



Bibliometric Visualization of Research Regarding Performance Measurement System (PMS) During the Covid-19 Pandemic Using VOSviewer

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Abstract. The impact of the Corona Virus Disease (covid-19) pandemic has reduced the stability of the world economy. One of the most common phenomena is the decline in performance during the COVID-19 pandemic. This research is a bibliometric visualization by taking journals through the publish or perish application with the scope of data available on Google Scholar about the performance measurement system. During the covid-19 pandemic using the VOSviewer application. The purpose of the bibliometric analysis in this study is to find out; 1) publication development trends related to the performance measurement system during the covid-19 pandemic every year, 2) Journal Publication Trends, 3) collaboration between researchers with similar topics, 4) trend terms title and abstract and 5) trend terms author keywords. Data was collected from the Publish or Perish database published in 2019–2022 using the keyword “performance measurement system during covid-19”. Then the author used VOSviewer software to analyze and visualize the database obtained. The results of the study show that 439 articles discuss the performance measurement system during the covid-19 pandemic. The year with the most research themes on performance measurement systems during COVID-19 was 2021, with 210 articles. The majority of research collaborations are carried out by researchers from China, including; Henry J. Liu, Jonathan Z. Li, Jiexiang Wang, etc. The analysis of the term title and abstract formed 5 clusters. The analysis based on keywords formed 6 clusters. The term in the title that was used the most in program coordination articles was “PMS” with a total of 185 events .

Keywords: Performance measurement systems · bibliometrics · covid-19

1 Introduction

Since hitting the world at the end of 2019 until now, *Corona Virus Disease* (hereinafter Covid-19) has reduced the stability of the world economy on a large scale. Worldbank [1] explained that almost all countries in the world experienced massive inflation due to the COVID-19 pandemic. One of the most affected aspects is performance. The trend of measuring performance is increasing during the covid-19 pandemic. The Ministry

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of Finance [2] said that the company's performance experienced many declines due to the COVID-19 pandemic. One of the reasons for the decline in company performance is due to the many changes in management policies within the company such as work from home policies which have an impact on decreasing employee performance in the company.

Previously, there have been many bibliometric studies on the performance of managers, employee performance, and company performance. Campbell *et al.*, [3] conducted bibliometric research as a performance measurement tool at the National Cancer Institute of Canada (NCIC). The results 685 researchers were supported through the NCIC during 1994–2006 and the NCIC support had a positive effect on the performance of scientists who conducted cancer research. Taticchi *et al.*, [4] who conducted performance measurement and sustainable supply chain management found that performance measurement and supply chain management are two isolated fields that appear in the literature with only a few studies on integrated approaches. In addition, Costas and Leeuwen [5] conducted a bibliometric analysis to measure the assessment of research performance at the individual level. The three levels analyzed comprise a total of 24,982 publications showing an overview of the three levels from an individual perspective through defined indicators.

However, research on performance during the COVID-19 pandemic is still very limited, even though the issue of declining performance during the COVID-19 pandemic is a very interesting topic to study. Therefore, researchers are interested in knowing the trend of the development of performance measurement systems during the covid pandemic. This study takes article data from the publish or perish database published between 2019 and 2022 or during the covid-19 pandemic. This research is bibliometric research that aims to determine; 1) the trend of publication development related to the performance measurement system during the covid-19 pandemic each year, 2) the trend of journal publications, 3) the collaboration between researchers with similar topics, 4) trend terms title and abstract and 5) trend terms author keywords.

2 Literature Review

A. Performance Measurement System

The performance measurement system is used as a basis for assessing the success/failure of implementing activities by the goals and objectives that have been set to realize the vision and mission of an organization. Performance measurement is a management tool used to improve the quality of decision-making and accountability [6]. Hall [7] argues that the use of a performance measurement system can improve managerial performance through cognitive and motivational mechanisms, namely psychological empowerment. One of the broad-based performance measurement systems is the strategic performance measurement system (SPMS), with the company's strategy SPMS can positively affect employee performance [8].

B. Bibliometrics

Tupan [9] said that bibliometrics is a term that uses mathematical and statistical methods to study and identify patterns in the use of literature/publications and library

services or as analytical material to determine the development of specific literature, especially authorship, publication and use. The purpose of bibliometrics is to explain the process of written communication and the nature and direction of developing descriptive means of counting and analyzing the various facets of communication. Bibliometrics is divided into 2 major groups, namely descriptive bibliometrics and behavioral bibliometrics. Descriptive studies usually describe the characteristics or characteristics of literature while behavior examines the relationships formed between the components of the literature [10].

C. Previous Research

Noeraida [11] conducted bibliometric research on performance measurement of accredited scientific journals in Batam using the VOSviewer application. The results of the study show that all journals have a good level of periodicity and show a scientific impact as measured by the number of articles cited in the high category.

Lacerda et al., [12] have also conducted bibliometric research on the literature on strategy and performance evaluation. From a total of 2,345 articles filtered to 41 articles that meet the criteria based on topics and keywords. In addition to the process of selecting articles to develop a theoretical framework on performance measurement from a strategic perspective, the researcher also conducted a bibliometric analysis which showed that articles with the theme of production economics became the most published topic of discussion in the last three years.

