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A bibliometric analysis of integrated management system research in the electricity business: trends and future research

ABSTRACT

Numerous studies have investigated integrated management system (IMS) practices in various businesses. However, bibliometric analysis in this field is still underdeveloped, particularly in the electricity business. The purpose of this study is to identify current research trends and provide recommendations for future research through bibliometric analysis of IMS research in the electricity business. The research sample included 43 papers obtained from scientific papers published in the Scopus database. Following the research findings, this study contributes by proposing future research and research trends for IMS practices in the electricity business.

Keywords: integrated management system, electricity business, sustainability, bibliometric.

INTRODUCTION

Many companies in the world are facing increasing demands from the environment for sustainability and the digitalization of business models in operations and investments (Carmo et al., 2023). At the same time, awareness of quality, environmental, safety, energy, and collaboration is increasing (Ramos et al., 2020). To meet this challenge, many organizations want to implement and certify management systems (MS) such as ISO 9001, ISO 14001, and ISO 45001 (Fonseca & Carvalho, 2019; Wright, 2000), which in turn

increases the need for harmonizing and integrating their MSs (Ikram et al., 2020; Nunhes et al., 2022).

The study of IMS has increased rapidly in scientific publications covering a wide range of topics, particularly in the fields of Business, Management, and Accounting (Nunhes & Oliveira, 2018). This indicates continued interest and effort in IMS practices (Ionescu et al., 2018; Nadae et al., 2021). Consequently, there has been an increasing adoption of IMS by companies in various business sectors, including the vital

business sector (Laal et al., 2019) and this is expected to increase significantly globally.

Given the growing importance and acceptance of IMS practices (Nadae et al., 2021), there is a need to assess and understand the current state of IMS research in vital business sectors. The electricity business, as one of the vital business sectors (Lenhart & Fox, 2021; Solin et al., 2009), is the object to be studied in this research because basically all activities require electricity consumption, which is essential for society, industry, and the country. The electricity business is often divided into five types of activities, depending on the type of business (Junda et al., 2018).

IMS practices that have been carried out in the electricity business sector include exploration and extraction (Poltronieri et al., 2019), power generation (Laal et al., 2019; Sui et al., 2018), transmission and distribution (Nadae et al., 2021), multipurpose projects (Nadae et al., 2019; Nunhes et al., 2022; Vulanović et al., 2020), and efficiency energy (Muzaimi et al., 2018). The practice of IMS is also widespread in several countries around the world, particularly in China, Brazil, Iran, Serbia, Portugal, and Malaysia.

The IMS Framework, which consists of Quality MS, Environmental MS, and Occupational Health and Safety MS, is the most widely utilized integration combination (Fonseca & Carvalho, 2019; Wright, 2000). This further validates findings from several studies that emphasize the

importance of industry-specific context for sustainable IMS practices (Nadae et al., 2021).

Overall, this study aims to provide current research trends and explore future research for IMS practice in the electricity business. Finally, by emphasizing the importance of this research, it is hoped that it can contribute to the advancement of IMS research and practice in the electricity business.

A brief reminder of this paper is organized as follows. Section 2 provides an overview of the bibliometric analysis approach. Section 3 presents graphs and discusses results. Finally, Section 4 concludes the study by summarizing the main findings.

RESEARCH METHODS

This study examines IMS research through a bibliometric analysis of the Scopus database from 1996 to 2023. The bibliometric analysis approach is quite popular these days since it provides an organized representation of published papers in each field of research by employing objective criteria for publication arrangement (Ronalter et al., 2023; Roziqin et al., 2023).

The research method is divided into four stages. The first stage is to select a bibliographic database. The bibliographic database chosen was the Scopus database, as it is a curated source of high-quality bibliometric data for academic research (Nunhes & Oliveira, 2018;

Rejeb et al., 2023; Roziqin et al., 2023; Saraiva et al., 2019) and fulfills the requirements to be used as a database for this study. The Scopus database contains various types of documents, namely articles, conference papers, conference reviews, reviews, abstract reports, books, book chapters, short surveys, editorials, and notes.

