Measurement of performance in SMEs: Bibliometric analysis (2015 – 2021)

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Abstract. Performance measurement (PM) in small and medium-sized enterprises (SMEs) is increasingly a space of crucial scientific contribution, not only because of the evidence of practical actions aligned to strategic planning but also due to the need to formalize and structure methodologies for the implementation of performance measurement systems in specific contexts. Assessing global research activity based on a bibliometric analysis helps position researchers regarding PM development in SMEs. 335 records extracted from the SCOPUS database were processed in VOSviewer (graphic visualization tool used). The primary analyses were the co-occurrence of keywords, publications, annual citations, countries, and most representative authors. Those analyses led to the recognition of foremost exponents, and critical themes around the proposed article, such as performance, sustainability, and innovation, have registered an increase in related research since 2019 and mainly in the region from Asia.

Keywords: Performance, SMEs, bibliometric analysis.

1 Introduction

The measurement of an organization's performance (PM) is vital to monitor and understand its performance, especially in the current environment where changes are accelerated. Competition intensifies so that it becomes essential for the organization to position and, in this sense, optimize its efforts [1], [2].

Formal and organized structures such as performance measurement systems (PMS) help organizations to position themselves and optimize their efforts by measuring the results obtained and evaluating them against the strategic objectives that have been proposed [3]. In this sense, PMSs result in balanced and dynamic systems that support the decision-making process by collecting, processing, and analyzing information [4].

In this investigation, SMEs are considered organizations that fit within the definition given by the Ecuadorian Organic Code of Production [5]. Small companies are deemed

to have less than 20 workers, and medium-sized companies have between 20 and 500 workers.

For this type of organization, having a PMS is extremely important for various reasons. First, the lack of formalized practices within their processes; second, the constant evolution of the concept of quality and a greater focus on continuous improvement, issues that PMSs address since the results can be evaluated against the objectives set to undertake corrective actions [6], [7], [8].

Finally, technological advances in information systems make PMSs less manual and easier to use [3]. What are the main trends within the field of research regarding performance measurement in SMEs? To provide an answer to this question, the objective of this work is to recognize the current trends regarding performance measurement systems through the bibliometric analysis of the research activity that has been developed around the subject during the period 2015 to 2021. The bibliometric analysis is based on a set of known data, since this offers a vision regarding research in a specific field of knowledge [9]. In addition, this study can be considered an approach to the current reality [10], allowing its results to support future research that observes the sustainable development of SMEs through the design and implementation of performance measurement systems.

There are previous works that address the research topic of this study. For instance, the study Assessing Worldwide Research About Performance Measurement for SMEs: 2006–2016 [11] is a comprehensive review of the existing literature on performance measurement for small and medium-sized enterprises (SMEs) over a decade. The authors identified and analyzed 105 articles published in 63different journals, covering various topics related to performance measurement, including frameworks, indicators, and the use of technology. The review reveals a growing interest in performance measurement for SMEs throughout 2006-2016, emphasizing the importance of tailored, context-specific approaches. Another previous work related to the topic of study is the paper; Performance measurement in SMEs: systematic literature review and research directions [8], which provides a systematic literature review of the state of research on performance measurement in small and medium-sized enterprises (SMEs). The authors conducted a comprehensive analysis of 131 articles published in peer-reviewed journals, identifying themes and trends in the existing literature. The study indicates that most of the research on performance measurement in SMEs has focused on developing frameworks and models, with less attention given to the practical application of these tools. Both studies highlight the importance of analyzing literature on SMEs performance measurement as a valuable resource for researchers and practitioners.

2 Methodology

This study used synthesized data from the Scopus database due to its essential characteristics that facilitate bibliometric analysis (see Fig. 1). Such features include contribution by country and author, title, source titles, keywords, abstract, and citation

index, among other items. The Scopus technology platform was developed by Elsevier and covers more than 20,000 journals, with 100% global coverage; Scopus is the most extensive database today [12].

