# Management of legal compliance in occupational health and safety. A literature review

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ABSTRACT

Occupational health and safety legislation is an essential part of the process to manage organisations and companies. However, there are criticisms that the regulation of occupational health and safety could be restricting the impulses of innovation and industrial development. This has led to proposals to repeal regulations to reduce the regulatory burden when possible. This work aims to delve into the difficulties that organisations encounter in their attempts to comply with occupational health and safety legislation and manage the process effectively. A systematic review was conducted of published studies that have analysed the relationship between occupational health and safety (OHS) management and compliance with legislation, regulations and rules. The search for relevant publications mainly used international bibliographic databases and scientific search engines. Quotes from other authors were also examined. This review provides knowledge on how compliance and non-compliance with legislation influences daily health and safety management in companies. The review highlights and discusses both successful regulatory strategies and the main difficulties, weaknesses, limitations and challenges companies face when adopting and complying with these regulations. This study concludes that management of legal compliance in companies, particularly in small and medium-sized enterprises has become a complicated task. Management of occupational health and safety systems should not only be based on prescriptive principles and the detection of non-compliance, but also on proactive principles including an examination of how legal compliance affects daily performance.

## 1. Introduction

According to the European Commission (2005), Labour Authorities in Europe are charged with overseeing the adaptation of legislation, regulations and rules to changing needs in the workplace. Legislators thus focus on providing safe working conditions by applying the legislation.

Occupational Health and Safety legislation is an important part of the process to manage organisations and companies. Meeting the legal requirements is the prime responsibility of any company (Jacinto et al., 2010). Although this is a minimalist safety strategy, it is the first preventive step in any organisation. As Jacinto et al. (2011) states, the correct application of legislation in companies can prevent and control an undesired event, and even diminish it impact.

According to previous studies (Katsakiori et al., 2010; Jacinto et al., 2011; Roed-Larsen and Stoop, 2012; Salguero et al., 2018), when accidents do take place, the investigation report should identify all cases of non-compliance detected during the investigation. It should be determined whether any of the errors associated with the accident can be considered as legal non-compliance or omission. Furthermore, when applying the "public" accident investigation model, which is run by the Labour Authorities, the assessment is conducted by an expert whose testimony can be used in court. Even when, as stated by Saleh et al. (2010), fear of a lawsuit usually hinders open communication regarding the facts during accident investigations, there are many evidences (Porter and Van der Linde, 1995; Robson et al., 2007; Tompa et al., 2016) about the tractor effect and effectiveness offered by the regulatory policies on the improvement of processes and results in health and safety in companies.

However, in academic circles, there have been criticisms that occupational health and safety regulation could be restricting impulses of innovation and industrial development and in turn, fuelling a bureaucratic aversion culture (Hale et al., 2015). In several countries, proposals have been presented to repeal the regulations and thus reduce the regulatory burden where possible (Audiffren et al., 2013). Even so, international institutions such as the World Bank and the OECD defend

that regulations and their enforcement are crucial for economic development, showing important benefits for productivity and long-term growth (Blanc, 2018). Moreover, as they explain Rinfret et al. (2014) companies, as stakeholders, must participate in the regulatory process from the beginning. Therefore, regulators are not necessarily adversaries to the regulated community.

Particularly in small and medium-sized enterprises (SMEs), management of legal compliance in terms of health and safety has become a complicated task (Hasle and Limborg, 2006). Small companies are organised differently than large companies. Results-based regulations are adapted to small enterprises only when the results are easy to measure, and the business has the authority to decide how to attain these objectives.

It is in small and medium-sized enterprises where most of the problems exist (Cagno et al., 2013). The European Agency (EU-OSHA, 2011a) recognises that the "old" EU-15 member states have almost 19 million SMEs that employ around 75 million people. It is in these SMEs where around 82% of all work-related injuries and up to 90% of fatal accidents take place.

Little debate has taken place regarding the obligations involved in the management of legal compliance for companies, particularly in the field of small and medium-sized enterprises. Thus, the reason for this study: to look at the both successful strategies and the difficulties, weaknesses and limitations that organisations encounter to comply with and effectively manage occupational health and safety legislation. A review was performed on the main published studies that have analysed the relationship between occupational health and safety (OHS) management and compliance with legislation, regulation and rules. Therefore this systematic review of the literature, seeks to provide some useful results and identify gaps in our knowledge on the subject, and thereby set an agenda for future lines of research.

