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EMS Application in Businesses – Systematic Review

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Abstract: This systematic review answers the question what aspects of Environmental Management System (EMS) implementation in small and medium sized enterprises (SMEs) are dealt in contemporaneous literature. For this purpose, by applying keyword search queries and the follow-up screening, 26 publications were filtered out of Web of Science database, which were then analyzed in a quantitative method using bibliometric procedures, followed by a systematic qualitative review. It was based on a conceptual analysis, identifying the basic EMS implementation aspects comprised. Through synthesis of the ascertainments obtained, we conclude that the main aspects of EMS implementations in SMEs are the implementation procedure hindrances, be that internal barriers, prohibitive costs and need for their justification.

Keywords: EMS; business; environmental practices; systematic review

JEL Classification: Q18; F52

1. Introduction

Small and medium businesses (SMEs) in general are often unconscious of their environmental impact (Ormazabal et al., 2018; Teriö & Kähkönen, 2011) and lack the knowledge and experience required to build and administer environmental management systems (EMS). These corporations however have had a substantial impact on the environment (Ammenberg & Hjelm, 2003), either alone or in combination with other industries. As a result of the challenge of optimizing their production processes to account environmental factors, SMEs have increased their focus on EMS (Yen Nee & Abdul Wahid, 2010).

1.1. Environmental Management System

To really be a successful aspect of corporate management, EMS must be an indispensable part of an integrated management solution (Teriö & Kähkönen, 2011). In this regard, EMS should be a constituent of a larger plan that incorporates workplace safety measures, quality management and healthcare (Frehe & Teuteberg, 2017). Thus, an EMS becomes an efficient tool to assist a corporation in realization of its periodic audits of its components (Ptáčková Mísařová, 2012) and developing appropriate process for setting environmental objectives, duties and internal regulations.

There is a stress for the need of an environmental management system which considers a company's structure via a complete evaluation of processes (Johnstone, 2020b) which analyzes how a company's activities effect ecological problems, reinforcing these notions, and which analyzes how a company's activities effect ecological problems, reinforcing these

notions (Granly & Welo, 2014). It should be pointed out that EMSs are applied as part of a set of administrative instruments to manage effects in order to encourage enterprises to upgrade their environmental and in general "green" practices. Besides the EMS application with small and medium size enterprises may aid them in the implementation of environmental standards and, under most circumstances, adhere to the standards of ISO 14001 (Pangboonyanon & Kalasin, 2018).

1.2. Application of EMS in Case of SME

In general terms, the majority stream of researches (Culley, 2019; Johnstone, 2020a; Naidoo, 2010) argue for incorporating an EMS into the core conception of a small and medium enterprise. They stress that it is absolute necessary to create efficient environmental management, health care system and quality management system.

The Standard ISO 14001 (Johnstone, 2020a) has made it possible to use EMS as a quality certification system. This guideline views environmental management system as a component of a wider system that comprises a business's whole strategic planning (Chan, 2011), institutional framework, duties (Hai, 2008), processes, operations, methods (Taylor & Murphy, 2004) and assets (Zobel, 2007) for integrating, developing implementing, improving and monitoring its green management.

Green developments in the case of small and medium size enterprises could be vital steps with the following benefits:

- contribution to improvement of environmental consequences and/or particular ecological renewable energy targets (Hillary, 2004);
- generation of new attitude, ideas, technologies and methods, or services (Rasit et al., 2019).

Combining these 2 beneficial aspects, the business can remain or become successful even in intense competition as a direct result of analyzing a corporate environment and identifying appropriate environmental improvements (Yen Nee & Abdul Wahid, 2010).

In Europe, a business is regarded as a small and medium enterprise (SME) (Musso & Francioni, 2014) if: a) its headcount is below 250 employees; and b) has either an annual turnover of less than EUR 30 million or a yearly balance equal or less than EUR 25 million. Also, in order to be taken as an SME, the business must allow a public body to control 25% of its capital and/or its voting rights.

