



CHARACTERIZATION OF THE INDICATORS FOR THE EVALUATION OF THE PERFORMANCE OF MANAGEMENT SYSTEMS

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Abstract

Ergonomics is related to the protection of workers' health, involving the physical, cognitive and organizational domains, achieving a systemic approach in all aspects of human activity. In the same sense as the activities of the Occupational Health and Safety Management System (OHSMS). These prevention activities need to be evaluated to verify their effectiveness and consequently establish reliable improvement strategies. Consequently, performance evaluation is considered essential in the advancement of the system and its indicators must measure the particularities of the risks in the context of the company, allowing the definition of action plans. Therefore, characterizing the type of evaluation and the performance indicators was the objective of this article. In the research, ProKnow-C was used, performing the systemic analysis that identified and explored the characteristics of the applied methods. It was found that 11 articles used individual or isolated indicators to measure performance, 14 applied a set of indicators. The applied evaluation systems are considered generic, as they do not adjust to the particularities of the organization. A research gap was identified regarding the indicators used to assess the OHSMS. Since they are generic, they may not provide accurate information on the status of the OHSMS, which can lead to errors in defining improvement strategies. Likewise, there is a lack of structures to define performance indicators adjusted to the characteristics of the organization. In addition, it is necessary to define monitoring procedures for the indicators, allowing an effective response to the control of occupational risks and contributing to the continuous improvement of the organization.

Keywords: Ergonomics; Occupational Health and Safety Management System; Performance evaluation; Performance indicators; Proknow-C.

1. INTRODUCTION

Ergonomics seeks to adapt work to human beings, covering not only the activities carried out with machines and equipment used to transform materials. In addition, the entire relationship between the person and the productive activity. This involves, in addition to the physical environment, cognitive and organizational aspects. Therefore, in order to achieve the desired results of the work, both in planning and design activities and in those of control and

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evaluation, ergonomics must be included with its physical, cognitive and organizational domains in order to obtain a complete management system (Iida & Buarque, 2016).

Obtaining safe work areas, providing the physical, psychological and social health of their workers is a constant concern of organizations. To achieve these objectives, an Occupational Health and Safety Management System (OSHMS) was developed. Between 1970 and 1980, three developments made the safety management system a topic of general interest: the increased demand for safety regulations in European countries; official reports on the consequences of major industrial disasters; and the introduction of international standards for quality management systems (Hale et al., 1997).

It should be noted that the management system is a set of interrelated elements that allows the establishment of policies and objectives to define actions. The Occupational Health and Safety Management System is considered a management system or part of a management system used to achieve occupational safety and health policy. The actions and results are oriented towards the prevention of workers' health problems and injuries, providing healthy workplaces (ISO, 2018).

The OHSMS seeks to identify and assess the risks of work and the legal requirements according to the economic activity of the organization. In addition, it defines the policy, organizational structure, responsibilities and functions to execute the planning of activities, processes, procedures, resources, etc. (ILO, 2001) same aspects that analyze the domains of ergonomics. Among the elements that make up prevention procedures, performance evaluation and monitoring are particularly important (Ai Lin Teo & Yean Yng Ling, 2006). The methods to evaluate them are generally oriented to verify the number of activities and the people participating, that is, the presence of the OHSMS. However, it is necessary to analyze the degree of protection and well-being of workers in the workplace. In addition, identify the level of efficiency and effectiveness of the activities and strategies implemented (Ai Lin Teo & Yean Yng Ling, 2006). The current focus of the OHSMS assessment is to identify the presence of the protection and well-being of workers resulting from prevention activities. This approach makes it difficult to identify the efficiency and effectiveness of the strategies implemented and to define prevention activities and processes (Neely et al., 1995). Precisely, performance evaluation is defined as the process of quantifying the efficiency and effectiveness of actions (Neely, 1999).

In occupational activities, it is necessary to adopt an approach that involves physical and cognitive, organizational, environmental, social aspects, etc. (IEA, 2019; Iida & Buarque,



2016). Resulting in a better adaptation to technological and work environments (Iida & Buarque, 2016).

Given the importance of evaluating the performance of the OHSMS, this article aims to analyze the characteristics of the type of evaluation used in scientific publications and the performance indicators of the OHSMS used. For this, a basic and advanced bibliometric analysis was carried out. These analyses allowed us to generate knowledge, identify gaps and opportunities for future research. In carrying out the research, the *Knowledge Development Process-Constructivist* (ProKnow-C) was applied as a tool (Dutra et al., 2015; L Ensslin et al., 2017; S. R. Ensslin et al., 2014).