## 2. Methodology and search criteria

### 2.1. Study design

A systematic review is a specific approach which allows to identify, select and assess all the literature from a certain level of agreed quality that is relevant for a research question (Booth et al., 2012). In order to perform this review, defined by Fink (2009) as "systematic, explicit and complete process for identifying, evaluating, and synthesizing the existing body of completed and recorded work produced by researchers, scholars and practitioners", techniques have been used that are defined in the methodologies proposed by Fink (2009), Okoli and Schabram (2011) and Zhou et al. (2015). Fig. 1 shows the main systematic review process carried out in this study.

### 2.2. Literature search

The period being studied covers from 1987 to July 2018 to extract current results following recent trends in the scientific community. The bibliographic search is restricted to scientific publications from any country published in Spanish or in English. The preliminary search was performed on four international bibliographic databases: Science Direct, Scopus, ISI Web of Science (WOS) and Google Scholar. An advanced search then took place using free language expressions and a complete text search.

The keywords were adapted depending on the type of search and the web tool used in each case. An exhaustive search was run in the "title/abstract/keywords" fields in the referenced databases.

In this preliminary search, 24 different combinations of keywords were used in the four different databases. The combined keywords were "legal", "legal compliance", "legal non-compliance", "occupational health and safety" and "occupational health and safety management". These combinations were also repeated using three synonyms for the word "legal" which were regulation, rules and legislation. And all these words were accompanied by the word "Review".

In the period being analysed, 1164 publications were found in the databases that were considered by applying the aforementioned search strategy. The results for the preliminary search are given in Table 1.

### 2.3. Literature selection. Pertinence criteria

After this process, it was inevitable that duplicated publications would appear because the same document could be indexed in different databases. After excluding the repetitions, 197 results were obtained, of which 127 were articles, 45 were conference papers and 25 were books. The first criterion of relevance of these references was decided by analysing the title, abstract and keywords, to filtering publications that explicitly look at the successful strategies, difficulties, weaknesses, limitations and challenges that companies face in terms of legal compliance in occupational health and safety. Cited publications were also analysed in an attempt to detect new relevant articles for our study. This selection produced 55 results that were downloaded for archiving, as it was necessary to read the entire text of these more relevant articles.

During the final reading and as a second criterion, those "types of study" (Cagno et al., 2013) were considered pertinent if they included prior bibliographic reviews, discussions and relevant proposals, descriptions of case studies or applications in a specific sector related to the topic in question. A final analysis produced a selection comprising 20 articles, 4 conference papers and 1 book.

## 3. Results and discussion

### 3.1. Literature classification

The publications that were eventually chosen were used to create the classification presented in Table 2, using five criteria: publication number in chronological order, type of study, author or authors and country of origin, aim and scope of the study, and source from which it was obtained.

In the following sections, the results from the selected literature are analysed, discussed and classified into the aforementioned categories.

### 3.2. Literature review on the impact of legislation on OHS issues

Despite the plentiful bibliographic references on developing models, theories and methods to manage health and safety, the topic of managing compliance with legislation in this matter is rarely discussed in the literature, and the impact of legal non-compliance is even more scarce when analysing organisations (Jacinto et al., 2011).

Among the few that do discuss it, the study by Hale and Swuste (1998) should be highlighted where they draw attention to how safety rules can constitute restrictions imposed from the outside on freedom of choice for individuals or companies; and they provide procedures to help companies meet the rules by creating a database with practical solutions for health and safety issues. This same study pointed out that the laws and rules are examples of invisible barriers which, when correctly implemented, allow companies to prevent, control and even reduce the impact of an undesired event. In other words, the legal framework in the companies can be considered as an "organisational barrier system".

Years later, Hollnagel (2004) confirmed the theory that, within an accident investigation, legislation can be considered as an "invisible barrier system", as part of the functions of analysing an accident using the FRAM method (Functional Resonance Analysis Method). However, as Hollnagel (2008) stated, we do not know the extent to which the health and safety legislation currently offers an effective barrier system.

