

# THE UNIVERSITY OF WARWICK

**Original citation:**

Cagno, Enrico, Masi, Donato and Leão, Celina Pinto. (2015) Drivers for OSH interventions in small and medium-sized enterprises. *International Journal of Occupational Safety and Ergonomics* . p. 19.

<http://dx.doi.org/10.1080/10803548.2015.1117351>

**Permanent WRAP url:**

<http://wrap.warwick.ac.uk/75899>

**Copyright and reuse:**

The Warwick Research Archive Portal (WRAP) makes this work of researchers of the University of Warwick available open access under the following conditions. Copyright © and all moral rights to the version of the paper presented here belong to the individual author(s) and/or other copyright owners. To the extent reasonable and practicable the material made available in WRAP has been checked for eligibility before being made available.

Copies of full items can be used for personal research or study, educational, or not-for-profit purposes without prior permission or charge. Provided that the authors, title and full bibliographic details are credited, a hyperlink and/or URL is given for the original metadata page and the content is not changed in any way.

**Publisher statement:**

"This is an Accepted Manuscript of an article published by Taylor & Francis Group in *International Journal of Occupational Safety and Ergonomics* on 14/12/2015, available online:

<http://www.tandfonline.com/10.1080/10803548.2015.1117351>

**.A note on versions:**

The version presented here may differ from the published version or, version of record, if you wish to cite this item you are advised to consult the publisher's version. Please see the 'permanent WRAP url' above for details on accessing the published version and note that access may require a subscription.

For more information, please contact the WRAP Team at: [publications@warwick.ac.uk](mailto:publications@warwick.ac.uk)

warwick**publications**wrap  
  
highlight your research

<http://wrap.warwick.ac.uk/>

# Drivers for OSH Interventions in Small and Medium-sized Enterprises

Enrico Cagno <sup>a</sup>, Donato Masi <sup>a, c</sup>, Celina Pinto Leão <sup>b</sup>

<sup>a</sup> Department of Management, Economics and Industrial Engineering, Politecnico di Milano, Italy

<sup>b</sup> Department of Production and Systems, University of Minho, Portugal

---

**Abstract:** The debate concerning occupational safety and health (OSH) interventions has recently focused on the need of improving the evaluation of interventions, and in particular on the need of providing information about why the intervention worked or not, under what circumstances, and in which context. Key concepts in the analysis of the context are the drivers, i.e., those factors enabling, fostering, or facilitating OSH interventions. However, the concept of driver for an OSH intervention is both confused and contested. Although the term is widely used, there is little consensus on how drivers should be understood, how important they are in different contexts, and how they can facilitate interventions. This exploratory study based on interviews with the owner-managers and the safety officers of small- and medium-sized enterprises (SMEs) gives an overview of the most characteristic drivers for OSH interventions. The results will be used to make an initial evaluation of SMEs needs, and will help orient interventions and future research.

Keywords: OSH interventions, drivers, SMEs, empirical investigation.

---

---

Correspondence should be sent to Enrico Cagno, Department of Management, Economics and Industrial Engineering, Politecnico di Milano, Via Lambruschini 4/b, 20156 Milan, Italy. E-mail: [enrico.cagno@polimi.it](mailto:enrico.cagno@polimi.it).

(<sup>c</sup>) Donato Masi's new affiliation is WMG, University of Warwick, Coventry, CV4 7AL – UK ([donato.masi@warwick.ac.uk](mailto:donato.masi@warwick.ac.uk))

## 1. Introduction

Smaller enterprises constitute a major challenge for the society's effort to improve occupational safety and health (OSH) as they, on one hand, have extensive needs, and on the other hand, are difficult to improve. Regulators, practitioners, and researchers have therefore looked into the possibilities of designing interventions which meet the specific needs of small enterprises [1, 2]. These interventions focus on developing engineering strategies that decrease the probability of an employee engaging in at-risk behaviours (see, e.g., [3-5]), on educating and training employees regarding equipment, environmental hazards, policies and procedures (see, e.g., [6-8]), and on enforcing the safety related policies and procedures (see, e.g., [9, 10]). The proposed intervention strategies are more difficult to apply in small- and medium-sized enterprises (SMEs) for different reasons. It is firstly possible to consider the scarcity with regard to large enterprises of human, economic and technological resources [11, 12]. From another point of view, some papers [1, 2] focused on the lack of capacity of small enterprises to assess and control risks in an effective way. It is so generally agreed that it is necessary to tailor interventions to the specific needs and context of small enterprises. However, there are only limited discussions in the literature about how to carry out such tailoring.

