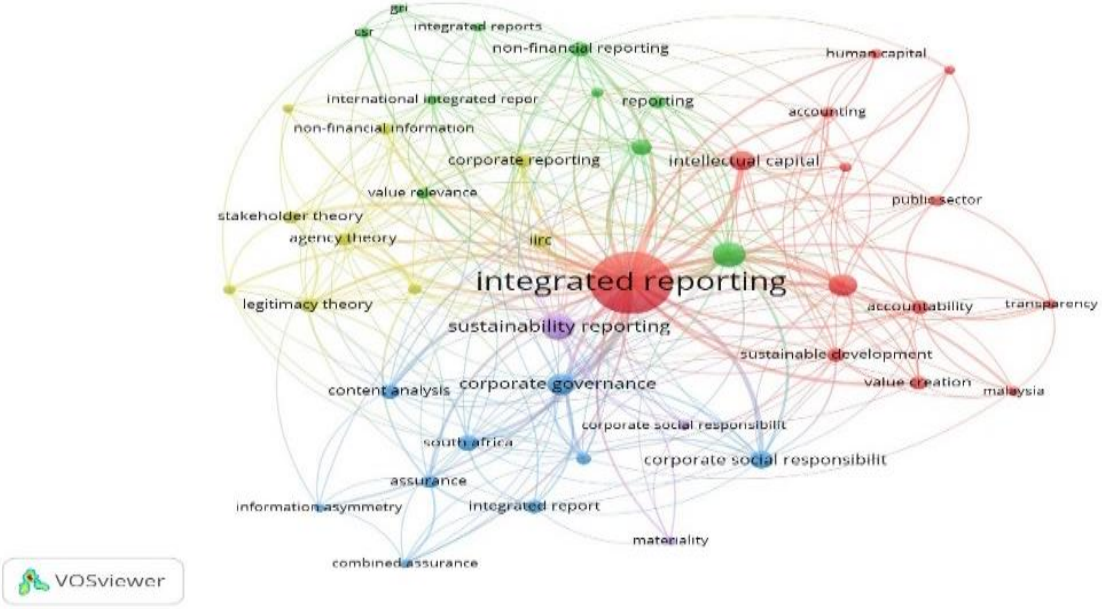
We used the search protocol in Figure 2 from SCOPUS, which resulted in 422 papers from the selected period that were imported into VOSviewer. The software selected 904 terms, of which only 44 reached the threshold of at least five frequencies. The network of key terms shown in figure 2 highlights five clusters of different sizes according to the intensity of the links between terms and their frequency. The first cluster (red-figure 2) consists of 13 items around IR, such as business model, intangibles, human capital, intellectual capital, sustainable development, integrated thinking, value creation, etc. The second cluster (green) collects ten specific reporting-related terms: disclosure, IR, international integrated reporting framework, GRI, non-financial reporting, stakeholders, CSR, sustainability, and value relevance. The next cluster (blue) groups terms such as assurance, combined assurance, information asymmetry, corporate governance, etc. The fourth cluster (yellow) also comprises nine items and highlights the theories used in IR research, such as stakeholders, legitimacy, institutional, and agency theories. Terms like CSR, sustainability reporting, and materiality draw the last cluster (purple).

The top 10 terms highlight that the latest research (2019) emphasizes quality in IR according to WOS; however, on SCOPUS, the focus is on integrated thinking. The top 10 items between the two platforms are different, but there are common elements such as sustainability, corporate social responsibility, and disclosure. (see appendix 1)

Based on the 180 scientific papers retrieved from the WoS, there are 346 different authors, but the network only shows 27 authors who reach the threshold of 3 frequencies, of which three are not connected. We can observe that 2017 and 2019 predominate as years of publication of articles in the IR area. The three authors in cluster 1 show the most intense connections, with several articles between 9-10 related to 2019. However, Maroun Warren published most of the articles in 2017 (appendix 2). Collaborations are limited; the largest clusters include four authors, namely Rubino Michele, Marrone Arcangelo, Raimo Nicola, and Vitolla Filippo, and the cluster of Tweedie Dale, Higgins Colin, Nielsen Christian, and Wendy Stubbs. Compared to the results analyzed previously based on WoS results, the top 10 authors in the IR research area, according to SCOPUS, are different. Still, we observe that the place of the first

place is the same authors, namely Maroun W. and Dumay J. but with a higher number of articles published in the same years (see appendix 2). The most cited authors for both categories of results are Dumay J. and De Villiers C. We also note that the number of papers in the IR area is higher in SCOPUS than in WoS.