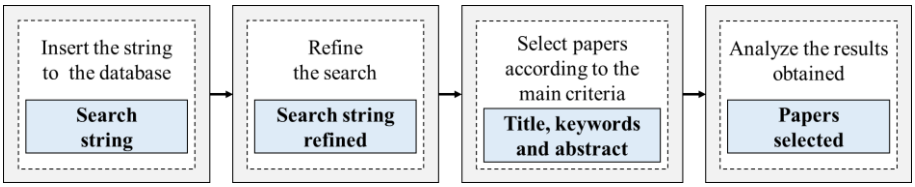

Fig.1. Methodology for bibliometric analysis

The period analyzed was from 2015 to 2021 and included the following questions for improvement: type of document - article and book chapter; thematic areas – were excluded: Psychology, Pharmaceutical, Health, and Veterinary, because these areas are not closely related to the main topic of performance measurement systems. As search keywords; performance, measurement, SME and SMEs were included, because they are the words that are closely related to performance measurement systems for SMEs. The search strategy used key terms: performance, measurement, and SME or SMEs in title-abstract-key. The search equation used is the following:

Title-Abs-Key (performance AND measurement AND (SME OR SMEs)) And Limit-To (PubYear, 2021) Or Limit-To (PubYear, 2020) Or Limit-To (PubYear, 2019) Or Limit-To (PubYear, 2018) Or Limit-To (PubYear, 2017) Or Limit-To (PubYear,2016) Or Limit-To (PubYear, 2015)) And Exclude (SubField, PSYC) Or Exclude (SubField, PHAR) Or Exclude (SubField, HEAL) Or Exclude (SubField, GO)) And Limit-To (DocType, ar) Or Limit-To (DocType, ch)).

Bibliometric analysis includes various techniques, such as citation analysis, co-citation analysis, bibliographic coupling, and co-authorship analysis. These techniques help identify the most influential authors, institutions, and research topics, and to map the structure and evolution of scientific fields over time [13].

In this sense, the proposed bibliometric analysis includes the co-occurrence of keywords, articles published and cited by year, location by country of research activity, and co-authorship analysis. The search was performed on April 12, 2022, and bibliometric map and network visualization methods were performed using VOSviewer, which is a software tool that allows creating maps based on network data, as well as visualizing and exploring these maps [14].

In the case of the keyword co-occurrence analysis, thresholds of a minimum of 4 articles were defined in VOSviewer where the analyzed terms appear. From this, a density display map was generated for those most frequently ranked terms across all keywords, where the most frequent terms had a dense color group.

For the analysis by the year of the articles published and their respective citations, the work was developed quantitatively in Microsoft Excel, considering the total number of articles in the database obtained through Scopus mentioned above.

First, a categorization by the year of the articles by year and the total citations of the same was carried out. In the second step, a ratio of the total citations per year was obtained compared to the articles published in that period. The objective of calculating

this ratio falls mainly on a better visualization of the impact of the publications of each of the years analyzed in this paper.

On the other hand, the analysis by countries considered, in the characteristics of VOSviewer, an analysis of the co-authorship; type on the countries; unit in the entire database. In addition, a minimum of 1 related document was indicated, and only those countries that had more connections and relevance within our data set were graphed. This attention was given to avoid losing data, however small they may be, on the investigative work in a group of countries, and, also, to recognize the actual relevance of certain actors in the research area.

3 Results

With the implemented search strategy, 460 records were obtained in the database, which was refined by reviewing source titles, titles, and abstracts; leaving then a total of 335 records.

3.1 Keyword co-occurrence

Co-occurrence analysis with all keywords determined 2061 keywords, and 44 meet the threshold. Fig. 2 shows the density visualization map of the most frequent key terms.