In the light of these challenges, contextual factors play a decisive role. Indeed, contextual factors are crucial in designing interventions which meet the specific needs of small enterprises, and it might be a moot point to isolate intervention and outcome from contextual influences, when it comes to organizational research [13, 14]. A new stream of research is so growing, in which several models have been proposed to characterize the intervention process and its context [15].

In this respect, an effective description of the context could be provided by the analysis of barriers and drivers [16]: barriers and drivers identify all those factors of context not directly involved in workplace safety intervention, but significantly affecting, respectively hindering and fostering, the outcome of interventions. Quite often drivers and barriers are simply seen as points on a continuum. For instance, high worker engagement can be seen as a driver of interventions, while low worker engagement can be seen as a barrier. However, practitioners experience factors not as a continuum, but as separated factors with a different impact on interventions [16]. As a consequence, in order to match the perception of practitioners, it is convenient to investigate separately the negative and the positive factors, namely the barriers and the drivers. This paper focuses mainly on drivers, which actively contribute to the design of OSH policies at different levels. A previous paper [17] focused on barriers, which inhibit the process of OSH intervention.

The existing literature dealing with drivers to OSH interventions shows three main gaps. First, existing studies are usually specific, while a comprehensive classification of drivers to the intervention process is still missing. Second, little empirical investigation has been carried out figuring out the intensity of the drivers in the enterprises, and in particular in the context of SMEs. Third, the few existing empirical investigations have considered SMEs as a whole, thus neglecting the strong possible differences existing, e.g., between a micro enterprise and a medium-large enterprise. In other words, although the debate concerning the size of the enterprises and their corresponding safety performance is growing, very little attention is paid to the difference between the micro- (MiEs, employees < 10), the small- (SEs,  $10 \leq$  employees < 50), and the medium-sized enterprises (MEs,  $50 \leq$  employees < 250), as defined in the 2003/361/EC Recommendation; in the majority of the cases, SMEs are bundled together and considered as a whole, in opposition to the large enterprises [11]. In the same way, the effect on the perceived drivers of the phase of the intervention process or the firm's industrial sector is neglected.

In the light of the foregoing, this study carried out exploratory research in order to produce a first picture of drivers for OSH interventions in SMEs. More specifically, our research described the drivers to OSH interventions in SMEs and explored their relevance in different contexts and situations. The paper is structured as follows: in section 2, an overview of the literature on drivers for OSH interventions in SMEs is provided. In section 3, the analysis of the frequency of drivers in SMEs is presented. Finally, in section 4, conclusions are taken.

## 2. Drivers to OSH Interventions in SMEs: an overview of the literature

In order to describe the likely drivers to OSH interventions in SMEs, the authors reviewed the related literature. The review of the literature has been conducted using a wide perspective. The keywords were "interventions" and "workplace safety" combined with "drivers" and other synonyms. In some cases, papers dealing with relevant factors for OSH performance have been considered, since a positive performance of the company with respect to some of the factors could be seen as a driver. The research was conducted in databases (e.g., SCOPUS, Web of Knowledge), and Science Search Engines (e.g., IEEE Xplore, Google Scholar). At the end of the process, twelve papers focusing on drivers and strictly related topics have been included in the review. Once the most relevant studies had been identified, a cross cut analysis has been performed with the aim of producing definitions suited for the empirical investigation in SMEs. The cross cut analysis has been conducted in parallel with extensive discussions with five safety officers from SMEs; these discussions had the purpose of identifying the proper level of detail of definitions, as well as the optimal way of cutting generic concepts. Overlapping and related drivers have been grouped within a unique definition, while too generic drivers have been split in different drivers. At the end of this process, seventeen likely drivers have been identified and defined. The review of the literature and the results of the cross cut analysis are presented in this section.