Along the same line of research, Laurence (2005) discusses changes to the standard-based structure in the Australian mining industry, from a compliance-based approach to a risk-based approach, by means of a

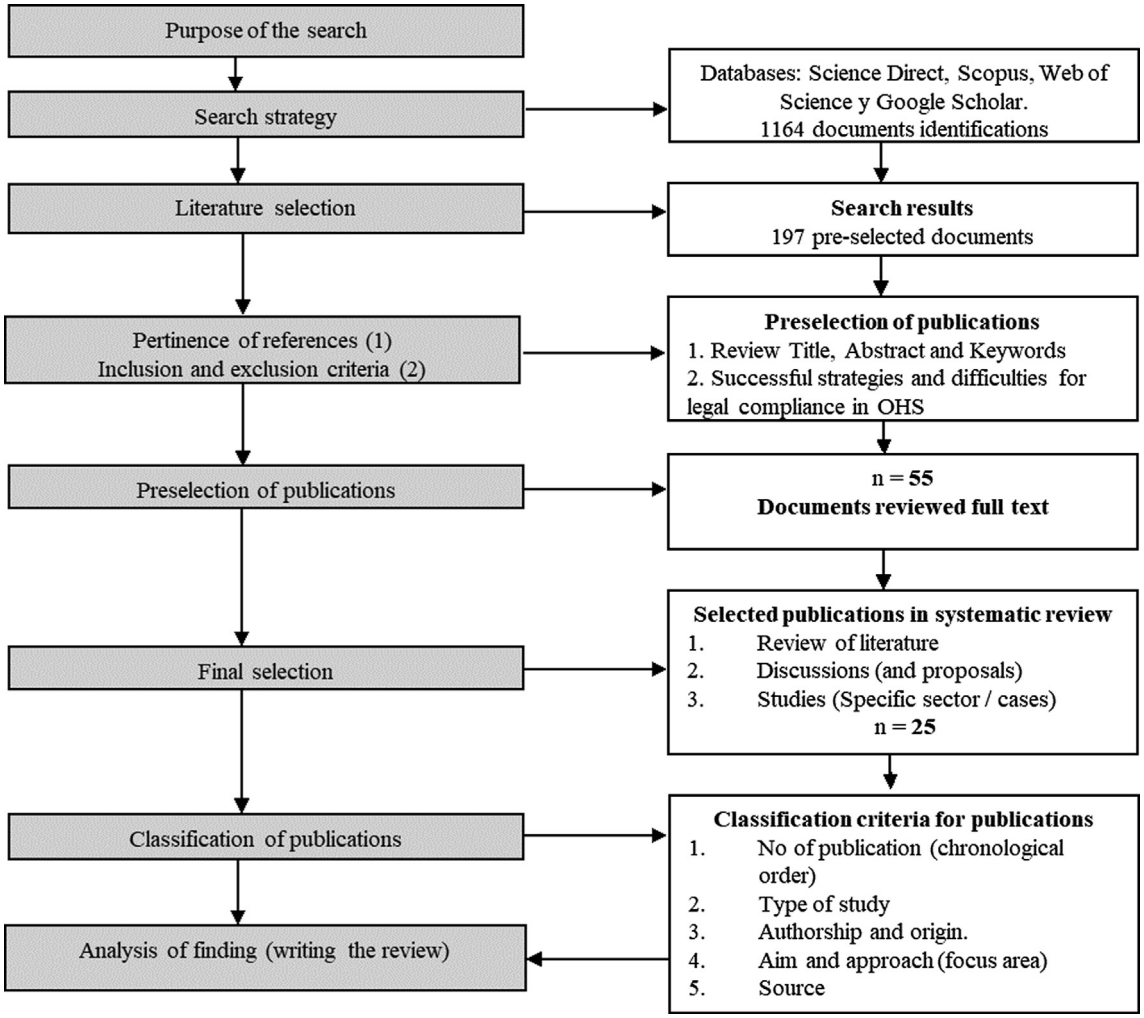


**Fig. 1.** Systematic literature review strategy and content classification. (Source: Zhou et al., 2015).

**Table 1**
Results from searching the four databases (Source: own research).

| Database | Web of science | Scopus | Google scholar | Science direct |
|---|---|---|---|---|
| No. of publications | 172 | 462 | 217 | 313 |

questionnaire given to almost 500 miners in the northeast of the country. He concludes that:

a. The administration should not continue creating more and more rules and regulations that aim to cover all aspects of mining.
b. Such wide-ranging and detailed regulating standards and health and safety management plans do not "connect" with the miners.
c. Effective rules and regulations are not the only way to make a workplace safer.