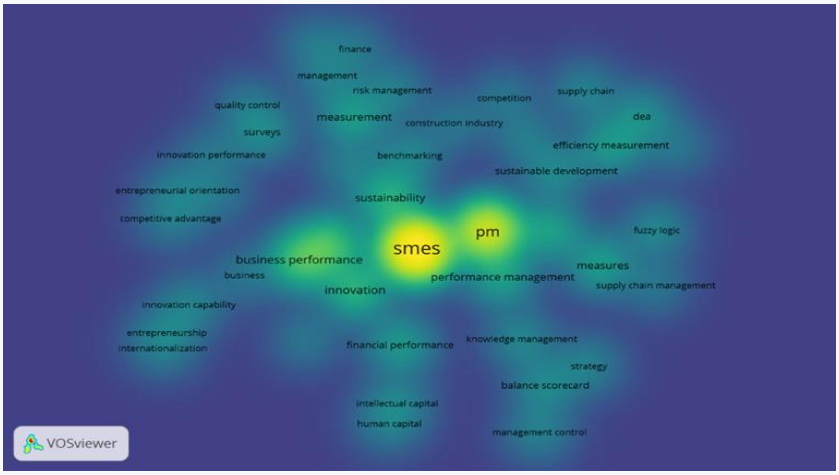

Fig. 2. Most representative terms in the PM of SMEs

Eight clusters were identified: the first cluster contains 8 terms, of which the most representative is business performance; the second cluster includes 8 terms, of which the most representative are performance and sustainability, the third cluster includes 6 terms, of which the most representative are SMEs and innovation; the fourth cluster contains 5 terms of which the most representative are efficiency measurement and dea; the fifth cluster includes 5 terms of which the most representative is measurement; the sixth cluster contains 5 terms of which the most representative is performance

measurement; the seventh cluster contains 4 terms of which the most representative is performance management; the eighth cluster contains 3 terms of which the most representative is productivity. Table 1 shows the evolution of the field of PM for SMEs.

Table 1. Evolution of published articles and total citations over time.

Year	Articles published	Total citations	Total citations/Article published
2015	24	318	13.25
2016	27	651	24.11
2017	41	391	9.54
2018	47	523	11.13
2019	51	332	6.51
2020	62	297	4.79
2021	55	80	1.45
2022	12	1	0.08

It can be seen that the annual production of published articles remained constant between 2015 and 2016, having a visible increase from 2017 to 2021, taking into account that this last year seems not to have been affected by the global contingency due to the COVID-19 pandemic, in the year 2022 it is finally noted that by the date of publication of this research, the number of published articles remains proportional to the number of previous annual publications.

Fig. 3 shows the articles published in its central axis and the average total citations in the secondary axis. It can be seen that the publications in 2016 are the ones with the highest value of citations per article, while as of 2019, a decrease in the value of this same relationship can be noted.

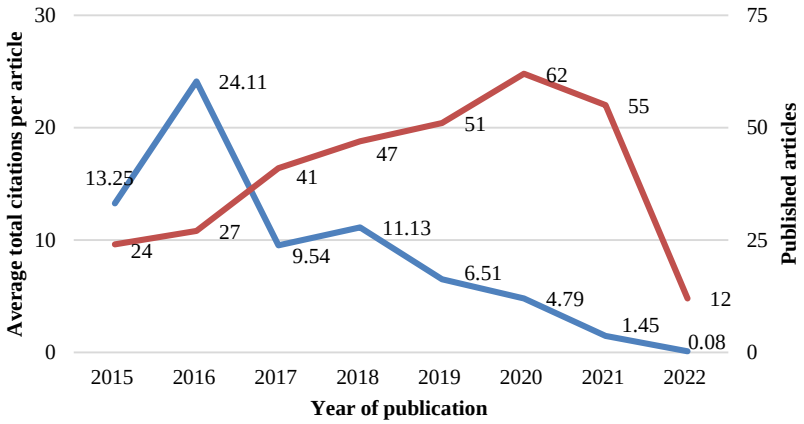

Fig. 3. Evolution of research in the PM of SMEs over time

3.2 Country Analysis

The analysis of co-authorship concerning countries has been made based on a database provided by the indicated search equation, which involves 68 countries; Thus, Vosviewer presents us with a total of 27 groups. However, the document will focus its analysis on the 12 most relevant groups. Fig. 4 describes twelve groups of countries.