An OSH intervention is defined as an attempt to improve safety and health conditions in workplaces by means of targeted activities and initiatives. Such activities include changes in work organisation and working conditions, engineering activities





Take in Table 4

XX

Using those responses, four main different analyses have been carried out: frequency and intensity of drivers in the total sample, Effect of the phase of the intervention process, Effect of the firm's size, and Effect of the sector.

**3.2. The total sample**

The frequency and the intensity of the drivers detected on the whole sample are reported in Table 5. The second column of Table 5 reports the absolute frequency of the drivers with intensity both high and low (Abs Freq (H+L)), i.e., the number of 1 and 2 in the answers to the questionnaires. It has been used because of the relatively small size of the sample, as to better clarify the number of answers taken into account for the analysis. Since there are 58 questionnaires, and each driver could be detected during three phases (design, implementation, and evaluation), the highest possible absolute frequency for each driver is 174 (i.e.,  $58 \times 3$ ). The third column of Table 5 reports the relative frequency of drivers perceived with a high intensity normalised by the absolute frequency of drivers with intensity both high and low (Rel Freq (H/H+L) = Abs Freq (H)/Abs Freq (H+L)), i.e., the number of 2 in the answers to the questionnaires, divided by the number of 1 and 2 in the answers to the questionnaires.

XX

Take in Table 5

XX

Analysing the distribution of the frequencies of the drivers, the 6 most frequent are the External support of consultants (D11), the Availability of Knowledge of effective interventions (D16), the Collaborations with associations and networks of companies (D12), the ICT (information and communication technology) tools supporting OSH interventions (D15), the Reduction of the insurance premium by the national compensation authority (D4), and collaboration with other stakeholders (D17).

It is firstly possible to observe the relevant role played by intermediaries, since 3 of the 5 most perceived drivers - External support of consultants (D11), Collaborations with associations and networks of companies (D12), and Reduction of the insurance premium by the national compensation authority (D4) - deal with intermediaries. The relevance of intermediaries for OSH has been already underlined in the literature [2]; the frequency and the intensity of the drivers related to intermediaries give the opportunity of understanding the relative importance for SMEs of the different kinds of intermediaries.

The most perceived driver is the External support of consultants (D11). The relevance of this driver can be related to several causes. First, several SMEs do not hold an inner OSH function, and they commit OSH management to external consultant. In these cases, it is possible to hypothesise that external consultants are the main promoters of OSH interventions, as well as the main source of knowledge and guidance for their proper implementation. Second, OSH interventions suggested by consultants are suited to the features of the companies, while interventions promoted by other intermediaries such as control authorities or associations are – or should be – more general and so less effective for SMEs: indeed, the characteristics of SMEs are so different that it is terribly difficult for these general preventive efforts to reach all SMEs and become effective [28, 35]. This driver is often (in 74% of the cases) perceived with a high intensity. This result is an indicator of the effectiveness of the driver; indeed the simple high frequency could be related to the lack of alternative measures or to the simplicity of use of this driver. Because of this effectiveness, this driver should be recommended and promoted among SMEs. In the light of the importance consultants for SMEs, there are several questions that should be carefully considered by researchers. First, the effectiveness of the methods adopted by consultants, second, the special qualification needed [36], and third, how to organize the contact in a cost effective way [2].

The second most perceived driver is the availability of knowledge of effective interventions (D16). The problem of the availability of knowledge of effective interventions has been widely discussed in the literature (see, e.g., [37]). This problem is complex: in some cases, there is no consensus in the literature about the most effective interventions for particular hazards; in other cases, there is an empirical evidence on the efficacy and effectiveness of OSH interventions, but this knowledge is not available for SMEs' OSH practitioners. In both cases, however, the result is that SMEs are not able to design and to implement effective OSH interventions, and so they perceive the availability of such a knowledge as one of the main drivers. Due to the relevance of this driver, other initiatives increasing the availability of knowledge for SMEs should be introduced. These initiatives could involve the sharing of best practices, research transfer, or public health campaigns (see [38] for a review). The intensity of the driver is often (in 61% of the cases) perceived as low; this result could be related to the heterogeneity of SMEs, that renders difficult the use of previous knowledge. Although relevant, interventions of empirically

proven effectiveness cannot be directly re-applied in SMEs because different contexts and features of the enterprise could alter the outcome of the intervention itself. The mediating role of consultants and safety officers is always needed in order to re-use previous knowledge.