Whilst big businesses have major environmental consequences (Santos et al., 2011), SMEs possess unique characteristics (Zorpas, 2010) which must be considered when applying EMS. Deficiency of experience and expertise (Ibrahim et al., 2018), a shortage of specific policies (Tüzün Rad & Gülmez, 2017), scarcity of funds (Campos, 2012) and high deployment expenses (Adel et al., 2020) with this sort of business, have all hampered SMEs' implementation of EMSs. The need of creating specific ways for adopting EMSs in SMEs has been underscored under these circumstances (Granly & Welo, 2014; Hillary, 2004; Zobel, 2007).

In past years, numerous studies on the application of environmental management in SMEs have been conducted all over the planet (Burke & Gaughran, 2006; Johnstone, 2020a;

Rasit et al., 2019; Zheng & Zhang, 2010). Several SMEs analyses have targeted on hazards, impediments to innovation, budget, technological and scientific improvements, and environmental indicators (Adel et al., 2020; Granly & Welo, 2014; Michlowicz, 2021). The significance of EMS as a prospective instrument for adopting environmental control in these businesses has also been stressed (Zorpas, 2010).

However, it must be admitted that only very few of the studies were systematically targeted at mapping individual EMS aspects applied in SMEs, which is regarded as a research gap by the authors of this study.

In light of this, the research question that inspired this study originated as follows: what are the main aspects of EMS implementation in SMEs that the contemporaneous research literature deal with? In order to answer this question, the systematic review presented aims to provide a survey of the state-of-the-art in the subject area.

2. Methods

This type of systematic literature review is characterized as mixed approach (Zhang et al., 2020) since it combines quantitative (i.e. bibliometric analysis) (Donthu et al., 2021) and qualitative (systematic analysis of papers, including their content analysis) techniques (Page et al., 2021a).

The study was carried out in the below consequent steps.

1. Determination of the database selection criteria and dataset fields

The database used in this research was Web of Knowledge (WoS) because of its a long and steady standing as a trans-disciplinary index of the most referenced periodicals in their related disciplines (Singh et al., 2021).

2. Formulation of inclusion and exclusion criteria for publications analyzed
3. Keyword database searching

The title, abstract, and keywords referencing to concepts related to EMS and SMEs were filtered out using an internal search WoS interface based on the selected keywords with application of the pre-defined search settings (Table 1) and search queries (Table 2) in conformity with the inclusion/exclusion criteria above.

Table 1. Search settings

Item	Settings	Rationale
Indexing service	Web of Science	Quality of materials published
Database	Web of Science Core Collection (1945-present)	Leading publications, full indexation and searchability
Edition	SCI-EXPANDED SSCI ESCI	Elimination of documents pertaining to irrelevant research areas
Exact search	disabled	Abridgement and simplicity of search queries, however without reduction of the scope of documents retrieved

Table 2. Search queries

Item	Query segment	Number	Rationale
Publication Years	PY=(1992-2021)	#1	Broad research period, enabling determination of time trends
Language	LA=("ENGLISH")	#2	Practical reasons: language gap
WOS Index	EDN=("WOS.SCI" OR "WOS.SSCI" OR "WOS.ESCI")	#3	Elimination of irrelevant research areas
WOS Categories	TASCA=("ENVIRONMENTAL SCIENCES" OR "GREEN SUSTAINABLE SCIENCE TECHNOLOGY" OR "ENVIRONMENTAL STUDIES" OR "MANAGEMENT" OR "ENGINEERING ENVIRONMENTAL" OR "BUSINESS" OR "PUBLIC ENVIRONMENTAL OCCUPATIONAL HEALTH" OR "OPERATIONS RESEARCH MANAGEMENT SCIENCE" OR "ECOLOGY" OR "ECONOMICS" OR "BUSINESS FINANCE" OR "TRANSPORTATION SCIENCE TECHNOLOGY" OR "TRANSPORTATION" OR "PUBLIC ADMINISTRATION" OR "LAW" OR "POLITICAL SCIENCE")	#4	Elimination of irrelevant research areas
Research Areas	SJ=("ENVIRONMENTAL SCIENCES ECOLOGY" OR "BUSINESS ECONOMICS" OR "TRANSPORTATION" OR "OPERATIONS RESEARCH MANAGEMENT SCIENCE" OR "PUBLIC ENVIRONMENTAL OCCUPATIONAL HEALTH" OR "PUBLIC ADMINISTRATION" OR "GOVERNMENT LAW")	#5	Elimination of irrelevant research areas
Keywords	TS="environmental management system*" OR TS=("EMS" AND "environment*")	#6	Focus on environmental certification
	TS=("emergency" OR "medical")	#7	Elimination of items related to "Emergency Medical Service"
	TS=("small and medium enterpris*" OR "small and medium business*")	#8	Focal on small and medium sized enterprises