Figure 2
Network of keyword co-occurrences for IR research from SCOPUS (1975- July 2021)



Source: developed by the authors using VOSviewer software

In terms of the organizations involved in the IR research area, we find that 10.5% of the organizations reach the threshold of 3 frequencies according to VOSviewer (i.e., several 21 organizations out of 200) for the results provided by WoS and for SCOPUS, the results are lower with only 2.76% of the organizations (i.e., 18 out of 674 organizations involved). All this shows that most organizations are at an early stage in the exploitation of IR and that collaboration between them is quite limited. The results are different, with a much higher number of published documents and citations in WoS (see appendix 2). Also, in appendix 2, we can see the top 10 countries with the highest number of documents published, number of citations, average publication year, and average citations. Here it stands out that the growing interest of countries such as Italy, Australia, the United Kingdom, New Zealand, and South Africa in IR is reflected in the number of citations recorded.

We can now conclude that 2017 was the peak year of IR literature for most countries, as revealed by WoS and SCOPUS results.

Results and discussion on statistical analysis

The use of bibliometric indicators retrieved from WoS and SCOPUS is an innovative and efficient way of operating; on the one hand, it supports the comparison of scientific results and displays the ranking of the most prominent publications indexed in these databases (. Thanks to the open access to the two scientific platforms, it was possible to build an archive of all the papers published on the topic of IR and the related key concepts mentioned, based on which it was possible to move from measuring individual outputs by author/instrument of origin, period or country of origin to measuring aggregated scientific outputs. To identify possible scenarios for improving the quality of scientific production, key bibliometric indicators calculated with

VOSviewer software were selected to determine the behavior of research clusters shortly. A similar attempt, but limited to a review of the main tools and applications developed for analyzing scientific production at high levels of aggregation (institutions, regions, nations), belonged to Baccini (2010). After testing the main aggregated bibliometric indicators through the estimation equation of the nonlinear multiple regression model, of the Cobb-Douglas production function type, we obtained the following model of research cluster behavior:

$$cluster = \beta\ TL^{\alpha_1}\ L^{\alpha_2}\ O^{\alpha_3}\ C^{\alpha_4}\ NC^{\alpha_5}\ e^{\varepsilon} \quad (1)$$

Where:

- Cluster - represents the group/cluster of key concepts orbiting around the IR topic (dependent variable);
- TL - represents the Total Links established between all key concepts present in all clusters (independent variable);
- L - represents links between key concepts within a cluster (independent variable);
- O - represents the frequency of each key concept (independent variable);
- C - represents the number of citations related (independent variable);
- NC - represents the most relevant citation rate (independent variable);
- E - random or residual variable;
- β - regression coefficient showing the mean value of the dependent variable cluster
- - are the $\alpha_1, \alpha_2, \alpha_3, \alpha_4, \alpha_5$ elasticities of the dependent variables.

Determining the parameters of the nonlinear multiple regression model using the least squares method is done by linearizing the model using the logarithm function. If we log equation (1), we obtain the following linearized model:

$$\ln(cluster) = \ln\beta + \alpha_1 \ln(TL) + \alpha_2 \ln(L) + \alpha_3 \ln(O) + \alpha_3 \ln(C) + \alpha_3 \ln(NC) + \varepsilon \quad (2)$$

The intensity of the links between the dependent variable (Cluster) and each independent variable is given by the correlation matrix, according to which we can observe that the behavior of research clusters is strongly influenced in a hierarchical order by the Citation Rate, which means that an important role is played by the quality of the published works, followed by the links, i.e., the homogeneity and compatibility of the key concepts within a research cluster, which highlights their coherence with the analyzed theme recognized by researchers regardless of their country of origin. Total links (i.e., the links between key concepts from all research clusters) are less influential, meaning that heterogeneity of scientific approaches, level of interdisciplinarity, or even transdisciplinary and different areas of interest are less important in the creation of future research clusters.