From the identification and analysis of the characteristics of the articles, in this fragment of literature, and the knowledge generated, guidelines for new research are identified, producing relevant information for the scientific community. It is considered original because no article was found in this fragment of the literature that analyzes the characteristics of the construction of the OHSMS performance evaluation method.

2. METHOD

An exploratory and descriptive bibliographic research was carried out to build the theoretical framework and broaden the understanding of the performance evaluation of the OHSMS. In this case, the intervention methodology adopted was the *Knowledge Development Process - Constructivist* (ProKnow-C), as an intervention instrument.

The research is based on a constructivist approach that develops: compilation, analysis and study of scientific knowledge, acquisition of main postulates and construction of the theoretical framework (Dutra et al., 2015; L Ensslin et al., 2017; S. R. Ensslin et al., 2014; Valmorbida et al., 2016).

2.1. ProKnow-C

This process is divided into stages that help in the construction of researchers' knowledge in the selection, organization and subsequent use, according to the interests established in the research (Dutra et al., 2015; L Ensslin et al., 2017). In this process, the researchers worked by defining the criteria for selecting the databases, keywords, time limits, especially the inclusion and exclusion criteria of the articles to establish the Bibliographic Portfolio (BP) (De Oliveira Lacerda et al., 2014; L Ensslin et al., 2017).



The systematic research is structured in four stages, presented in Fig. 1: (i) bibliographic selection of the portfolio; (ii) bibliometric analyses; (iii) systemic analyses; and (iv) formulation of questions, identification of gaps and research objective (Cardoso et al., 2015; Dutra et al., 2015; L Ensslin et al., 2017; S. R. Ensslin et al., 2014; Valmorbida et al., 2016; Valmorbida & Ensslin, 2015).

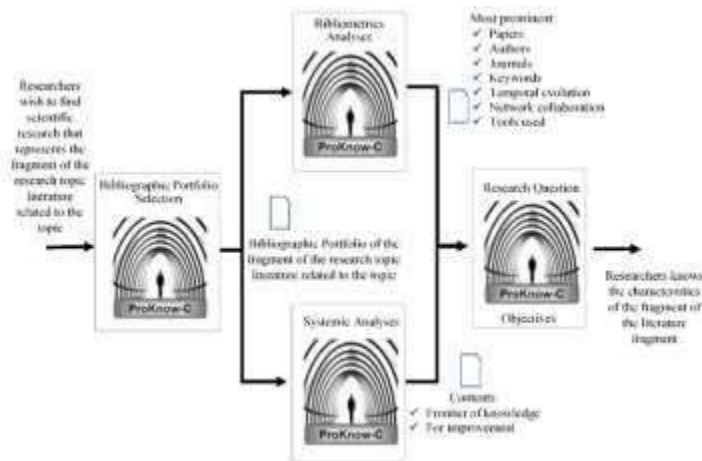


Figure 1. Stages of adapted ProKnow-C (L. Ensslin et al., 2012)

Phase 1 was applied, identifying, according to the researchers' perceptions, a limited set of relevant scientific articles that are aligned with the research theme; Phase 2, which offered the opportunity to identify the most relevant articles, authors, journals, and keywords in the selected bibliographic portfolio; and Phase 4, definition of gaps and research objectives.

2.2. Procedures for the selection of the Bibliographic Portfolio

The selection of the Bibliographic Portfolio involves: (i) definition of keywords; (ii) definition of databases; (iii) search for articles in the selected databases based on the defined keywords; and (iv) keyword adherence test (Dutra et al., 2015; L Ensslin et al., 2017; S. R. Ensslin et al., 2014; Valmorbida et al., 2016).

The definition of the keywords is made from the identification of the research axes, the first the Performance Evaluation, the second the Occupational Health and Safety Management Systems. Establishing as search command ("*performance measure**" OR "*performance evaluation*" OR "*performance assess**" OR "*performance appraisal*" OR "*management*" OR "*indicator**") AND ("*health and safety*" OR "*ergonomics*" OR "*safety incidents*" OR "*occupational safety*" OR "*workplace risk*"). Using in it the combination of search expressions that included options in the singular and plural of the keywords.



The definition of databases consists of the identification of scientific databases whose contents are aligned with the research theme. The databases, chosen from the CAPES Journal Portal, were: *Scopus*; *Web of Knowledge*; *Science Direct*; *Compendex*; *ProQuest*; *EBSCO Academic Search Premier*.