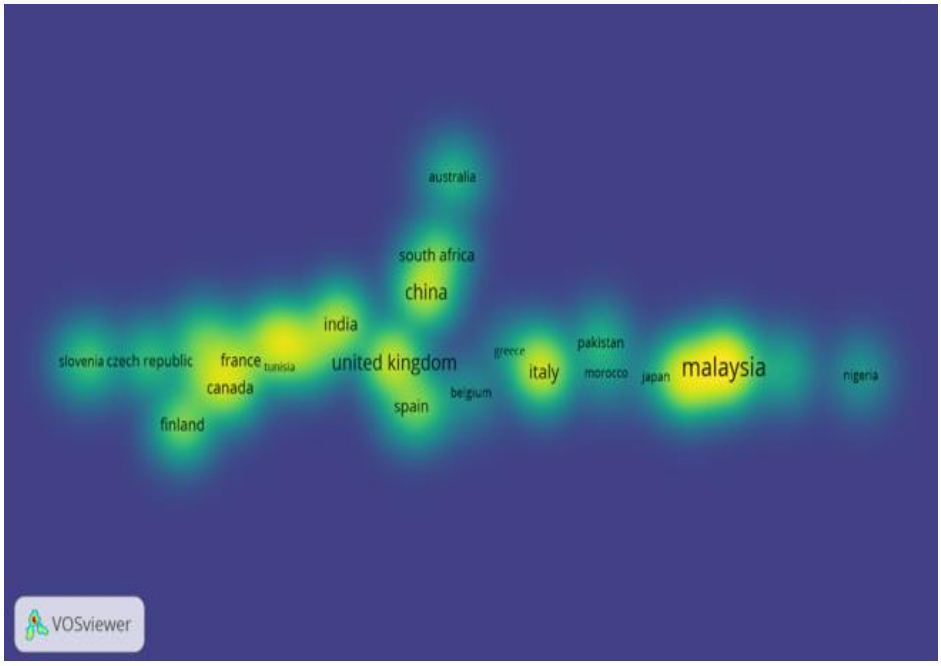

Fig. 4. Density visualization map of countries that study the PM of SMEs

The first group contains 7 countries and its representative is Malaysia; The second group is made up of 6 elements, where the United Kingdom stands out; The third group comprises 6 countries and its greatest exponent is France; The fourth group presents 5 members, of which we have China as a representative; The fifth group groups 5 elements and indicates the United States as the main one; The sixth group contains 5 countries and its representative is Italy; The seventh group is made up of 5 members, where the Czech Republic stands out; The eighth group comprises 4 elements and its greatest exponent is Finland; The ninth group presents only 3 countries and points to Spain as a representative; The tenth group groups 3 countries, of which the main one is Indonesia; The eleventh group has 2 members and Nigeria is their representative, and The twelfth group contains 2 elements and, by little difference, Thailand stands out.

The application used, VOSviewer, produces an additional graph (see Fig. 5), which will complement the co-authorship analysis of countries, pointing out the primary connections of countries that jointly investigate the topic raised. Among the countries with the most collaborations, we have the United Kingdom with 19 connections; China

with 14; Malaysia with 12; Germany and the Netherlands with 11; France with 10, and the United States with 9 collaborations.