As seen from Table 3, the presence of a strong correlation between the five independent variables influences the formation of the research clusters, which validates the multiple nonlinear models from an econometric point of view

Table 3
Correlation matrix

		LN (cluster)	LN (Totallinks)	LN (Links)	LN (Occurrence)	LN (cit.)	LN (norm.cit.)
Pearson Correlation	LN(cluster)	1.000	-.463	-.508	-.138	-.537	.112
	LN(Totallinks)	-.463	1.000	.989	.888	.458	.167
	LN(Links)	-.508	.989	1.000	.838	.484	.161
	LN(Occurrence)	-.138	.888	.838	1.000	.230	.155
	LN(citations)	-.537	.458	.484	.230	1.000	.485
	LN(norm. citations)	.112	.167	.161	.155	.485	1.000
Mr (1-tailed)	LN(cluster)	.	.000	.000	.000	.000	.000
	LN(Totallinks)	.000	.	.000	.000	.000	.000
	LN(Links)	.000	.000	.	.000	.000	.000
	LN(Occurrence)	.000	.000	.000	.	.000	.000
	LN(citations)	.000	.000	.000	.000	.	.000
	LN(norm. citations)	.000	.000	.000	.000	.000	.
N	LN(cluster)	3247	3247	3247	3247	3247	3247
	LN(Totallinks)	3247	3247	3247	3247	3247	3247
	LN(Links)	3247	3247	3247	3247	3247	3247
	LN(Occurrence)	3247	3247	3247	3247	3247	3247
	LN(citations)	3247	3247	3247	3247	3247	3247
	LN(norm. citations)	3247	3247	3247	3247	3247	3247

Source: developed by the authors

Table 4
Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.816a	.666	.666	.59741

a. Predictors: (Constant), LN(norm. citations), LN(Occurrences), LN(Citations), LN(Links), LN(Totallinks)
b. Dependent Variable: LN(cluster)

Source: developed by the authors

Table 5
Estimation of the regression model

Model		Unstandardized Coefficients		Standardized Coefficients	t	Mr
		B	Std. Error	Beta		
1	(Constant)	4.547	.056		81.291	.000
	LN(Totallinks)	-1.139	.089	-1.277	-12.805	.000
	LN(Links)	.056	.089	.052	.625	.532
	LN(Occurrence)	1.075	.033	.985	32.812	.000
	LN(citations)	-.345	.014	-.369	-24.788	.000
	LN(norm. citations)	.553	.019	.344	28.441	.000

a. Dependent Variable: LN(cluster)

Source: developed by the authors

Using the data in Table 5, the estimated equation of the multiple linear regression model can be determined. It has the following form:

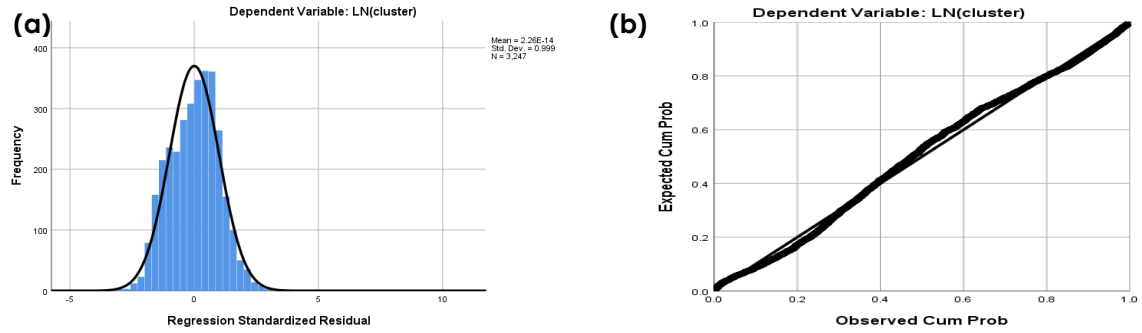
$$cluster = e^{4.547}\ T^{-1.139}\ L^{0.056}\ O^{1.075}\ C^{-0.345}\ NC^{0.553} \quad (3)$$

or

$$cluster = 94.36149\ T^{-1.139}\ L^{0.056}\ O^{1.075}\ C^{-0.345}\ NC^{0.553} \quad (4)$$

According to the multiple nonlinear regression model, we can see that as the strengths of links between keywords within the same research cluster increases, their frequency (occurrences), along with normalized citations (which represents the normalized number of citations received by keywords related to the IR topic), implicitly leads to a strengthening of the cluster of origin, in the sense that citations are more concentrated on certain niches (the normalized number of citations received by a document or the total normalized number of citations received by all documents published by a source, author, organization or country). At the same time, we note that augmentation of the bibliometric indicators Total Links and Citations will result in a reduction in the number of research clusters, i.e., a concentration of researchers on topics focused on those key concepts that have a significant influence on the research topic, will reduce the dilution of research streams and, at the same time, will validate the above statement, i.e., the concentration of research on well-established areas.