The third most perceived driver is the Collaborations with associations and networks of companies (D12). This driver covers a broad range of possibilities. Examples of collaboration are the sharing of information [27, 28], but also in the sharing of human and economic resources, more and more promoted in fields like the eco-efficiency [39]. Associations and networks of companies are another kind of intermediaries, which play an essential role for SMEs, as previously stated. Associations and networks of companies have a relevant role for different reasons. First, when SMEs request interventions to central or local authorities: the isolated enterprises will likely not be able to influence these authorities, while the influence of associations and networks is obviously stronger. In all the cases in which interventions from external authorities are essential for the improvement of OSH conditions, the relevance of this driver is so clear. Second, in several cases the use of consultants is not cost effective. A meaningful example is represented by training interventions related, e.g., to new laws and regulations. The interventions are exactly the same for lot of enterprises and so it can be more effectively provided by an association instead of being implemented by the companies separately. This driver is often (in 50% of the cases) perceived with a high intensity, thus demonstrating that for the all the above-mentioned cases associations and networks of companies are as effective as consultants in the improvement of OSH conditions.

The fourth most perceived driver is ICT tools supporting OSH interventions (D15). This driver is important for two different reasons: first, it is important in all the interventions based on a flow of information; second, it can reinforce the effect of other drivers using information. Examples of drivers that could be reinforced by ICT tools are the availability of knowledge of effective interventions (D16) previously described and Collaborations with associations and networks of companies (D12), since the collaboration could include the sharing of information.

The fifth most perceived driver is the Reduction of the insurance premium by the national compensation authority (D4). It is possible to do several observations. First, it is interesting to notice how this economic support is one of the most perceived driver, but only the fifth one and moreover the intensity perceived for this driver is generally low. This seem to confirm some studies focusing on barriers to OSH interventions [16, 17], that include the lack of resources among barriers to OSH interventions but not among the most perceived ones. This result suggest that the economic support for OSH is an useful measure which however should be provided in conjunction with other measures, aiming, e.g., at improving the awareness of SMEs or the effectiveness of the tools used for the implementation of interventions. Second, it is possible to notice how the Reduction of the insurance premium by the national compensation authority (D4) recurs with an higher frequency with respect to other economic incentives, such as Rewards, bonuses and awards from the company (D1), Monetary incentives from central or local authorities (D2), Reduction of fees for deserving companies (D3). This result could be related to a distortion in the perception of practitioners. Indeed, while the incentives proposed by the driver D4 have been experiences by practitioners of Italian SMEs, the other drivers (D1-D2-D3) have been rarely experienced in Italian SMEs, and so practitioners tend to neglect their relevance. Moreover, it has to be considered that according to a common vision OSH is considered only as a cost, and so it is difficult that practitioners connect OSH to other economic areas of the company, such as the investments and the related credit availability. These considerations suggest that apart from introducing economic incentives in conjunction with other measures, practitioners should be made aware of the economic advantages of OSH [40] and consequently of the possibility of asking for different new economic incentives.

The sixth most perceived driver is related to the Collaboration with other stakeholders (D17) such as customers, contractors, and suppliers. This driver bears a particular relevance firstly when the enterprise is responsible for the safety of these external actors: e.g., when contractors work in a yard managed by the enterprise. The improvement of the safety conditions of these external workers is strongly dependent on their collaboration. Other cases in which this driver plays a relevant role arise when a supplier provides machinery that is critical for OSH: the supplier has to clearly communicate the features of the machinery and he has to collaborate with the enterprise in order to ensure its proper use.

### 3.3. Effect of the phase of the intervention process

The effect of the phase of the intervention process on the frequency and intensity of the drivers is reported in Table 6. For each phase, two columns are presented. The first column reports the absolute frequency of the drivers (Abs Freq (H+L)), i.e., the number of 1 and 2 detected for the particular phase (since there are 58 questionnaires, the highest possible absolute frequency for the particular phase is 58); and an asterisk indicates that the driver is detected mainly (i.e., >45% of the times for the whole intervention process) in that particular phase. The second column reports the relative frequency of the drivers perceived with a high intensity normalised by the absolute frequency (Rel Freq (H/H+L)), i.e., the number of 2, divided by the number of 1 and 2 in that particular phase; an asterisk indicates that the difference between the relative frequency of drivers in the particular phase and in the total sample is >20%.