Note: The resulting search query was formulated by concatenating the above query segments in the WoS Advance Search Interface with the following syntax: #1 AND #2 AND #3 AND #4 AND #5 AND #6 NOT #7 AND #8

4. Screening of keyword database searching results

The goal was to check whether the publications obtained by the preceding stage through keywords database searching of their titles, abstracts, and keywords and full-texts are factually related to the subject examined in this study. Unlike the preceding keyword database searching, this one was performed by human screening exclusively. To visualize the results obtained we used an adapted extended version of the standard PRISMA flowchart (Moher et al., 2016)

5. Bibliometric (quantitative) and systematic (qualitative) analysis

The bibliometric analysis was performed through human screening by the authors, with the support of the online WoS analytics interface. Systematic analysis was carried out through human screening performed by the authors (no automatic searching tools) in 2 steps as recommended by Page et al. (2021b): a) First, the papers were searched for presence of conceptual definitions of EMS, and then b) Aspects of EMS implementation in SMEs were identified and classified and the outcome then synthesized in accordance with the main subject of this study. As regards software applications used, The gathered references were stored and processed using Mendeley online (Takatori, 2016). This application is a reference manager that may be coupled with the databases used in this review.

3. Results and Discussion

3.1. Keyword Database Searching

The keyword database searching was executed on January 31, 2022 by applying the search settings and queries as specified in the methods section. The database searching (publications) respectively identification of publications via other methods yielded 29 results, respectively 25 results, as rendered in the upper left (resp. right) bold-framed nod of the PRISMA Flowchart (Annex).

3.2. Screening of Keyword Database Searching Results

The total of 54 results obtained as specified above were screened for compliance with the inclusion/exclusion criteria as specified above. The screening lead to a resulting portfolio of 26 publications as rendered in the lower bold-framed nod of the PRISMA Flowchart (Annex), which were then entered into the quantitative bibliometric analysis and the following qualitative systematic analysis.

3.3. Bibliometric Analysis

In the resulting portfolio we identified 3 reviews, 15 case studies and 8 surveys (Figure 1 A). This shows that – in the subject of environmental aspects of small and medium enterprises – case studies are clearly predominant, which is confirmed also by Balanovska et al. (2019).

The portfolio comprises 11 theoretical studies and 15 empirical studies (Figure 1 B), which indicates that empirical approach is most applied on this subject. Like Hai (2008), the authors believe that this may have its rise in the purely practical and complex character of the subject explored, i.e. EMS implementation in business sphere, which makes its – due to its complexity – its rendering by means of constructs in the theoretical plane is rather difficult and impracticable.

The most frequented keywords identified in the resulting portolio were EMS (15 occurrences), Environmental Management System (11), small and medium business (4), small and medium enterprise (7), environmental protection (3) (Figure 1 C). This makes us conclude that the environmental certification aspect is the most accentuated, followed by the

aspect of the enterprise size. This outcome is quite understandable and could undoubtedly be expected.

We identified 21 qualitative oriented articles in the portfolio, versus only 5 quantitative oriented ones (Figure 1 D). This leads us to assume that qualitative aspect is absolutely predominant within the scope of problems related to environmental aspect of activities of small and medium enterprises. This observation is in a perfect correspondence with Pangboonyanon and Kalasin (2018), who – however – do not try to explain the reason. The authors of the study presented believe that the predominance of qualitative-oriented research has its rise in the fact that environmental aspects of business operations are difficult to be rendered in quantitative manner, which requires clear identification and unambiguous definition of constructs, followed by an exact numerical analysis, as also has been mentioned in the section related to the study approach (theoretical vs. empirical).