Figure 3
(a) Histogram; (b) Normal P-P Plot of Regression Standardized Residual.



Source: developed by the authors using SPSS (26)

The histogram in figure 3 shows an asymmetric distribution to the right (on the decreasing slope of the Gauss curve), which means that there is a great interest in researchers from some countries in this research topic (Australia, Italy, South Africa, UK) and that they have published a large number of papers with impact in an academic environment (evidenced by the citation rate).

Theoretical Implications

In the mainstream literature, we find several bibliometric analyses that focus on the concepts we have reviewed, but most of them address these concepts in a sequential manner, such as BS and its link to sustainable development (Wichaisri and Sopadang, 2018; Dima *et al.*, 2022); the evolution of the business model concept (Gupta and Bose, 2017; Pan et al., 2022) and firm value (Raza *et al.*, 2021); CSR and its interactions with sustainable development (Ye *et al.*, 2020) or sustainability (Meseguer-Sánchez *et al.*, 2021) or with marketing (Quezado *et al.*, 2022), etc.; the evolution of stakeholder

theory or stakeholder engagement and its role in the daily operations of firms (Zárate-Rueda et al., 2021; Johnson-Cramer *et al.*, 2022). Regarding IR, the most debated term in the literature, we find bibliometric analyses that scrutinize its relationship with voluntary disclosure ((Brinzaru et al., 2021) or investment decision-making (Kostenko *et al.*, 2021a). However, bibliometric analyses that address the five concepts together with the aim of determining their relationship are lacking, despite their importance in current corporate practice.

The results of our research primarily contribute to the development of the literature by mapping the current state of research outlined by the keyword networks resulting from processing with VOSviewer. Secondly, the bibliometric and statistical analysis contributes to shaping future research directions in IR. Thus, through the clustering method, researchers can track how the considered concepts gravitate around IR and decide to develop these themes according to emerging trends or address them interdisciplinarily. At the same time, research gaps can be identified and exploited, especially in the current economic context, when IR is considered the optimal solution for communicating the effects of the health pandemic (García-Sánchez *et al.*, 2020) with stakeholders of the companies.

Practical Implications

The results of our research reveal the high potential of IR, especially in the case of managers who play a decisive role in adopting IR. We cannot discuss IR without bringing BS, CSR, business model, and stakeholders to the forefront, as demonstrated by the network of key terms captured by VOSviewer. Therefore, the success of IR is closely linked to the business model and CSR strategies adopted, the correct implementation of business sustainability and integrated thinking, and stakeholder engagement, all of which directly affect the work of managers.

At the same time, our research highlights issues that practitioners may face in implementing IR, such as the risk associated with voluntary disclosure or implementation within SMEs (Stacchezzini, Melloni, and Lai, 2016; Gerwanski, 2020). All these considerations may be the focal point of debates on this topic that can provide optimal solutions for implementing and adapting IR according to the specificities of each company. Furthermore, managers should be aware that IR enhances the credibility of reported information among stakeholders (Wang, Zhou, and Wang, 2020), which also would significantly distinguish their companies.

Conclusions

An objective assessment of scientific research on a specific topic of high interest, such as IR, with an important role in BS, is possible with the support of bibliometric indicators, the only data currently available on an international scale and ensuring a viable benchmark. We strongly believe that the bibliometric and statistical analysis on the IR issues, based on all the literature available in the two internationally acknowledged databases, provides valuable support in clarifying issues related to BS, stakeholder requirements, global firm value, and CSR policies, but especially in mapping the relevant areas of interest for authors in the context of the IR concern. These considerations are particularly important as they create the conditions for a simple framework for a scientific debate on prevailing research trends, as well as the problems and gaps faced by accounting professionals, auditors, and all other stakeholders, which can trigger serious debates on these issues and provide viable solutions for optimizing the reporting of non-financial information to meet stakeholder expectations to the greatest extent possible.