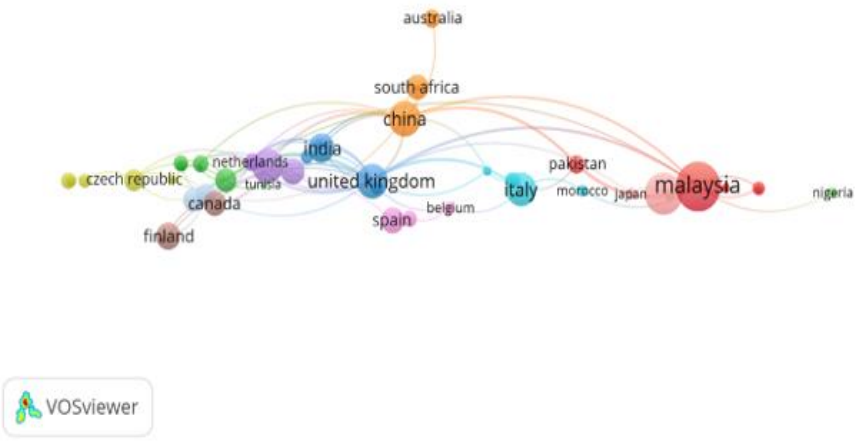

Fig. 5. Map of co-authorship connections of countries that study the PM of SMEs

Additionally, the number of recognized documents grouped by continent is shown in Fig. 6 to complement the bibliometric analysis by country. Africa is recognized with 23 records; America with 51; Oceania with 7; Asia stands out, with 190 documents; and Europe, with 156 papers, as the continents that present the most recognized research documents in our database.

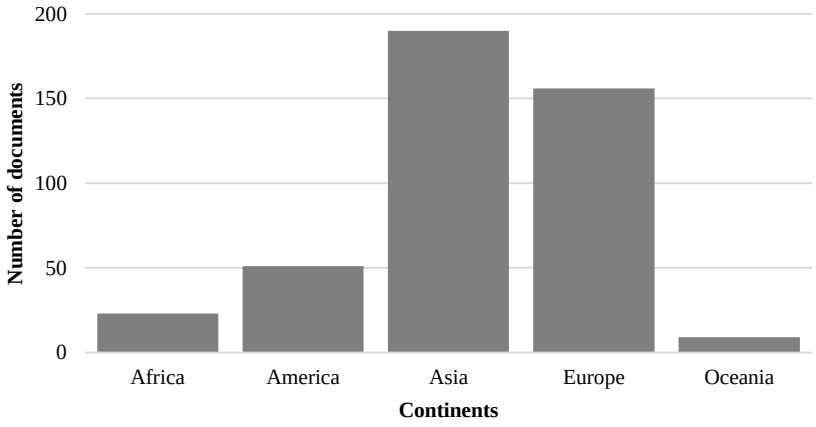

Fig. 6. Recognized documents by continent that study the PM of SMEs

3.3 Co-authorship Analysis

Fig. 7 corresponds to the co-authorship density visualization map, where 911 authors were recognized, of which 61 meet the threshold of two or more publications within the period analyzed.