A related study by Poplin et al. (2008) compared how to address to standards compliance between the United States and Australia in an attempt to explain accident variation rates in coalmines between the two countries. These authors also highlighted the need for "case studies" to assess the impact of legislation on health and safety, and its effectiveness in prevention and risk control.

### *3.3. Literature review on difficulties in implementation of European Directive 89/391/CEE*

Important studies have been published in Europe that analyse the adoption and implementation of the European Council Directive 89/391/CEE of 12 June (European Council, 1989) regarding the application of measures to promote improvements in workers' health and safety in the workplace. One reasonably complete study, according to Jacinto et al. (2011), comes from Gomes (2008), a Portuguese work inspector who studied the implications of legislation emanating from the EU Directives on accidents related to agricultural, industrial and construction machinery.

With a different approach, the study by Morillas et al. (2013) performed a comparative analysis on how European Directive 89/391/CEE was transposed and implemented in Sweden and Spain. The results of this study exposed the poor integration of health and safety management in companies, and that it had become a mere exchange of documents to comply with legislation. In addition, it was identified that under the unique supervision of the labour authorities, business owners, workers and their representatives should limit themselves to meeting the standard. But nevertheless, the study by Niskanen et al. (2012), which assessed the effectiveness of implementing the European Framework Directive in Finland in relation to the use of risk assessment, highlighted the necessary implication of health and safety professionals, workers and business owners. As a complement, Niskanen et al. (2014) concluded that occupational health and safety inspectors should monitor companies' management systems more effectively, even going