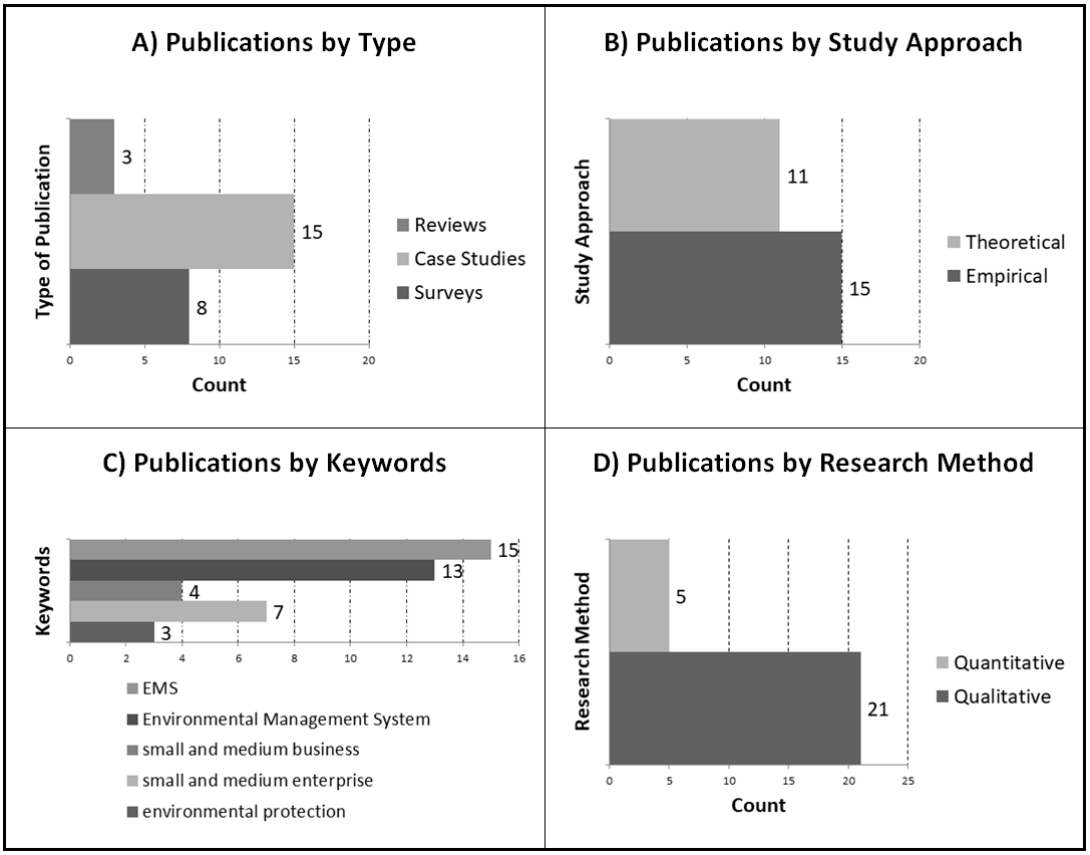

Figure 1. Bibliometric analysis of the resulting portfolio

3.4. Systematic Analysis

Following the quantitative bibliometric analysis, the portfolio publications entered into qualitative analysis stage for systematic review as defined by Johnstone (2020a), which was the main goal of this study (no quantitative analysis was performed within the framework of the systematic review) It consisted in examining the state of literature dealing with EMS implementation in SMEs. Table 3 provides a list of the dominant aspects of the EMS implementation as treated in each of the resulting portfolio publications.