For the research, the delimitations of the process were: (i) articles published in scientific journals; (ii) articles published from 2000 to 2021; (iii) research on keywords, title and abstract; and, (iv) articles in English and Portuguese.

Access to the databases was carried out through the network of the Federal University of Santa Catarina (UFSC). The EndNote® X9 software (Thomson Corporation, 2018) is used to manage the information collected in the databases used in the research process.

With these documents imported from the databases, the initial filtering is done. First delete all non-article documents and duplicates. To complete the first step, the keyword adhesion test was performed to validate the raw article database.

The next step is the selection, by title, of the articles aligned with the theme. The summary was then analyzed. Finally, a complete review of the content of the articles is carried out. They are called initial Bibliographic Portfolio (PB) articles.

The final step corresponds to the analysis of the references of the articles in the initial BP, following the same delimitation criteria. Selecting a new group of articles aligned with the research theme. Figure 2 illustrates the sequence of the BP selection process and the Representativeness Test.

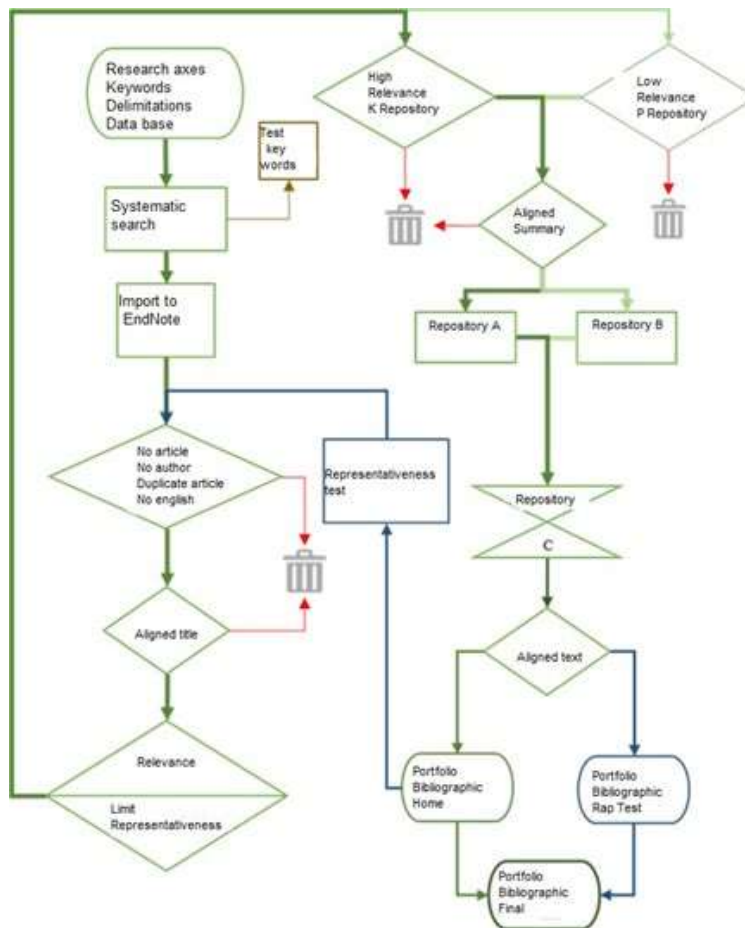


Figure 2. Composition of the bibliographic portfolio: BP filtering and Representativeness test

Thus, the stage of selection of the fragment of the literature on performance evaluation of the Occupational Safety and Health Management Systems was concluded, according to the perception, delimitations and emphasis of the researchers' interests. To finally carry out the bibliometric and systemic analyses of the selected articles.

3. FINDINGS

3.1. Bibliometric Analysis: Basic Characteristics

The basic bibliometric analysis characterizes the following variables: (i) prominent authors; (ii) relevant articles; (iii) keywords that represent the subject or were the most used; (iv) outstanding scientific journals; and (v) impact factor of scientific journals (De Oliveira Lacerda et al., 2014; L Ensslin et al., 2017); (vi) temporal evolution of publications; and (vii) tools used in empirical studies (Cardoso et al., 2015; Valmorbida & Ensslin, 2015).

The first variable, the prominent authors, of the 54 articles selected for addressing the topic of the evaluation of the OHSMS, aims to identify researchers with established careers in



the area. Figure 3 shows the authors of the BP and the representativeness test, taking into account the number of articles published. This information can contribute to a better understanding and updating of knowledge. Likewise, it can be a guide in the lines of research.