**Table 2**
List of selected publications regarding management of legal compliance with OHS (Source: own research).

| No. | Type | Author and origin | Aim and scope (focus area) | Journal or source |
|---|---|---|---|---|
| 1 | Discussion (and proposals) | Hale and Swuste (1998)<br>Netherlands | This paper presents a partial classification of safety standards as restrictions imposed from the outside on individuals' or companies' freedom of choice. The document proposes the solution of providing support to companies on how to follow the rules by using the practical solutions database for health and safety issues. | SS |
| 2 | Discussion (and proposals) | Hollnagel (2004)<br>Denmark | This work focusses more on prevention than analysis of accidents from a more proactive than reactive approach. It confirmed the theory insofar as the legislation within accident investigation can be considered as an "invisible barrier system". | HA |
| 3 | Study (application in a specific sector) | Laurence (2005)<br>Australia | This paper studies changes in the standard-based structure in the Australian mining industry, from the compliance-based approach to the risk-based approach. | JSR |
| 4 | Discussion (and proposals) | Hale (2006)<br>Netherlands | This paper proposes that there was a need to carry out studies on legislation regarding the use of sufficiently clear rules and it even analysed the capability for self-regulation, particularly in small and medium-sized enterprises (SMEs). | SS |
| 5 | Literature review | Hasle and Limborg (2006)<br>Denmark | Review of studies on management of occupational health and safety prevention in SMEs. The main conclusion of this review is that legal compliance management has become a difficult task. | IH |
| 6 | Discussion (and proposals) | Walters (2006)<br>UK | This document examines national and sectorial approaches to improve chemical risk management in small companies in several countries of the European Union. It consider the evidence of the effectiveness of current strategies and tools used at these levels. | PPHF |
| 7 | Study (application in a specific sector) | Loosemore and Andonakis (2007)<br>Australia | This analyses the difficulties brought about by incorporating new health and safety legislation in the construction sector in Australia. The main obstacles were identified as implementation costs, linguistic barriers and fear of change. Legal compliance monitoring was suggested to be the main challenge. | IJPM |
| 8 | Literature review | Robson et al. (2007)<br>Canada and UK | This is a systematic review whose objective was to synthesize the best available evidence on the effects of both voluntary and mandatory interventions in OHS management along with associated economic results. | SS |
| 9 | Study (application in a specific sector) | Poplin et al. (2008)<br>United States and Australia | This study compares standard-based approaches in the mining sectors in Australia and the United States. They assess the accident variation rates in coal mines in the two countries. | SS |
| 10 | Study (sample analysis) | Katsakiori et al. (2010)<br>Greece | This paper analyses a sample of 40 accidents that took place between 2000 and 2008 in the manufacturing industry. This study detects the legal non-compliance that led to each of the accidents being analysed. | HFEMSI |
| 11 | Study (application in a specific sector) | Njå and Fjelltun (2010)<br>Norway | It examines the attitudes of executives in the commercial transport sector in Norway in terms of compliance with legislation. | SS |
| 12 | Study (application in a specific sector) | Hohnen and Hasle (2011)<br>Denmark | It analyses the implantation of a certified OHS system in the manufacturing sector in Denmark. It concludes that the certified management system does not necessarily tackle the most urgent problems in the work environment and can exclude important aspects such as psychosocial factors. | SS |
| 13 | Discussion (and proposals) | Jacinto et al. (2011)<br>Portugal | This work describes the process for recording, investigating and analysing occupational accidents by using the RIATT methodology. It introduces analysis of the impact of legal compliance. | PPHF |
| 14 | Discussion (and proposals) | Niskanen et al. (2012)<br>Finland | This paper discusses the effectiveness of implementing the European Framework Directive in Finland in relation to the use of risk assessment. According to the study, it is necessary to involve health and safety professionals, workers and business owners. | AE |
| 15 | Study (application in a specific sector) | Parejo-Moscoso et al. (2013)<br>Spain | This work studies occupational health and safety management in a very important sector in Spain: manufacturing olive oil in oil mills. It concluded that activities dictated by the law were not implemented in this matter. | SS |
| 16 | Discussion (and proposals) | Morillas et al. (2013)<br>Spain | This work performs comparative analysis on how the European Directive 89/391/CEE was transposed and implemented between Sweden and Spain. It discusses opportunities for improvement in Spanish companies regarding how they can make their risk management practices more effective. | JSR |
| 17 | Literature review | Audiffren et al. (2013)<br>France | This paper reviews management of legal compliance and OHS certification in French companies. It covers concepts such as regulatory monitoring, compliance assessment and management of action plans. | ESRC-ESREL |
| 18 | Study (application in a specific sector) | Rubio-Romero et al. (2013)<br>Spain | This paper studies safety conditions for scaffolding in the construction sector. It reveals that there are no legal requirements in the European Union for supported scaffolding manufacturers but there are some regulations on the use of this type of scaffolding in the construction sector. | SS |
| 19 | Discussion (and proposals) | Legg et al. (2015)<br>New Zealand and Denmark | Editorial column in the special issue of the Safety Science journal on "safety management in small and medium-sized enterprises." It argues that future OHS legislation should increasingly consider the specific features of SMEs. | SS |
| 20 | Literature review | Hale et al. (2015)<br>UK, Netherlands, Australia and United States | Based on a literature review study, it analyses similarities and differences regarding the development, use and compliance of regulations to influence and control how organisations behave. | SS |
| 21 | Discussion (and proposals) | Schröder-Hinrichs et al. (2016)<br>Sweden | Discusses and introduces the concept of Resilience Engineering regarding management of legal compliance in naval sector companies. | SRE |
| 22 | Literature review | Tompa et al. (2016)<br>Canada | Systematic review that shows solid evidence of the effectiveness of safety and occupational health policies and regulatory compliance in reducing injuries. | AJIM |
| 23 | Discussion (and proposals) | Darabont et al. (2017)<br>Romania | Identifies and analyses key aspects for successful implementation of the ISO 45001: 2018 standard in companies' OHS management system. | MATEC |
| 24 | Study (application in a specific sector) | Lingard et al. (2017)<br>Australia and United States | This paper brings in an essential predictive indicator for OHS management in the form of detection of legal non-compliance in audits taken by the companies or violation of a procedure or process. | SS |

(*continued on next page*)