Table 3. Publications by EMS implementation aspect in SMEs

Publication	Aspect
Musa and Chinniah (2016)	Presents analysis of failures, corrections of the procedure course and improvements to environmental policy.
Teriö and Kähkönen (2011)	Recommends application of other tools for data collection of EMS aspects, such as webpage research, report analysis.
Adel et al. (2020)	Proposes to apply cross-evaluation in decision-making on EMS implementation
Zobel (2007)	Proposes behavioral methods in researching SME activities
Sampaio et al. (2012)	Stresses the role of efficient systems for evaluation of EMS efficiency in decision-making about EMS implementation and maintenance
Campos (2012)	Points out the importance of in-depths analysis of both internal and external environment of SMEs in decision-making about eventual EMS implementation.
McKeiver and Gadenne (2005)	Considers how operation of SMEs influences living environment; examines environmental aspects SMEs activities
Seiffert (2008)	Points out the risk of endeavors to reach maximum integration of environmental and other systems across a group of SMEs comprising heterogeneous business as regards their economic power.
Zorpas (2010)	Elaborates planning, documentation, measurement, monitoring, and evaluation of environmental responsibility implementation goals
Ramos et al. (2013)	Emphasizes that in research aspects of EMS implementation in SMEs it is important to obtain a sufficient sample of examined businesses.
Yen Nee and Abdul Wahid (2010)	Emphasizes the importance of engaging SMEs employees; underlines the need to assign powers to them; the business should give incentives to the employees to actively support environmental endeavors of the business
Cordano et al. (2010)	Deals with special methods applied in research of environmental aspects of activities pursued by SMEs
Chan (2011)	Focuses on resource availability
Santos et al. (2011)	Deals with the scope of problems concerning implementing EMS in groups of SMEs.
Ammenberg and Hjelm (2003)	Suggests that also third parties should be involved in decision making process about implementation and maintenance of EMS in SMEs.
Chavan (2005)	Considers a wide range of factors active in decision of SMEs about implementing EMS
Hillary (2004)	Considers mutual differences between the SMEs based on internal division of SMEs according to their size and field of their entrepreneurial activity (business sector)
Hai (2008)	Underlines environmental management training
Rasit et al. (2019)	Stresses the importance of certification and compliance with ISO standards
Granly and Welo (2014)	Emphasizes that there should be made a distinction between the individual SMEs in the group depending on their economic situation (prosperous versus poor). EMS implementation should consider differences between individual SMEs in the group and the implementation policy should be differentiated and formulated accordingly.
Burke and Gaughran (2006)	Stresses the role of specialists and external consultants in implementing EMS within the SME organization structure
Wong et al. (2020)	Considers the quality of the relation between the SME managers and their owners; points out the fact that their environmental interests (and thereby also approach) may differ or be even contradictory
Jaroenroy and Chompunth (2019)	Details aspects of EMS maintenance in SMEs
Prajapati et al. (2021)	Deals with engagement of the supporters, public and media in decision –making procedure about EMS implementation.
Ardente et al. (2006)	Emphasizes the importance of innovations leading to new environmental solutions which combine efficient "green" benefits and low costs
Johnstone (2020b)	Defines recommended corporate environmental policy and planning sets

Bases on the ascertainment as stated above, we can gather that the papers analyzed pointed out the following problems associated with EMS implementation in SMEs: cost savings in long-term sustainable practices (Balanovska et al., 2019), necessity of gaining a competitive edge as a result of EMS implementation (Campos, 2012), insufficient knowledge concerning environmental consequences (Johnstone, 2020a), need for formal environmental regulation (Chan, 2011), strengthening business reputation of the enterprise owing to environmental compliance (Teriö & Kähkönen, 2011), unclear ethical benefits ensuing from environmental compliance and need for clear definition of "green" responsibility (Zorpas, 2010), difficult EMS administration (Balanovska et al., 2019), need for schooling on environmental issues (Ammenberg & Hjelm, 2003), gaining new clients based on improved environmental image (Taylor & Murphy, 2004), inter-business cooperation in environmental problems (Hai, 2008), high expenses associated with EMS implementation (Wieczorek-Kosmala et al., 2020).

However, a great many of the studies reviewed (Adel et al., 2020; Ammenberg & Hjelm, 2003; Balanovska et al., 2019; Ramos et al., 2013; Yen Nee & Abdul Wahid, 2010; Zorpas, 2010) also state that – once and if SMEs managed to overcome early financial obstacles and a lack of prior expertise about deploying EMSs, the EMS implementation did yield favorable benefits and had a positive impact on the operational efficiency of the enterprise. Consequently, as a result of successful EMS implementation, a majority of small and medium sized enterprises were able to implement and successfully run environmental management of their organizations as confirmed by Adel et al.(2020).

4. Conclusions

Based on conceptual analysis of literature sources, using the PRISMA standard and OSF-open-ended – registered protocol the systematic literature review identifies what aspects of EMS implementation in SMEs are treated in the contemporaneous research papers.

Having synthetized the results, we can conclude that the most frequented focus is directed to the scope of problems related to difficulties with EMS implementations, hindrances, be that internal barriers, prohibitive cost and need for their rational justification. Thereby the study presented offers a deeper insight into green aspects of SME operation, which are to be considered even in the for-profit sector.