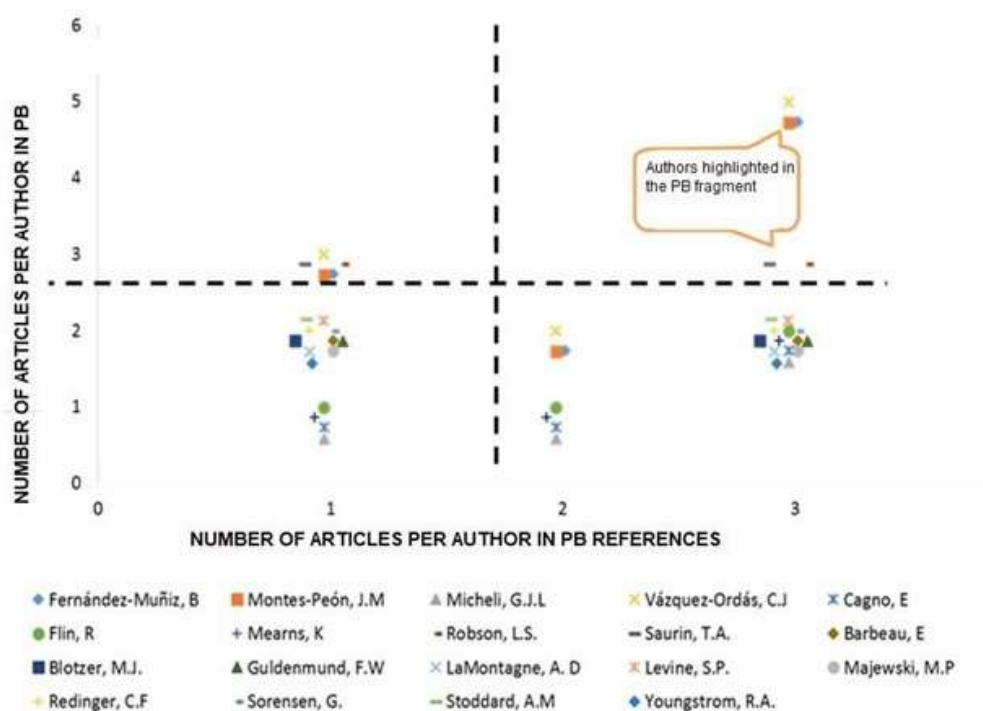


Figure 3. Prominent authors

The authors who led the articles with the highest number of citations were Lynda S. Robson, Tarcisio Abreu Saurin, the team of researchers Beatriz Fernández-Muñiz, José Manuel Montes-Peón and Camilo José Vázquez-Ordás. Lynda S. Robson has been a researcher at the *Institute for Work & Health* (IWH) since 1997. Her research projects are focused on two areas: (i) advances in organizational change in OSH and the evaluation of prevention programs; and (ii) development of key OSH audit data management indicators. In turn, Tarcisio Abreu Saurin has a postdoctoral degree at the *University of Salford*, England, in 2012. His research focuses on safety and production management in complex systems; lean production systems and resilience engineering.

Beatriz Fernández-Muñiz holds a PhD in Business Management from the University of Oviedo. His research activity focuses on the study of human resource management, corporate strategy, competitive advantage, organizational culture, and safety management and culture. José Manuel Montes-Peón holds a PhD in *Business Economics* from the University of Oviedo. His main interests include human resource management, strategy and organization, knowledge



management, and safety management and culture. Finally, Camilo José Vázquez-Ordás holds a PhD in Economic and Business Accounting from the University of Oviedo. His research activity focuses on the study of business operations management, production strategy and safety management and culture.

Likewise, a graph was prepared that illustrates how many authors participated in each article in this fragment of literature, Fig. 4. When analyzing the number of authors, it was identified that articles written by 3 authors predominate, a total of 16, noting that Fernández-Muñiz's team, Beatriz; Vázquez-Ordás, Camilo José and Montes-Peón, José Manuel, participated in 5 articles. Pairs of authors wrote 14 of the articles; and finally, teams of 4 authors write 9 different articles