2 The second stage consisted of filtering the search in the Scopus database. The terms integrated management system, electricity, and energy were used as keywords filtered on title, abstract, keywords, and publication year set from 1996 to 2023. The initial data search began in 1996 as an initial concept of MS integration following the publication of the Environmental MS, which could then be integrated with the Quality MS that had appeared earlier in 1987 (Karapetrovic & Jonker, 2003; Nunhes & Oliveira, 2018; Wilkinson & Dale, 2002). The first 43 papers were selected as the search using the Boolean algorithm in the Scopus database detected the most relevant papers for the given keywords. This stage was completed in July 2023.

The third stage consisted of collecting data from the 43 selected papers. This study focuses on data records related to bibliographic data and text data in published papers from 1996 to 2023. In the fourth stage, the collected data was then subjected to bibliometric analysis, which is then presented in this study. In the bibliometric analysis, VOSviewer software was used to

graphically display the analyzed data using category maps (van Eck & Waltman, 2010).

RESULT AND DISCUSSION

The bibliometric analysis in this study uses a tool, namely VOSviewer software. VOSviewer software is a tool used to build and visualize maps based on network data, bibliographic data, and text data (Mahyuni, 2021; van Eck & Waltman, 2013). In this study, two methods were used to answer the research questions: bibliometric analysis based on bibliographic data and text data. Bibliometric analysis uses map analysis based on bibliographic data to find current research trends, and bibliometric analysis uses map analysis based on text data to recommend future research. Furthermore, there are three types of outputs from the VOSviewer software to display the research results: network visualization, overlay visualization, and density visualization.

Research Trends

A bibliometric analysis was conducted based on bibliographic data (Martínez et al., 2021; Nunhes & Oliveira, 2018; van Eck & Waltman, 2013). There are 35 authors, 21 organizations, 15 countries, 256 keywords, 451 documents, 23 sources, and 1,214 references in the bibliographic data in this study. The most frequently used keywords were collected and examined to

categorize the 43 papers in the sample. This analysis highlighted the keywords that appeared most frequently in the area under study.

Table 1 and Figure 1 show the results of the co-occurrence analysis of author keywords, which found four clusters. This cluster examines the connectivity or coverage associated with IMS and the electricity business.

Tabel 1. Clustering of Research Trends

No.	Clusters	Concept Items	Colors	Items no.
1	Clusters 1	Corporate sustainability, environmental, iso 14001, iso 26000, iso 45001, iso 9001, lean manufacturing, occupational health and safety, and social responsibility.	Red	9 items
2	Clusters 2	Accidents, business improvement, customer requirements, energy, human reliability, management systems, sustainability, and water.	Green	9 items
3	Clusters 3	Case studies, economic performance, environmental management system, environmental performance, integrated management system, management system standar, ohsas 18001, sustainable development, and triple bottom line.	Blue	9 items
4	Clusters 4	Energy consumption, greenhouse gas emission, process management software, quality, and sustainable management.	Yellow	5 items

Cluster 1 describes corporate sustainability that focuses on integrating environmental and social responsibility, following Quality MS, Environmental MS, Occupational Health and Safety MSs, and applying lean manufacturing principles to prioritize occupational health and safety. Cluster 1 shows that current research trends are related to IMS practices and corporate sustainability performance in the electricity business (Gianni et al., 2017).

Cluster 2 describes the utilization of human reliability and efficient MS to meet customer needs and businesses that implement sustainable energy practices, work to prevent accidents, and conserve water resources. Cluster

2 shows current research trends related to the resources needed for IMS practices in the electricity business (Gianni et al., 2017).

Cluster 3 revolves around case studies, economic performance, Environmental MS, Occupational Health and Safety MS, and sustainable development concepts, all of which focus on IMS, environmental performance, and the triple bottom line approach. Cluster 3 shows current research trends related to IMS practices and sustainable organizational performance in the electricity business (Nadae et al., 2021).

Cluster 4 describes sustainable management practices that integrate process management software to optimize energy consumption, reduce greenhouse gas emissions, and improve overall quality. Cluster 4 shows current research trends related to the role of technology in IMS practices in the electricity business (Pauliková et al., 2021).