3 Research Methodology

This research is quantitative research using descriptive analysis. According to Morant *et al.*, [13] bibliometric analysis makes it possible to know the past, understand current progress and improve future research. Natakusumah [14] states that bibliometrics is a mathematical and statistical method in books or other communication media. Bibliometric studies involve the qualitative analysis of a publication or a set of publications, by looking at the bibliography, authorship, year of publication, citations, pictures, and charts, etc. Data processing is processed using Microsoft Excel for data tabulation [11]. The bibliometric analysis step consists of four stages, namely the search stage, the filtering stage, the examination of bibliometric attributes, and the bibliometric analysis. [15]. Meanwhile, to visualize the development of research on performance measurement systems, VOSViewer software is used. Search Stage.

The publish or perish application is used to search for publication data. In this study, the bibliographic search was limited to several criteria. First, the type of bibliography used in the journal article title, abstract, and keywords. Second, the keywords used are “performance measurement system during covid-19”. Third, the articles taken are only limited to international journals. Fourth, the publication year is limited to 2019–2022 or during the covid-19 pandemic.

A. Filtering Stage

At the filtering stage, the selection is made to select the articles to be analyzed. The bibliography selected and used is the type of article title, abstract, keyword, article or

review. Initial data search via the publish or perish application yielded 957 articles, with limited search criteria with the keywords “performance measurement system during covid-19”. Next, screening of article titles that match the keywords resulted in 439 articles.

B. Bibliometric Analysis Stage

This study will analyze based on the four trends contained in the introduction. The bibliometric analysis is expected to provide answers to the research objectives stated in the introduction. This bibliometric visualization is done by exporting the search results from the publish or perish application to RIS format, then entered into the VOSViewer software. VOSViewer is a computer program used to visualize bibliometric maps. The text mining function can be used to visualize a network or relationship (co-relation) in an article citation [16].

The screenshot shows the 'Publish or Perish' software interface. The main window displays a list of search results with columns for Clus, Per year, Rank, Auth., Title, and Year. The search criteria are 'performance measurement system during covid'. The results list includes articles such as '2020 MBNCanada Performance Measurement Report-Measuring Performance, Inspiring Exc...' and 'A case study on strategies to deal with the impacts of COVID-19 pandemic in the food and...'. The interface also shows various filters and options for refining the search results.

Fig. 1. In-App Bibliography Search Publish or Perish. Source: Database Publish or Perish

The screenshot shows the 'VOSviewer' software interface. The main window displays a visualization of bibliometric analysis results, showing a network of nodes and edges representing relationships between articles. The interface includes various settings and options for customizing the visualization, such as 'Scale', 'Layout', 'Size', 'Color', and 'Font'. The visualization shows a complex network of nodes and edges, indicating a high degree of interconnectedness between the articles.

Fig. 2. Vosviewer Display to Visualize Analysis Results. Source: VOSviewer Database

4 Results and Discussion

A. Analysis of Publication Development Trends

The development of scientific publications on the performance measurement system during COVID-19 during the last 4 years, from 2019 to 2022 has experienced a significant increase. The development of these publications can be seen in the following graph (Fig. 3).

A search on the publish or perish database with the keyword “performance measurement system during covid-19” in the last four years, resulted in 439 articles. Based on Fig. 1, the most publications of articles occurred in 2021 as many as 210 articles, while the least publications occurred in 2019 with 34 articles. This is because the COVID-19 pandemic occurred at the end of 2019 so that research on performance measurement systems during the COVID-19 pandemic has not been widely carried out.

B. Research Collaboration Analysis

Figure 2 shows that the author’s tendency to publish is done in collaboration with several authors. The visualization results show that there is a collaboration between authors from 5 journals, the bigger the circle, the more often the authors collaborate. Collaboration between authors occurs because there are similarities in the research subjects, even though they have different work units or functional positions. Most of the research collaborations were carried out by researchers from China. The majority of authors who collaborated include Henry J. Liu, Jonathan Z. Li, Jiexiang Wang, etc.

C. Published Journal Trend Analysis

From the results of the screening, the results obtained were as many as 92 journal publications recorded. Table 1 shows 8 journal publications that dominate in this study. Emerald.com is the journal that publishes the most articles on performance measurement systems during covid-19 with a total of 167 articles. Then Elsevier published as many as 26 articles over the last four years. Meanwhile, mdpi.com, springer and Taylor & Francis have almost the same number of articles (Fig. 5).