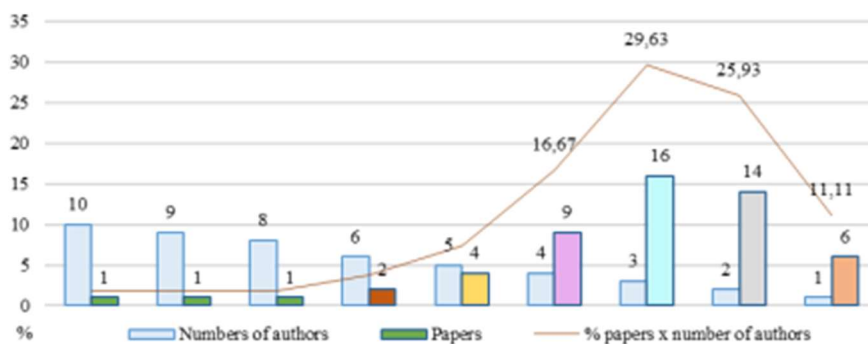


Figure 4. Number of authors in each article

Now the featured articles are presented in this fraction of the literature. Figure 5 illustrates how many citations each selected article has. This information was consulted on Google Scholar in 2021. The three papers with the highest number of citations are those led by authors Bourne, Mike, Flin, R., and Guldenmund, F.W., published in 2000.



Figure 5. Featured Articles



The first article is "*The nature of safety culture: a review of theory and research*", written by Frank Guldenmund and published in *Safety Science* in February 2000. The article analyzes the safety culture and the safety climate by discussing the content and consequences of these topics in the last two decades of the twentieth century.

Secondly, the article "*Measuring safety climate: identifying the common features*" is the result of research by the authors Flin, R.; Mearns, K.; O'Connor, P. and Bryden, R. It is an article published in *Safety Science* in February 2000. The article deals with the measurement of the security climate and how it has given rise to a proliferation of assessment tools. The authors analyzed 18 scales used to assess the safety climate. They reviewed the categories covered by the questionnaires of these 18 scales (Flin et al., 2000).

Finally, "*Designing, implementing and updating performance measurement systems*", written by Mike Bourne, John Mills, Mark Wilcox, Andy Neely, and Ken Platts, published in the *International Journal of Operations & Production Management* in July 2000. The article addresses the problems when designing, implementing, using, and continuously updating performance measurement systems in manufacturing companies. The authors developed, based on theoretical research, a framework to analyze the implementation of a performance measurement system. The article concludes that specific procedures are necessary to continuously align the performance measurement system with the company's strategy. The authors indicate that when these processes are combined with a well-defined model of strategic success, the measurement system can improve case management by challenging assumptions and the strategy itself (Bourne et al., 2000).

Then, keywords that best represent the subject or that most authors used were analyzed. Figure 6 shows the keywords used two or more times in the selected articles group. The most used keywords were *Occupational health and safety*, and *Safety climate*, present in 7 articles. We then identify the *Safety management system* and *Health & Safety management*, used without 6 articles. In addition to the keywords: *Accident(s)*, *Safety culture* and *Structural equation modelling*, present in 5 articles. Another 189 keywords, different and not repeated, were used by the authors to identify the research theme.



Figure 6. Keywords

Then, prominent scientific journals and their impact factor were analyzed. It was possible to identify that the journals *Safety Science*, *Journal of Loss Prevention in the Process Industries*, and *Journal of Safety Research* had the highest number of publications, Fig. 7. Another 14 journals participated with an article, among those selected in this fragment of scientific literature, which addresses the theme of Performance Evaluation of the Occupational Safety and Health Management System, with the delimitations established by the researchers.

The most prominent journal was *Safety Science*, a multidisciplinary journal created in 1989. It publishes topics ranging from the safety of people at work to various areas such as transport, energy or infrastructure, as well as the fields of human activities considered dangerous or high risk. This journal enables academic researchers, engineers, and decision-makers in companies, government agencies, and international organizations, to increase their level of information about the latest trends in the field.