XX









however, the results suggest that some perceptions of practitioners are distorted. As a consequence, further researches could analyse the perception of other stakeholder, such as members of control authorities or physicians.

The research described here presents some problems of SMEs and links them to some organizational characteristics and specific intervention phases. Although the study was exploratory in nature, its findings can be used to orient future research on OSH intervention. Building on the results of this exploratory study, further research should develop a comprehensive taxonomy of the contextual factors affecting OSH interventions, with a clarification of the hierarchical relationship among the factors. Moreover, it is possible to explore the perception of other stakeholders, such as members of control authorities or physicians.

## References

1. Champoux D, Brun J-P. Occupational health and safety management in small size enterprises: an overview of the situation and avenues for intervention and research. *Saf Sci.* 2003; 41: 301–318.
2. Hasle P, Limborg HJ. A review of the literature on preventive occupational health and safety activities in small enterprises. *Ind Health.*2006; 44: 6–12.
3. Hollnagel E. *Barriers and Accident Prevention.* Hamshire, UK: Ashgate Publishing Limited; 2004.
4. Hasan R, Bernard A, Ciccotelli J, Martin P. Integrating safety into the design process: elements and concepts relative to the working situation. *Saf Sci.* 2003; 41: 155–179.
5. Pohjola VJ. Fundamentals of safety conscious process design. *Saf Sci.* 2003; 41: 181–218.
6. Robson LS, Stephenson CM, Schulte PA, Amick BCI, Irvin EL, Eggerth DE, Chan S, Bielecky AR, Wang AM, Heidotting TL, Peters RH, Clarke JA, Cullen K, Rotunda CJ, Grubb PL. A systematic review of the effectiveness of occupational health and safety training. *Scand. J Work Environ Health.* 2011; 38: 193–208.
7. Paul PS, Maiti J. The role of behavioral factors on safety management in underground mines. *Saf Sci.* 2007; 45: 449–471.
8. Whysall Z, Haslam C, Haslam R. A stage of change approach to reducing occupational ill health. *Prev Med.* 2006; 43: 422–428.
9. Robson LS, Clarke JA, Cullen K, Bielecky A, Severin C, Bigelow PL, Irvin E, Culyer A, Mahood Q. The effectiveness of occupational health and safety management system interventions: A systematic review. *Saf Sci.* 2007; 45: 329–353.
10. Laurence D. Safety rules and regulations on mine sites - The problem and a solution. *J Safety Res.* 2005; 36: 39–50.
11. Micheli GJL, Cagno E. Dealing with SMEs as a whole in OHS issues: Warnings from empirical evidence. *Saf Sci.* 2010; 48: 729–733.
12. Beaver G. Management and the small firm. *Strateg Chang.* 2003; 12: 63–68.
13. Olsen O, Albertsen K, Nielsen ML, Poulsen KB, Gron SMF, Brunnberg NL. Workplace restructurings in intervention studies - a challenge for design, analysis and interpretation. *BMC Med Res Methodol.* 2008; 8: 39.
14. Pawson R. Evidence-based Policy: The Promise of 'Realist Synthesis'. *Evaluation.* 2002; 8: 340–358.
15. Pedersen LM, Nielsen KJ, Kines P. Realistic evaluation as a new way to design and evaluate occupational safety interventions. *Saf Sci.* 2012; 50: 48–54.
16. Whysall Z, Haslam C, Haslam R. Implementing health and safety interventions in the workplace: An exploratory study. *Int J Ind Ergon.* 2006; 36: 809–818.
17. Masi D, Cagno E. Barriers to OHS interventions in small and medium-sized enterprises. *Saf Sci.* 2015; 71: 226–241.
18. González E, Cockburn W, Irastorza X. European Survey of Enterprises on New and Emerging Risks: Managing safety and health at work. European Agency for Safety and Health at Work; 2010.
19. Vecchio-Sadus AM, Griffiths S. Marketing strategies for enhancing safety culture. *Saf Sci.* 2004; 42: 601–619.
20. Hale AR, Guldenmund FW, van Loenhout PLCH, Oh JIH, Evaluating safety management and culture interventions to improve safety: Effective intervention strategies. *Saf Sci.* 2010; 48: 1026–1035.
21. Walker D, Tait R. Health and safety management in small enterprises: An effective low cost approach. *Saf Sci.* 2004; 42: 69–83.
22. Pransky G, Snyder T, Dembe A, Himmelstein J. Under-reporting of work-related disorders in the workplace: a case study and review of the literature. *Ergonomics.* 1999; 42: 171–182.
23. Gangwar M, Goodrum PM. The effect of time on safety incentive programs in the US construction industry. *Constr Manag Econ.* 2005; 23: 851–859.
24. Roy M, Parent R, Desmarais L. Knowledge Networking: A Strategy to Improve Workplace Health & Safety Knowledge Transfer. *Knowl Creat Diffus Util.* 2003; 1: 159–166 .
25. European Network for Workplace Health Promotion (ENWHP). Criteria and models of good practice for workplace health promotion in small and medium-sized enterprises (SMEs). 2001.
26. Tait R, Walker D. Motivating the Workforce : The Value of External Health and Safety Awards. *J Safety Res.* 2000; 31: 243–251.