**Table 2** (*continued*)

| No. | Type | Author and origin | Aim and scope (focus area) | Journal or source |
|---|---|---|---|---|
| 25 | Study (sample analysis) | Salguero et al. (2018)<br>Spain | This work analyses a sample of 98 occupational accident investigations carried out by the Labour Authorities in Andalusia in 2014. It shows that 46% of the reports analysed had identified some type of legal violation when investigating this incident. | Work |

| ACRONYMS | | Number of publications selected | ACRONYMS | | Number of publications selected |
|---|---|---|---|---|---|
| SS | Safety Science | 11 | PPHF | Policy and Practice in Health and Safety | 2 |
| JSR | Journal of Safety Research | 2 | AE | Applied Ergonomics | 1 |
| HA | Hampshire: Ashgate | 1 | ESRC-ESREL | European Safety and Reliability Conference-ESREL 1 | |
| IH | Industrial health | 1 | Work | Work Journal | 1 |
| SRE | Symposium on Resilience Engineering | 1 | MATEC | MATEC Web of Conferences | 1 |
| IJPM | International Journal of Project Management | 1 | AJIM | American journal of industrial medicine | 1 |
| HFEMSI | Human Factors and Ergonomics in Manufacturing & Service Industries | 1 | | | |

*Names abbreviated according to LTW.

so far as to provide advice in the actual workplace to help move beyond the minimums set by the legislation.

### *3.4. Literature review on detection of legal non-compliance in occupational accident investigation*

In relation to detection of legal non-compliance in investigation reports, Gomes (2008) studied a large sample of fatal accidents to identify the predominant categories of causes and then combined them with the legal requirements and the compliance levels, or lack of, when appropriate. He subsequently identified a series of blind spots where the legislation is either not clear or insufficient, in other words, it does not provide adequate coverage. Gomes's work revealed that one highly important requirement is the need to compare real data on the factors causing accidents against the applicable legislation, in other words, with the relevant regulations that should have helped prevent the accidents being analysed. This link can only be made if the investigation process includes an analysis of the related "legal factors". This could produce useful 'alerts' that would help companies identify legal breaches or gain an understanding of the regulations that had been ignored.

Two publications were referenced as an application of legal non-compliance detection in occupational accident investigations. The first is by Katsakiori et al. (2010), which analyses a sample of 40 accidents that took place between 2000 and 2008 in the manufacturing industry. The sample used was obtained from the database of reports from the East Attica Risk Prevention Centre in Greece. This study is interesting in that it uses a method known as MILI, which was developed by the Labour Inspection Department to be used in accident investigations. It not only identifies factors causing the accident, but also detects any legal non-compliance that led to it. The second publication is a study by Salguero et al. (2018), which analyses a sample of 98 occupational accident investigations carried out by the Labour Authorities in Andalusia in the last quarter of 2014. This sample was analysed by following the five phases defined in the RIAAT methodology (Jacinto et al., 2010) and it demonstrated that a considerable percentage of the reports being analysed (46%) identified some legal violation committed in the event under investigation.

### *3.5. Literature review on detection of legal non-compliance in OHS as leading indicators*

Another facet of the relationship between safety management and complying with standards is the possibility that more attention is being given to compliance than the safety practices themselves. Njå and Fjelltun (2010) highlight this possibility in a study that examines the attitudes of executives in transport companies in Norway. They conclude that, for many managing directors, the meaning of OHS is more a question of compliance with rules and regulations than actually managing safety. These authors also stress that both economic pressure and commercial competitiveness lead to possible conflicts with the management of legal compliance in health and safety.

However, within companies' organisation and management, detection of legal non-compliance during a work accident commission is no more than an indicator of something that has already happened, with something that already is in the past (Ale, 2009). In short, this refers to indicators that demonstrate a reactive approach to occupational health and safety management. These indicators are currently described as retrospective indicators, also known as lagging indicators (Dyreborg, 2009; Hopkings, 2009; Kjellén, 2009).

In contrast, prospective indicators, better known in the literature as leading indicators (Alexander et al., 2017) are measurements of the system conditions that provide a forecast of future performance (Salas and Hallowell, 2016). The researchers began to study the *leading indicators* in an attempt to move away from *lagging indicators*, and use measurements that can be compiled and applied before an injury takes place (Hallowell et al., 2011). These studies are invariably focussed on

measuring the extent to which the supposed prospective indicators predict future safety results.