Conflict of interest: none

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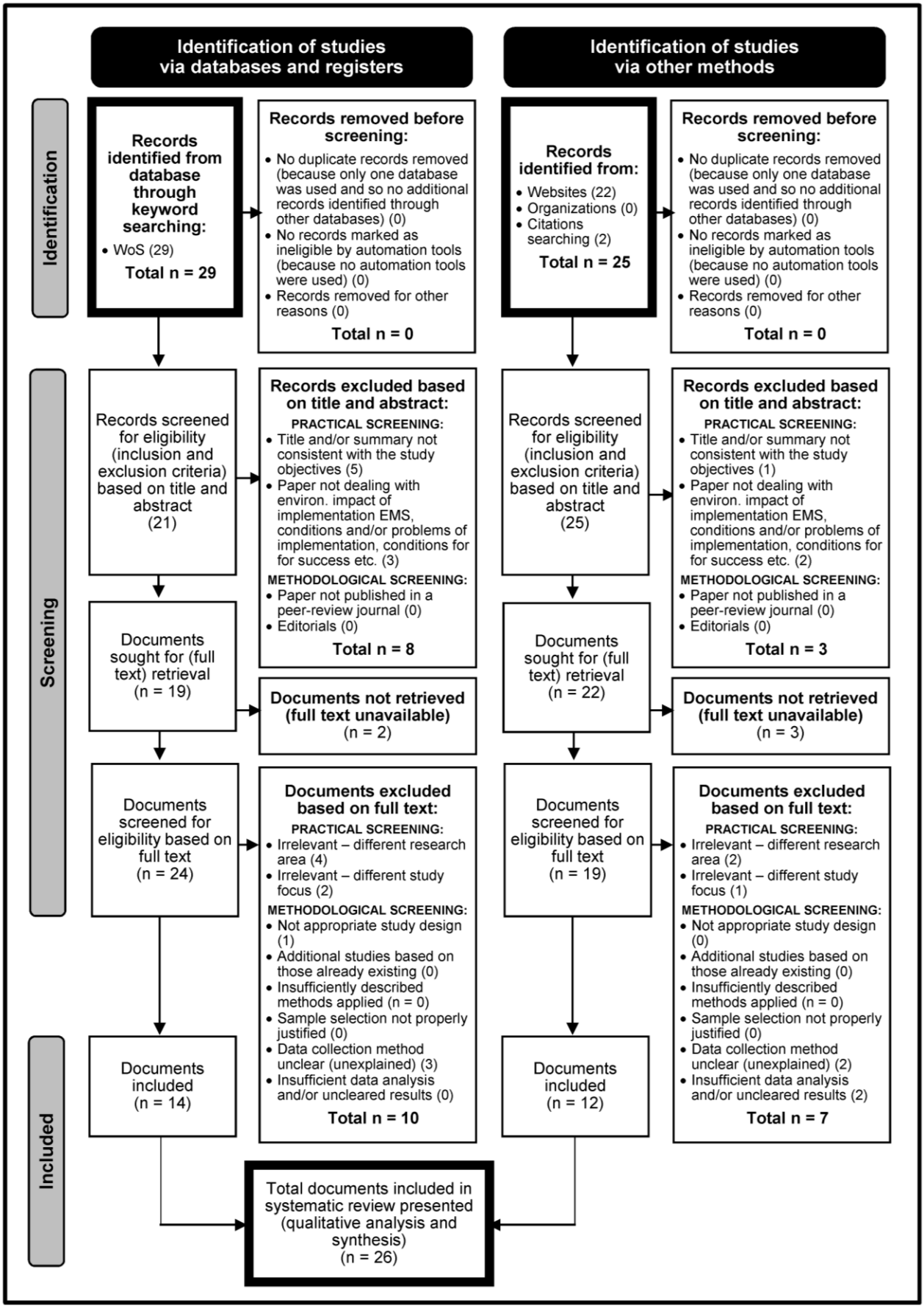
Annex. PRISMA flowchart (adapted from Tricco et al. (2018)).



Note: No quantitative analysis we performed within the systematic analytical stage