27. Kogi K. Advances in participatory occupational health aimed at good practices in small enterprises and the informal sector. *Ind. Health.* 2006; 44: 31–34.
28. Cagno E, Micheli GJL, Perotti S. Identification of OHS-related factors and interactions among those and OHS performance in SMEs. *Saf Sci.* 2011; 49: 216–225.
29. Antonnson L, Birgersdotter AB, Bornberger-Dankvardt S. Small enterprises in Sweden - Health and safety and the significance of intermediaries in preventive health and safety. Stockholm, Sweden: National Institute for Working Life; 2002.
30. Sims RH. Hazard Abatement as a Function of Firm Size - The Effects of Internal Firm Characteristics and External Incentives [doctoral dissertation]. Santa Monica, USA: Pardee Rand Graduate School; 2008.
31. European Commission. EU SMEs in 2012: at the crossroads - Annual report on small and medium-sized enterprises in the EU, 2011/12. 2012.
32. INAIL (Italian Workers' Compensation Authority). Annual Report 2011. Rome, Italy: INAIL; 2012.
33. European Commission. Commission recommendation of 6 May 2003 concerning the definition of micro-small and medium-size enterprises. 2003.
34. Trianni A, Cagno E. Dealing with barriers to energy efficiency and SMEs: Some empirical evidences. *Energy.* 2012; 37: 494–504.
35. Walters D. Health and Safety in Small Enterprises. European Strategies for Managing Improvement. Bruxelles, Belgium: Peter Lang International Academic Publishers; 2001.
36. Hasle P. Health and safety in small enterprises in Denmark and the role of intermediaries. Copenhagen, Denmark: Centre for Alternative Social Analysis; 2000.
37. Verbeek J, Husman K, Van Dijk F, Jauhiainen M, Pasternack I, Vainio H. Building an evidence base for occupational health interventions. *Scand J Work Environ Health.* 2004; 30: 164–168.
38. Schulte PA, Okun A, Stephenson CM, Colligan M, Ahlers H, Gjessing C, Loos G, Niemeier RW, Sweeney MH. Information Dissemination and Use : Critical Components in Occupational Safety and Health. 2003; 531: 515–531.
39. Wallner HP. Towards sustainable development of industry: networking, complexity and eco-clusters. *J Clean Prod.* 1999; 7: 49–58.
40. Cagno E, Micheli GJL, Masi D, Jacinto C. Economic evaluation of OSH and its way to SMEs: A constructive review. *Saf Sci.* 2013; 53: 134–152.
41. Swuste P, Hale A, Pantry S. Solbase: A Databank of Solutions for Occupational Hazards and Risks. *Ann Occup Hyg.* 2003; 47: 541–547.
42. Robson LS, Shannon HS, Goldenhar LM, Hale AR. Guide to evaluating the effectiveness of strategies for preventing work injuries - how to show whether a safety intervention really works. Cincinnati, USA: National Institute for Occupational Safety and Health; 2001.