Authors such as Hinze et al. (2013), Shea et al. (2016); Lingard et al. (2017), have created classifications of leading indicators that can be used in organisations and more specifically in labour sectors such as construction. This classification includes, as an essential predictive indicator, detection of legal non-compliance, in audits done by the companies, or violations of procedures or processes.

### 3.6. Literature review on self-regulation

The topic of safety legislation and its interactions with OHS management was included in the research priorities proposed by Hale (2006) in his conference at the Delft University of Technology in September 2006. Specifically, Hale suggested that there was a need to perform studies on legislation regarding the use of sufficiently clear rules. He even proposed self-regulation, particularly in the context of small and medium-sized enterprises (SMEs). In this sense, self-regulation should be understood as the application of voluntary norms as well as codes of good practice (Robens, 1972).

Recent strategies and legislation on occupational health and safety are founded on knowledge acquired in large companies, whilst research in this area has been scarce in SMEs (Legg et al., 2015). Despite this, a study by Cagno et al. (2013) reviews the literature on the economic assessment of OHS in small and medium-sized enterprises. As a result, both Cagno et al. (2013) and Legg et al. (2015) argue that future OHS legislation should increasingly consider the specific features of SMEs. It is necessary to develop a better understanding of how owners and managers of small and medium-sized enterprises define their company identity and how this, in itself, influences safety management practices.

Frequently, small companies are organisations that focus their resources on merely surviving (Legg et al., 2015). Company managers have to handle different problems at the same time, and health and safety is not always a priority (Hasle and Limborg, 2006). In addition, many small business owners consider occupational safety as the employee's responsibility, and regulations and demands to improve health and safety rules are a mere financial burden (Hasle and Limborg, 2006; Hale et al., 2015). Due to their limited material and human resources, many small companies, particularly micro-companies, find it hard to meet all the legal requirements, and these tend to be better managed by large companies (Stevens, 1999; Fabiano et al., 2004; Hasle et al., 2009). For this reason, as stated by Blanc (2018), one might ask to what extent the management of legal compliance presents as many costs as benefits for companies.

In order to reduce this obvious gap, self-regulation, as already proposed by Hale (2006), emerged as a way of being able to reduce the major regulatory burden, and the excessive bureaucracy of occupational health and safety regulations (Hale et al., 2015). Independently of the company's size or business, use of international norms such as ISO 45001 or occupational health and safety management systems (ISO/DIS, 2018), represent an important tool for implanting, managing or updating OHS management systems (Darabont et al., 2017). In addition, use of a voluntary standard such as ISO 45001 meets the needs expressed by many companies to deal with aspects such as regulation monitoring, compliance assessment and managing action plans (Audiffren, et al., 2013). However, not all of them were happy to have the "burden" of self-regulation and setting their own rules imposed on them, particularly the SMEs. Initially, they thought that self-regulation would mean deregulation, but obviously that was not the case or at least it will not be whilst we are concerned about maintaining best practices in OHS (Hohnen and Hasle, 2011; Hale et al., 2015).

The effect of standard-based self-regulation in companies in the field of legal compliance management poses several challenges; on the one hand, the regulators and certifiers should be as strict as possible with the companies whilst also quick to react to give them an incentive to get the certificate. In this respect, and as Hale (2006) mentioned, regulators require effective auditing tools that can tell them when it is possible to trust that a company is self-regulating correctly in a complex system. On the other hand, it is also a challenge to know what proportion of companies can be trusted in this way: optimists say it is the majority, pessimists think that the number is very small (Hale et al., 2015). Moreover, as explained by Braithwaite et al. (2007), the more innovative the regulator is, postponing as long as possible punitive actions on companies, the more rewarding will be their support for them.

### 3.7. Literature review on legal compliance within the new Resilience Engineering paradigm

Finally, it is necessary to go into greater depth on how the new safety management paradigm (Woods and Hollnagel, 2006), Resilience Engineering, can influence legal compliance management in companies.