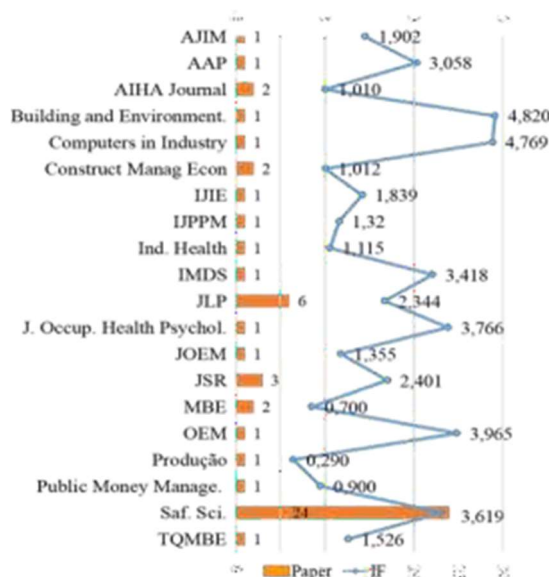




Figure 7. Prominent Journals and Impact Factor

In turn, the *Journal of Loss Prevention in the Process Industries (JLP)* with an impact factor of 2.344. It publishes articles in the areas of process and plant design, plant layout, risk assessment, accidents and losses, plant inspection, plant operation, process control and monitoring, protection system design, equipment design and reliability, use of computer systems in loss prevention, accident analysis, emergency planning, transportation and offshore, risk assessment, management aspects and operational training, as well as risk assessment in work activities.

On the other hand, the following basic characteristic analyzed was the temporal evolution of the publications in the Occupational Health and Safety Management System. It was possible to identify that in 2006 and 2010 the largest number of papers were written, seven, with respect to other years, in the segment selected in this research.

In 2007, a management safety performance measurement was developed. The authors proposed to validly and reliably measure the safety performance of construction managers. Likewise, the article sought to motivate managers to improve their safety performance (Cameron & Duff, 2007).

Shahin and Mahbod conduct a survey using the *Analytical Hierarchy Process (AHP)* technique as a basis for comparisons of SMART criteria (*specific, measurable, attainable, realistic, time-sensitive*), considering each organizational performance indicator (KPIs) in terms of SMART (Shahin & Mahbod, 2007).

In addition, the researchers used the statistical structural equation technique with which they analyzed the most important works on safety management. They developed a measurement scale operationalizing the safety management system concept. With the scale, they calculated the reliability and validity of the system (Fernández-Muñoz et al., 2007b).

In the same year Robson led a team that conducted a systematic search of eight databases to describe the effectiveness of OSHMS. The analysis presents the characteristics, but concluded that the evidence was scarce to make recommendations for or against OSHMS due to the heterogeneity of the articles analyzed (Robson et al., 2007).

In addition, Choudhry, Wu, Chuang, and Ma conducted a review on safety culture. They placed special emphasis on a 1998 survey and presented some clarifications in terms of positive safety culture and safety culture models. The levels of aggregation and safety performance were



provided after the presentation of appropriate empirical evidence and theoretical developments (Choudhry et al., 2007).

In 2010, a theoretical research was published whose objective was to examine the content validity of management auditing methods in occupational health and safety (OSH) (Robson et al., 2010). In addition, Cagno, Micheli and Perotti also did theoretical research to identify what are the most impactful factors when the company wants to improve the OHSMS. In the article, they analyzed the interaction of key factors of the OSHMS. They identified the training factor interacting with 'correct operating procedures' and 'PPE use and status' as interesting aspects. The magnitude of working time and the frequency of use and status of PPE were evaluated as factors in which it is easier to intervene in the context of small and medium-sized enterprises (Cagno et al., 2011).

And, Carlucci proposes a model, based on the *Analytic Network Process* (ANP) to guide managers in the selection of organizational performance indicators (KIPs). The use of the ANP makes it possible to extract weights to establish priorities between the indicators, taking into account the mutual dependencies between indicators and criteria (Carlucci, 2010).

Ramli, Watada and Pedrycz develop an *Intelligent Data Analysis* (IDA) with possible regression. They present an approach to support the analysis of key factors influencing OSHMS (Ramli et al., 2011). In turn, Saurin and Carim Junior evaluate and carry out a proposal for the improvement of an evaluation method of health and safety management systems using Resilience Engineering (RE) (Saurin & Carim Júnior, 2011). In the same year, Granerud and Roch presented a model with which it is possible to identify and analyze the improvement processes in the management system. They presented the result of the application in five case studies (Granerud & Rocha, 2011). Finally, Zeng, Xie, Tam, and Shen conduct an analysis of the offshore facilities management system to identify best practices in safety management (Zeng et al., 2011).

The last basic characteristic of the analysis corresponds to the tools used in the articles selected in the bibliographic portfolio. First, the type of article is classified: (i) theoretical, (ii) case study or (iii) survey. The total number of articles in each type is presented in Fig. 8, 8 articles present the results of case studies, 20 articles perform theoretical analysis to present the findings, and 26 were survey type (data collection with workers from one or more companies).