Symbol	Driver	Definition	Reference
D1	Rewards, bonuses and awards from the company	The driver arises when the company awards some “prize” to individual employees or employee groups who have worked for a specified period of time without having an accident or who have adopted correct safety behaviours. These programs can facilitate OSH interventions in all the cases in which the involvement of personnel plays a decisive role.	[22, 23]
D2	Monetary incentives from central or local control authorities	The driver consists in monetary incentives provided to the companies achieving or aiming at achieving one or more OSH performance thresholds. The incentives could be provided by several control authorities. The driver facilitates interventions by providing economic resources for their implementation or by motivating the company to obtain these incentives and to invest on safety.	[26, 21, 30]
D3	Reduction of fees for deserving companies	The driver consists in the reduction of fees guaranteed to the companies achieving one or more OSH performance thresholds. The driver facilitates interventions by providing economic resources for their implementation or by motivating the company to obtain reduction of fees and to invest on safety.	[26, 21]
D4	Reduction of the insurance premium by the national compensation authority	The driver consists in the reduction of the insurance premium – compulsory by law- guaranteed to the companies achieving one or more OSH performance thresholds. The driver facilitates interventions by providing economic resources for their implementation or by motivating the company to obtain these discounts and to invest on safety.	[26, 21]
D5	Reduction in bank lending rates	The driver consists in the bank benefits guaranteed to the companies achieving one or more OSH performance thresholds.	[26, 21]
D6	Insurance benefits	The driver consists in the reduction of the insurance costs - not compulsory by law - guaranteed to the companies achieving one or more OSH performance thresholds.	[26, 21]
D7	Sanctions by control authorities	The driver indicates sanctions imposed by the control authorities to the companies not achieving one or more OSH performance thresholds. It can facilitate OSH interventions by motivating companies to intervene and through the indications for the improvement provided by control authorities.	[2]
D8	Behaviour of unions	The driver indicates the support to OSH interventions provided by unions. This support could consists both in motivating the management or the workers, both in providing technical or economic support.	[2]
D9	Tailor made legislation for SMEs	The driver indicates laws and regulations matching the features of SMEs and fostering OSH interventions. The support to interventions could derive from guidelines for the compliance with regulations or from the regulation themselves, providing the motivation to intervene on the proper factors.	[29]
D10	External support in the OSH management by control authorities	The driver indicates the support to OSH interventions provided by control authorities. This support could consists both in motivating the management or the workers, both in providing technical or economic support.	[2, 26, 21]
D11	External support of consultants	The driver indicates the support to OSH interventions provided by external consultants. This support mainly consists in the competencies and the knowledge provided by the consultants.	[29]
D12	Collaborations with associations and networks of companies	The driver indicates the support to OSH interventions provided by associations and networks of companies. This support consists in sharing knowledge, in sharing other OSH related resources, and in promoting common initiatives. This kind of support to OSH interventions is crucial in all the cases in which the collaboration of similar companies plays an essential role.	[2, 28, 24]
D13	Training programs for SMEs	This driver indicates training programs designed for SMEs. These ones foster interventions by increasing the awareness and the knowledge of the personnel, which is so more motivated to intervene or to correctly behave.	[21]
D14	Communication tools	This driver indicates all the tools fostering the communication among employees or between management and employees. It can foster OSH interventions in all the cases in which a proper communication plays an essential role.	[19, 20, 27]

D15	ICT tools	This driver indicates all the ICT tools fostering OSH interventions. These tools can improve the communication and the management of data and information; they play an essential role in all the phases of the interventions requiring the use of knowledge or the fast flow of information.	[28]
D16	Knowledge of effective interventions	This driver indicates the availability of knowledge of effective OSH interventions. Those interventions can be replicated or adapted in the particular SMES, thus helping the achievement of proper safety conditions.	[25, 24, 30]
D17	Collaboration with other stakeholders (customers, contractors, and suppliers)	The driver indicates the support to OSH interventions provided by other stakeholders such as customers, contractors, and suppliers. This driver bears a particular relevance firstly when the enterprise is responsible for the safety of these external actors: e.g., when contractors work in a yard managed by the enterprise or when a supplier provide a machinery which is critical for OSH.	[21]

Table 1: Overview of drivers to intervention process, with definitions matching the particular features of SMEs.