Accident causality models and the actual organisations have evolved over time (Stopp and Dekker, 2012), with a move from the simple linear model (Heinrich, 1931) to complex linear or epidemiological models (Reason, 1997). The third generation of accident causality models now includes the concept of Resilience Engineering (Hollnagel et al., 2006). Resilience Engineering considers that the accident models being used were not correct or were not accurate in many situations. Accidents appears to be a non-linear phenomenon that emerges from a complex system that leads to systemic models of accidents or non-linear models (Rubio-Romero, 2015).

Resilience Engineering considers that normal performance is subject to variability and that this is necessary to achieve daily success, so it should not be restricted. This concept thus proposes that we should develop resilient organisations that can tackle this variability in current systems to achieve success (Hollnagel, 2011).

However, in the current reality of most organizations and companies, the management health and safety is still characterized by the use of prescriptive standards and reactive-based approaches. It seems obvious that the legislation focuses on things that go wrong, contrary to what Resilience Engineering proposes, that is, focusing on the things that are going well. Nevertheless, this does not imply that regulations should be abandoned, but must be reevaluated to adapt to the changing reality of companies (Schröder-Hinrichs et al., 2016) and be compatible with current operational performance.

It is often difficult for companies and organizations to avoid deviation in legal compliance, this being the easiest option. Thus, companies move in the dilemma between the choice of operational requirements and legal compliance requirements (Grøtan et al., 2017). However, resilience and legal compliance should not be incompatible. While it is true that Resilience Engineering focuses on the operational level and variability in daily performance rather than strict legal compliance (Anderson et al., 2016). Both can be combined so that resilient performance favours and supports compliance.

Hollnagel (2017) points out that skills or capabilities that organizations should develop and strengthen in order to improve their resilience in their daily performance are respond, monitor, learn and anticipate. In the development of these skills, legal compliance can be supported, especially by monitoring it and anticipating possible regulatory changes. In this sense, Grøtan et al. (2017) highlights the importance of "resilience in the context of compliance" and of creating a "space of manoeuvre" to favour the recovery capacity based on the experience and the adaptability of the workers.

## 4. Conclusions

The aim of this bibliographic review was to determine how compliance with legislation, regulations and standards influences health and safety management in companies. The result of this work is highlighting and discussing both the successful regulatory strategies in occupational health and safety, and the main difficulties, weaknesses,

limitations and challenges that companies face in adapting and fulfilling them.

This study has shown clear evidence of the effectiveness of regulatory compliance in terms of improving occupational health and safety. Even so, it concludes that, particularly in small and medium-sized enterprises, their limited economic, human and material resources can make complicated the compliance with the legal requirements to which they must respond. Likewise, the knowledge and understanding of the legislation can sometimes not be easy. This situation could lead to the use by organizations of a minimalist strategy in terms of regulatory application to deal with safety.

However, despite the difficulty for companies in the intense elaboration of rules and regulations by the administration, their coherent application can maintain and even enhance the set of socio-technical factors of the companies.

In this line, this study shows that the use of self-regulation can be a way to reduce existing regulatory obligations, as well as the considerable amount of bureaucracy of occupational health and safety regulations. In spite of that, the management and control of self-regulation can be a complex task indeed.

Likewise, we conclude that best practices for managing occupational health and safety systems in large companies and SMEs, which are currently changing significantly, should include not only prescriptive principles but also proactive ones. For this reason, in addition, to monitoring how legal non-compliance in occupational health and safety management affects daily performance, companies should include a more precise assessment of the effectiveness of complying with legislation with regard to safety programmes, plus their efficacy in terms of anticipating, preventing and controlling risks. In this sense, both public authorities and companies should promote the improvement of working conditions through the elaboration of standards and the development of actions that promote compliance.

To do this, it will be essential for organisations to have access to tools and methodologies that provide knowledge regarding health and safety standards, and their applicability. This will be an interesting area for future research, and a clear trend and innovation in managing occupational risk prevention. At the same time, researchers should develop scientific studies that on cooperation between regulators and professionals in health and safety management during the development of legal standard, which would encourage the adoption of an effective implementation and compliance with new regulations.

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## Appendix A. Supplementary material

Supplementary data to this article can be found online at https://doi.org/10.1016/j.ssci.2019.08.033.

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