Finally, with survey type articles, the tool used to analyze the collected data was identified. Figure 9 shows the list of tools used. The *Analytic Hierarchy Process* (AHP) was used in 5 studies (Ai Lin Teo & Yean Yng Ling, 2006; Chang & Liang, 2009; Law et al., 2006;



Podgórski, 2015; Shahin & Mahbod, 2007). And the *Structural equation modelling* used in 4 (Fernández-Muñiz et al., 2007b, 2007a, 2014; Zeng et al., 2011). Being the most used tools.

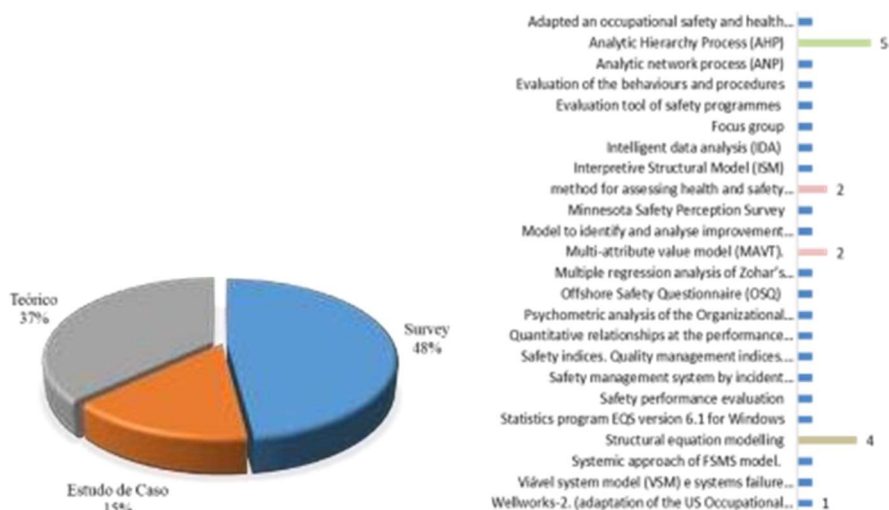


Figure 8. Type of research Figure 9. Tool used

3.2. Bibliometric Analysis: Advanced Features

The advanced analyses applied with the ProKnow-C tool were structured according to the concepts defined by Neely et al., (1995): (i) system analysis or performance evaluation tool developed/applied; (ii) alignment of indicators or objectives with the company's strategy; (iii) use of a tool or system; and (iv) interactions of the evaluation performance system with the environment. Likewise, the characteristics of the life cycle or phases of the performance evaluation systems (v) type of design are analyzed; (vi) implementation characteristics; and (vii) use or revision of the system. The latter are based on the information presented by the authors Bourne et al., (2000) and Nudurupati et al., (2011).

When analyzing the 28 articles that use systems or tools in the development of research, the first advanced feature, shown in Fig. 10. It was identified that 11 use individual measures to measure performance. In 14 articles, the authors applied a set of measures, the other articles did not apply measures in their analyses.

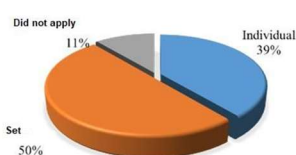


Figure 10. Assessment system or tool

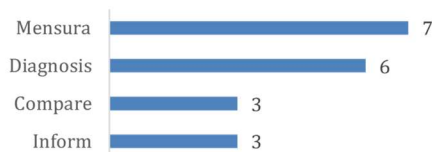


Figure 11. Use of tool or system



The second characteristic, alignment of indicators and/or objectives, identified that in seven cases the indicators make the relationship between the performance evaluation system and the environment. In addition, 16 surveys show that there is an alignment of indicators with the company's strategy or goals. In the other articles, no evidence was found to classify the indicators.

Regarding the use of the tool or system, the third advanced analysis, Fig. 11, it was possible to identify how the indicators are used. Checking how many articles: measure performance; presents a performance diagnosis; compare with other performance; or provides information for management. In most of the articles, measurements of the performance. In six cases, the authors presented a diagnosis of the evaluations made, 3 articles compared the results between several companies and another 3 provided information for the management of the OHSMS.

Regarding the type of interaction of the performance evaluation system with the environment, fourth advanced characteristic. It was found that the indicators analyzed the internal environment in 10 articles. In the other surveys, both the internal and external environments are measured, in 18 of them.

As for the type of project, it was identified when the research used: (i) 5 used an existing system, created by other authors and not modified; (ii) 13 surveys used indicators adapted from another system or tool; or (iii) the authors built a new system or tool in 7 surveys.