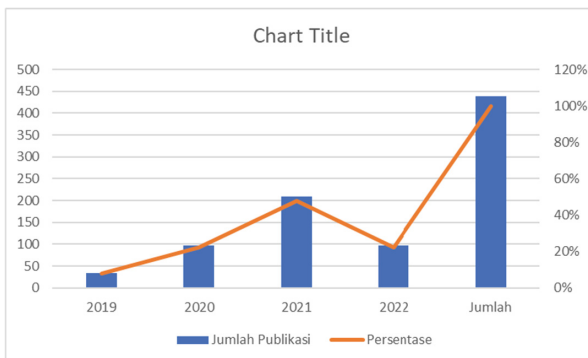


Fig. 3. Diagram of the Development of Scientific Publications on Performance Measurement Systems during Covid-19. Source: Data processed 2022

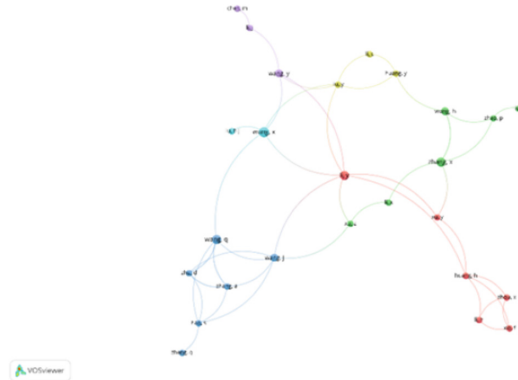


Fig. 4. Map of Collaboration of Performance Measurement System Researchers during Covid-19.
Source: VOSviewer 2022 data processing

Table 1. Dominant Publication Journal

No	Journal Publisher	Number of Article
1	Emerald	167
2	Elsevier	26
3	mdpi	15
4	Taylor & Francis	13
5	Springer	11
6	ssrn	7
7	ieeexplore	7

Source: Data processed 2022

D. Trend Analysis of Title and Abstract Terms

There are 2,479 words recorded in VOSviewer, using the minimum number of occurrences of the 2 conditions, the results found as many as 453 relevant words. There are 5 clusters, the following is an explanation:

- Cluster 1 green color consists of 17 topics, the largest cluster is PMS, performance measurement systems, performance management systems, individual performance, company, firm performance, strategic, performance measurement, sustainability, PMSS, industry, organizational performance, economy, SMEs and relationship.
- Cluster 2 in red consists of 25 topics, the biggest topics are Pandemic, measure, corona virus, study, effect, covid-19, corona virus disease, risk, association, mental health, staff, university student, anxiety, stress, healthcare workers, India, measurement, implementation.

that appear simultaneously in the articles under [17–19]. There are 268 keywords, using the minimum number of occurrences of the 2 conditions, then the results are found to be 153 relevant. There are 6 clusters, 46 types of green cluster 1, 7 types of red cluster 2, 9 types of purple cluster 3, 12 types of yellow cluster 4, 17 types of brown cluster 5, and 6 blue clusters. 26 species, 22 types of orange cluster 7 and 14 types of brown cluster 8. The term in the title that was used the most in program coordination articles was “PMS” with a total of 185 articles (Fig. 4). Here’s the explanation:

- Cluster 1 in green consists of 11 topics, the largest cluster being Covid, sleeping intervention, banking performance, measures of employee, importance of remote learning, employee depression, supply chain resilience, employee engagement, economic impact, revenue management, performance and budget financial, working from home, development project manager, managing entrepreneurship, HRD measures, measurement and assessment, companies performance.
- Cluster 2 in red consists of 7 topics, the largest of which are Performance measures, program management, management accounting, management performance measures, and performance assessment topics.
- Cluster 3 is purple, consisting of 11 topics, the largest of which is the topic of the Performance management system, performance measurement tool, behavioral strategy, measurement, CSR, student, performance appraisal, manufacturing, HR.
- Cluster 4 is yellow, consisting of 10 topics, with the most topics being Performance, project manager, hospitality, management application, manager, performance evaluation, employee performance, management control system.
- Cluster 5 is blue, consisting of 11 topics, with the most topics being PMS, association of performance, performance metrics, performance management system, balanced scorecard, quality performance, BSC, business performance, SME, physical activity.
- Cluster 6 is brown, consisting of 12 topics, with the most topics being Performance measurement systems, bibliometric, non-financial performance, banking industry, individual performance, management control, government, supply chain, value chain.

5 Conclusion

Bibliometric analysis is a scientific method that can be useful for researchers who wish to pursue a retrospective of a broad and rich field of research. Bibliometric methodologies have gained great popularity in recent times due to the omnipresence and usefulness of bibliometric software and databases that facilitate the acquisition and assessment of large volumes of scientific data. An important and relatively recent application of bibliometrics is in program coordination [16].

Based on the results and discussion, it can be concluded that the publication of the performance measurement system during the covid-19 pandemic showed the highest publication year occurred in 2021 which reached 302 articles published. The majority of research collaborations are carried out by researchers from China, including; Henry J. Liu, Jonathan Z. Li, Jiexiang Wang, etc. The journal that publishes the most articles on the topic of performance measurement systems during covid-19 is Emerald with 167 articles. The analysis of the term title and abstract formed 5 clusters. The analysis based on keywords formed 6 clusters. The term in the title that was used the most in program

coordination articles was “PMS” with a total of 185 events. The author suggests the need to add new keywords to get more research results so that it is more comprehensive.

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