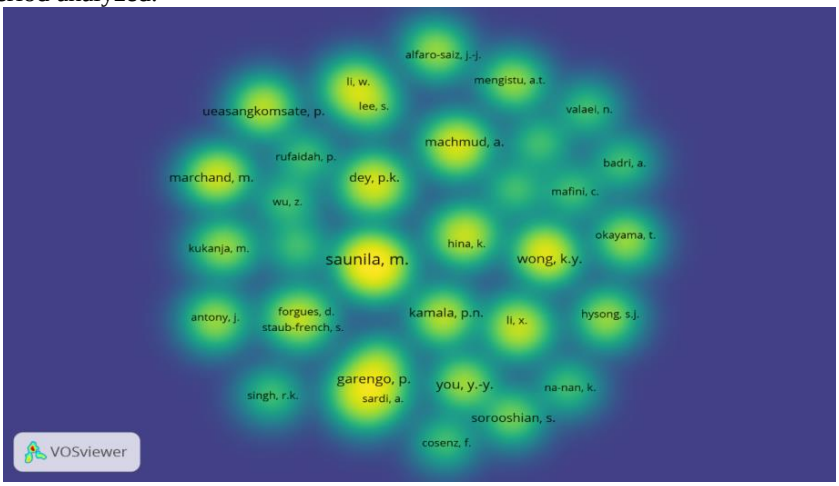

Fig. 7. Visualization of the density of the co-authorship map

The map shows 31 clusters: cluster number one contains 5 authors where Garengo P. is an essential author; cluster number two of 4 authors have Saunila M. as the most relevant author; cluster number three contains 4 authors where Wang X. has the highest number of co-authors; cluster number four includes 3 authors where Machmud A. is an essential author; cluster number five contains 3 authors where Dey P. K. is the most representative author; cluster number six contains 3 authors including Forgues D., Poirier E. A., and Staub-French S.; cluster number seven contains 3 authors where Hina K., Khalique M., and Ramayah T. are found; cluster number eight contains 3 authors where Li X., Wang H., and Yuan G. X. are found, and of the remaining clusters, 10 have two authors, and 13 are made up of a single author, of which You Y stands out. -Y., and Wong K. Y. with four publications each.

4 Discussion

The co-occurrence analysis shows areas with higher density within the network; around the terms SMEs and Performance Measurement, the primary relationships were focused; on the other hand, to a lesser extent, the terms business performance, performance, innovation, and sustainability stood out. In addition, the map presents different keywords with many links to other terms, which are manufacturing Industries, efficiency measurement, and sustainable development. The analysis of the articles published over time reveals a growing trend in the number of publications from 2017, which allows us to believe that there is an increasing interest within the community of

performance evaluation within small and medium-sized companies focused mainly on production. On the other hand, the evident downward trend in the ratio of total citations and published articles only strengthens the growth in the number of publications. Moreover, there is a drop in the number of sources in the years 2021 and 2022, being able to attribute this phenomenon to the pandemic faced by the world during this period.

Based on the analysis regarding the countries that investigate the current topic and the data displayed graphically, we can conclude that the countries of the Asian continent predominate, in the data set, by 44.49%; however, the contributions from Europe cannot be ignored, while representing 36.53% of the total documents presented. Likewise, the study indicates 12 countries and representatives, making significant contributions to PM in SMEs, including criteria highlighted in the previous sections on critical terms; In addition, many grants are recognized from Malaysia, which works hand in hand with 12 other countries, of which China and the United Kingdom stand out, as they manifest many investigative works in conjunction with various countries of the world.

Finally, the co-authorship analysis allows us to recognize those authors with great scientific production between 2016 and 2021 and their relationships, and the different clusters they constitute. Thus, the leading exponents in the study of PM in SMEs are Garengo P., Saunila M., You Y. -Y., and Wong K.Y., with four publications each.

5 Conclusions

It is worth noting that bibliometric analysis has several contributions. In this case, performing a bibliometric analysis on PMS in SMEs can provide valuable insights and inform future research efforts. However, it also has some limitations, such as the potential for bias in the data and the lack of context or qualitative data that may be important to understand the research landscape. The density maps made it possible to recognize that in the case of the critical terms, there is a concentration of relationships around the words SMEs, performance measurement, business performance, innovation, and sustainability; which leads to conclude that the research and development trends in the PM area in SMEs are focused on these topics. On the other hand, regarding the analysis of co-authorships, it was determined that the leading exponents in the area are Garengo P., Saunila M., Machmud A., You Y. -Y., and Wong K. Y., who are part of networks of researchers focused on PM in SMEs.

The results of this study show an increasing trend in performance evaluation research in SMEs focused on production as of 2017. The decrease in citations of articles from 2021 and 2022 may be a sign of a lack of impact of the publications of this period for the sectors interested in PM. Additionally, there are many contributions from Asia and Europe on the PM of SMEs; In the same way, it is possible to contemplate a growing interest from the American continent to generate more content in this research area.

Finally, the suggestion is to include bibliographic databases from other sources such as Web of Science or Google Scholar in future research. To include the largest number of articles on the subject and thus recognize trends more precisely. To be able to delve

deeper into those topics identified and outline complementary or related research based on the context to be analyzed.

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