The bibliometric analysis, undoubtedly, does not exhaust the problem of discovering research areas in the field of IR reporting, which is why we also considered it adequate to carry out statistical analysis precisely to support future research, in the sense that the authors will be able to decide whether they consider it more important to consolidate the current research clusters on IR or to focus on the inter- and transdisciplinary approach, in the sense of multiplying the number of research clusters and discovering new paths in new scientific areas. We estimate some limitations in our work, so we intend to continue our research efforts in the next phase to analyze and evaluate the qualitative and substantive content of the papers on IR.

In conclusion, we consider that:

- The model developed allows for mapping future research trends that, unlike the pre-2020 period, are more pronounced towards the social domain, captured by key terms such as health crisis, COVID-19, and human capital, but also towards the environmental issues (environmental performance, global warming, recycling, etc.).
- IR is an interdisciplinary topic shaped by research, including today's most used keywords, such as CSR, sustainability, BS, business model, non-financial reporting, etc., found in many research areas.

IR research is influenced by the ongoing socio-economic context, with an increasing number of published papers linking IR to the health crisis, seen as the best tool to inform stakeholders about the effects of the pandemic on companies' economic operations.

Disclosure statement

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Appendix 1

	Top	Items	Cluster	Links	Total link strength	Occurrences	Avg. pub. year	Avg. citations
WOS	1	integrated reporting	1	87	818	135	2017	36.963
	2	sustainability	1	80	355	56	2017	40.9107
	3	management	1	74	266	41	2018	29.0732
	4	performance	2	81	285	39	2018	25.5641
	5	disclosure	2	74	290	38	2018	33.6316
	6	determinants	1	73	252	33	2018	28.1212
	7	information	3	67	224	32	2017	32.9375
	8	corporate social-responsibility	2	60	197	28	2018	26.9286
	9	governance	2	67	199	25	2017	34.8
	10	quality	4	63	198	24	2019	14.9583
SCOPUS	1	integrated reporting	1	41	386	256	2018	20.9492
	2	sustainability reporting	5	25	75	43	2017	27.6047
	3	sustainability	2	26	83	40	2017	19.875
	4	integrated thinking	1	20	60	31	2019	14.1613
	5	corporate governance	3	23	57	30	2018	17.4667
	6	intellectual capital	1	19	51	27	2017	30.8889
	7	corporate social responsibility	3	15	43	21	2016	22.6667
	8	South Africa	3	17	37	17	2016	24.9412
	9	disclosure	2	19	37	16	2018	25.625
	10	non-financial reporting	2	20	38	15	2018	16.6667

Appendix 2

	Top	Author	Cluster	Links	Total link strength	Documents	Citations	Avg. pub. year	Avg. citations
	The top 10 occurrence keywords for the IR topic								
WoS	1	Maroun, Warren	6	1	3	12	208	2017	17.3333
	2	Dumay, John	4	2	5	11	545	2018	49.5455
	3	Raimo, Nicola	1	3	22	10	206	2019	20.6
	4	Vitolla, Filippo	1	3	22	10	206	2019	20.6
	5	Rubino, Michele	1	3	21	9	205	2019	22.7778
	6	De Villiers, Charl	3	2	3	6	487	2017	81.1667
	7	Garcia-Sanchez, Isabel-Maria	5	1	1	4	227	2016	56.75

SCOPUS	8	Haji, Abdifatah Ahmed	12	0	0	4	85	2017	21.25
	9	Melloni, Gaia	9	1	2	4	208	2017	52
	10	Tweedie, Dale	2	3	3	4	67	2018	16.75
	1	Maroun W.	2	3	7	22	578	2017	26.2727
	2	Dumay J.	1	5	16	16	779	2018	48.6875
	3	De Villiers C.	2	5	10	11	611	2018	55.5455
	4	Guthrie J.	1	6	13	8	400	2018	50
	5	Busco C.	3	3	6	6	85	2015	14.1667
	6	Melloni G.	6	2	6	6	290	2017	48.3333
	7	Stacchezzini R.	6	2	7	6	134	2018	22.3333
	8	Atkins J.	2	1	5	5	206	2017	41.2
	9	Bernardi C.	1	4	10	5	396	2017	79.2
	10	Granà F.	3	2	4	5	24	2016	4.8
The top 10 authors' cooperation characteristics order by published documents									
WoS	1	Macquarie Univ	2	6	9	15	612	2018	40.8
	2	Univ Witwatersrand	12	0	0	13	223	2017	17.153
	3	Univ Pretoria	3	2	7	9	731	2017	81.222
	4	Univ Auckland	3	2	7	7	316	2018	45.142
	5	Univ Lum Jean Monnet	9	0	0	6	116	2019	19.333
	6	Univ Salamanca	5	1	1	5	389	2016	77.8
	7	Monash Univ	1	3	5	5	470	2016	94
	8	Bucharest Univ Econ Studies	6	0	0	5	29	2016	5.8
	9	Univ Valencia	5	1	1	4	115	2017	28.75
	10	Deakin University	7	0	0	4	90	2020	22.5
SCOPUS	1	University of the Witwatersrand, Johannesburg, South Africa	13	0	0	11	269	2017	24.4545
	2	Macquarie University, Australia	2	1	2	7	152	2017	21.714
	3	University of Siena, Italy	10	0	0	6	49	2016	8.1667
	4	National University of Ireland, Galway, Ireland	4	1	3	5	18	2013	3.6