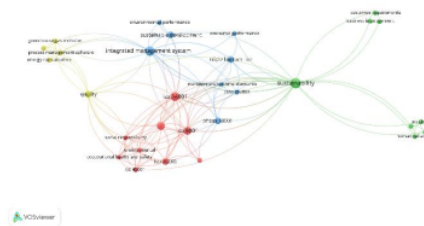


Figure 1.
 Visualization of Research Trends

Future Research

A bibliometric analysis was conducted based on text data (Mahyuni, 2021; van Eck & Waltman, 2013). 546 textual entries were taken from the titles and abstracts of the 43 selected papers. The

bibliometric analysis results are the output of the network visualization. The output of the network visualization is an overview of the topics included in the 43 selected papers that meet the research keywords.

Moreover, Figure 2 provides an overview of which topics are most widely examined, which are shown in the shape of increasingly enormous circles and indicate the relationship between different topics. This involves estimating which topics still require more investigation by looking at the topics with small circles in the output of network visualization. Based on the results of the search and visualization of 546 topics based on text data, an overview of research topics is obtained, which are grouped into several clusters that are interconnected with each other.

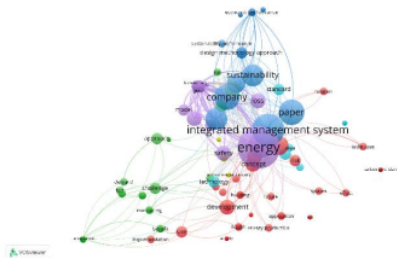


Figure 2.
Overview of Topics

There are six clusters found in this study that are marked with different colored circles, namely red, green, blue, yellow, purple, and navy. Within each cluster, there are topics that are related to each other. Within each cluster, there are other topics such as energy, integrated management systems, and others. The most conducted

research is on the topics of energy, integrated management system, company, quality, paper, sustainability, integration, management system, and environment, which are marked with enlarged circles.

Furthermore, Figure 3 shows an overlay visualization that provides an overview of previous and current research. The brighter color of the circle indicates that the topic is new. Research that is well-researched is on topics related to energy, integrated management systems, integration, and management systems. However, there are also topics that are new but still underdeveloped, namely topics on sustainability performance, economic performance, application, energy production, and alternative technology.

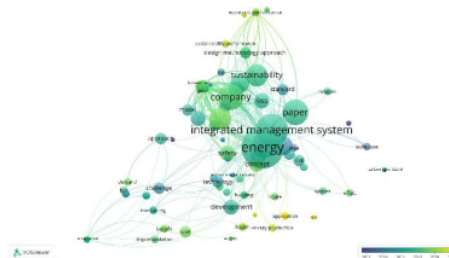


Figure 3.
Overview of Emerging Topics

Further inspection revealed some relatively new and less developed topics, highlighted in light green and slightly yellow, as shown in Figure 4. These topics are sustainability performance, standard, approach, technology, improvement, energy production, and application. Given these results, future research should focus on the

application of continuous improvement methods in accordance with MS standards and new technologies to increase energy production and achieve corporate sustainability performance (Gianni et al., 2017; Nadae et al., 2021).

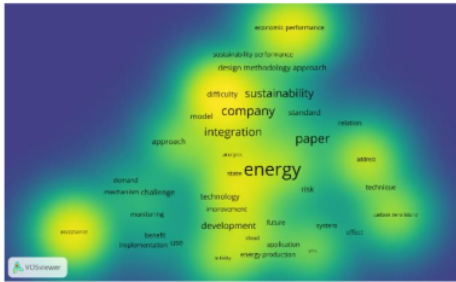


Figure 4.
Overview of New and Emerging Topics

CONCLUSION

In light of the results and discussion, this study found current IMS research trends related to corporate sustainability performance, business resources, sustainable organizational performance, and the role of technology in IMS practice in the electricity business. Future research recommendations include the development of continuous improvement methods in accordance with MS standards and new technologies to improve energy production and achieve corporate sustainability performance. In addition, it is concluded that the outlined research objectives have been successfully achieved. However, the limitation of this research is that it only uses one well-known international database, Scopus. Therefore, future

research can use several databases to cover this limitation.

3 ACKNOWLEDGMENT

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