Regarding the studies that implemented the system, characterizing the type of data collection used, Fig.12. It was identified in how many cases the research used interviews, observations, questions, focus group, document review or audit in the collection process.



Figure 12. Type of data collection used

In some cases, the collection was carried out with various types of data collection, such as "*Measuring effectiveness of safety programs in the Thai construction industry*". In it, the authors used interviews and observations (Aksorn & Hadikusumo, 2008). In the case of the



article "*Evaluating and selecting key performance indicators: an ANP based model*", the author used interviews, focus groups and document reviews (Carlucci, 2010). To analyze the theme of the article "*Developing a model to measure the effectiveness of safety management systems of construction sites*", the authors used interviews and audit reports (Ai Lin Teo & Yean Yng Ling, 2006). And in the research done for the article "*Exploratory analysis of the safety climate and safety behavior relationships*", the authors used questions and observations (Cooper & Phillips, 2004). While the use of the system review was identified, 13 studies were identified that presented a diagnosis, 12 analyzed the performance, and 9 communicated the results obtained with the system or tool applied in the study.

4. DISCUSSION

Bibliometric analysis, applying ProKnow-C, allowed the generation of knowledge to identify gaps and opportunities for future contributions. Likewise, it shows its constructivist dynamics to identify "where" and "how" to intervene scientifically. The definition of the characteristics studied allows a complete analysis of the information addressed in the scientific literature. That is, how the topics were addressed, to validate new choices or support their application in a new article.

It also makes it possible to identify the advances in the performance evaluation of the OHSMS and the perspectives addressed by the researchers. As well as, what has been done so far, the gaps and alignments to continue to improve this matter. In fact, with the bibliometric analysis it was possible to identify the characteristics of the publications. This analysis focuses on the qualitative evidence of the information in the articles.

Some aspects, such as who are the prominent authors, identified the level of impact of the research; which journals published the research, indicate their level of scientific relevance. In turn, the advanced analysis allowed us to understand the alignment of the worker's safety and health from the point of view of the tool used to carry out the analysis and evaluation of the system's performance. Likewise, the alignment of the indicators used and the characteristics of the life cycle or the phases of the performance management systems.

The indicators proposed in the analyzed articles require additional studies and validation of use in various sectors of the industry. The indicators used were generic, taken from the scientific literature without adjusting the characteristics of the organization in which they were applied. It is considered necessary to establish structures to define performance indicators adjusted to the characteristics of the organization that will be evaluated. In addition, it is



necessary to define procedures for monitoring indicators as part of the OHSMS so that managers respond more effectively to irregularities in operation.

To solve problems related to health, safety, comfort and efficiency, it is necessary to use the fields of ergonomics. The ergonomic approach is based on systems theory, analyzing the relationship between the worker and his or her tasks. Thus, risks can be controlled or reduced, considering human capabilities and limitations during the project and its environment. This approach can also help prevent errors and improve employee performance. It brings numerous benefits both from a financial point of view to reduce costs and to increase productivity, from a motivational point of view.

5. CONCLUSION

The research used ProKnow-C to perform systemic analyses to identify and explore the characteristics of the methods applied in the selected articles. Allowing the characterization of the type of evaluation and the performance indicators of the OHSMS.

The various advanced analyses applied allowed us to know the characteristics of the models applied by the authors of the analyzed articles. This information allows you to delve into the details of the type of analysis applied during the collection process, as well as in the analysis. Giving tools for researchers to use in new research in this area.

Regarding the indicators used to assess the OSHMS, a research gap was identified. They are generic and may not provide accurate information on the status of the OHSMS in the evaluated organization, which can lead to errors in the definition of continuous improvement strategies. Likewise, there is a lack of structures to define performance indicators adjusted to the characteristics of the organization.

It is considered necessary to develop research to define monitoring procedures for the indicators, allowing to respond effectively to the control of occupational risks taking into account the aspects of physical, cognitive and organizational ergonomics to contribute to the continuous improvement of the organization. Research that allows the definition of systematic evaluation methods that measure and establish classification scales to eliminate the subjectivity of the results. In addition to establishing objective criteria or standards to evaluate performance.

This study was delimited by searching for articles on the CAPES journal portal. The selection of papers depends not only on the professional knowledge of each researcher, but also on some personal judgments, therefore, subjectivity is unavoidable in this process. Other criteria in the selection of articles can be studied in future research.



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