	5	The University of Auckland, New Zealand	1	1	4	5	176	2019	35.2
	6	University of Pretoria, SA	1	2	5	5	192	2018	38.4
	7	California State University, Los Angeles, United States	7	0	0	4	37	2013	9.25
	8	University of Verona, Italy	9	0	0	4	115	2018	28.75
	9	University of Perugia, Italy	4	1	3	4	1	2013	0.25
	10	Arthur J. Bauernfeind College of Business, Murray State University, United States	5	0	0	3	76	2019	25.333
	The top 10 organizations cooperation characteristics ordered by published documents								
WoS	1	Macquarie Univ	2	6	9	15	612	2018	40.8
	2	Univ Witwatersrand	12	0	0	13	223	2017	17.153
	3	Univ Pretoria	3	2	7	9	731	2017	81.222
	4	Univ Auckland	3	2	7	7	316	2018	45.142
	5	Univ Lum Jean Monnet	9	0	0	6	116	2019	19.333
	6	Univ Salamanca	5	1	1	5	389	2016	77.8
	7	Monash Univ	1	3	5	5	470	2016	94
	8	Bucharest Univ Econ Studies	6	0	0	5	29	2016	5.8
	9	Univ Valencia	5	1	1	4	115	2017	28.75
	10	Deakin University	7	0	0	4	90	2020	22.5
SCOPUS	1	University of the Witwatersrand, Johannesburg, South Africa	13	0	0	11	269	2017	24.4545
	2	Macquarie University, Australia	2	1	2	7	152	2017	21.714
	3	University of Siena, Italy	10	0	0	6	49	2016	8.1667
	4	National University of	4	1	3	5	18	2013	3.6

	Ireland, Galway, Ireland							
5	The University of Auckland, New Zealand	1	1	4	5	176	2019	35.2
6	University of Pretoria, SA	1	2	5	5	192	2018	38.4
7	California State University, Los Angeles, United States	7	0	0	4	37	2013	9.25
8	University of Verona, Italy	9	0	0	4	115	2018	28.75
9	University of Perugia, Italy	4	1	3	4	1	2013	0.25
10	Arthur J. Bauernfeind College of Business, Murray State University, United States	5	0	0	3	76	2019	25.333

The top 10 countries' cooperation characteristics order by published documents

WoS	1	Italy	1	2	11	43	1115	2018	25.9302
	2	Australia	1	8	16	39	1676	2017	42.9744
	3	South Africa	2	5	16	26	978	2017	37.6154
	4	England	2	6	19	23	991	2017	43.087
	5	Spain	5	1	2	14	796	2016	56.8571
	6	Germany	4	5	6	14	501	2017	35.7857
	7	New Zealand	2	5	15	13	961	2016	73.9231
	8	USA	5	4	7	9	555	2015	61.6667
	9	Scotland	3	4	9	9	293	2016	32.5556
	10	Romania	4	1	1	8	37	2017	4.625
SCOPUS	1	Italy	5	16	56	87	1441	2017	16.5632
	2	United Kingdom	4	19	55	63	1697	2017	26.9365
	3	South Africa	6	6	25	59	1474	2017	24.9831
	4	Australia	7	12	35	58	2069	2017	35.6724
	5	United States	2	13	27	34	597	2015	17.5588
	6	New Zealand	6	5	20	22	1125	2017	51.1364
	7	Germany	1	12	15	20	229	2017	11.45
	8	Romania	8	3	6	16	54	2018	3.375
	9	Spain	9	4	6	16	339	2016	21.1875
	10	Malaysia	3	3	3	15	163	2018	10.8667

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