Note: OSH = occupational safety and health; ICT = information and communication technology; SMEs = small- and medium-sized enterprises.

Reference	Main driver(s)	Driver †																
		D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	D11	D12	D13	D14	D15	D16	D17
[22]	Safety incentive programmes	X																
[26]	Externally organized health and safety award schemes		X							X								
[25]	Sharing best practices																X	
[29]	Support of consultants										X							
	Legislation								X									
[24]	Networks of companies											X					X	
[27]	Communication tools													X				
[19]	Marketing tools and effective communication strategies													X				
[21]	Low-cost		X	X	X	X	X			X			X					X
[23]	Rewards and incentives from the company	X																
[2]	Occupational health services											X						
	Insurance companies						X											
	Labour unions							X										
	Accountants and public authorities							X		X								
[20]	Constructive dialogue between shop-floor and line management													X				
[28]	ICT tools														X			
	Sharing of knowledge											X						

Table 2: Relationships between the overview of drivers and the contributions of the literature.

Note: † Please refer to Table 1 for explanations; ICT = Information and Communication Technology.



Sector	Code	No. of companies
Food	C 10	2
Textiles, wearing apparel	C 13; C 14	2
Leather (excluding apparel) and related products	C 15	1
Wood, and wood and cork products	C 16	2
Paper and paper products	C 17	1
Coke and refined petroleum products	C 19	1
Chemical products, Basic pharmaceutical products and pharmaceutical preparations	C 20; C 21	4
Rubber and plastic products	C 22	11
Other non-metallic mineral products	C 23	2
Basic Metals	C 24	1
Metal products, excluding machinery and equipment	C 25	15
Computer, electronic and optical products; electro-medical and measuring equipment, watches and clocks, Electrical equipment and non-electric domestic appliances	C 26; C 27	5
Machinery and equipment	C 28	6
Motor-vehicles, trailers, semi-trailers	C 29	1
Other manufacturing industry products	C 32	1
Other	–	3
Total		58

Table 3: Sectors of the companies.

<b>Turnover (EUR)</b>	<b>No. of workers</b>				<b>Total</b>
	<10	10–49	50–99	100–249	
≤2 million/year	4	6	0	0	10
2–10 million/year	0	8	6	1	16
10–20 million/year	0	6	5	1	12
>20 million/year	0	1	7	12	20
Total	4	21	19	14	58

Table 4: Features of the companies in term of turnover and number or workers.

Driver †	Abs Freq (H+L)	Rel Freq (%) (H/H+L)
D1	12	33
D2	30	30
D3	29	24
D4	42 <sup>(+)</sup>	17
D5	11	18
D6	31	10
D7	30	23
D8	16	38 <sup>(+)</sup>
D9	14	14
D10	23	35
D11	98 <sup>(+)</sup>	74 <sup>(+)</sup>
D12	48 <sup>(+)</sup>	50 <sup>(+)</sup>
D13	36	25
D14	36	14
D15	48 <sup>(+)</sup>	40 <sup>(+)</sup>
D16	62 <sup>(+)</sup>	39 <sup>(+)</sup>
D17	40	25

Table 5: Absolute frequency of the drivers with intensity both high and low (i.e., Abs Freq (H+L)) and relative frequency of drivers with a high intensity (i.e., Rel Freq (H/H+L)), detected on the whole sample. In each column the 5 highest values are marked with (+).

Note: † Please refer to Table 1 for explanations.

Driver †	Abs Freq (H+L)	Rel Freq (%) (H/H+L)	Phase of the intervention process					
			Design		Implementation		Evaluation	
			Abs Freq (H+L)	Rel Freq (%) (H/H+L)	Abs Freq (H+L)	Rel Freq (%) (H/H+L)	Abs Freq (H+L)	Rel Freq (%) (H/H+L)
D1	12	33	5	40(+)	4	25	3	33
D2	30	30	12	25	16(+)*	31	2	50(+)
D3	29	24	12	8	12	50(+)*	5	0
D4	42(+)	17	16	25	15(+)	20	11(+)	0
D5	11	18	5*	0	4	50(+)*	2	0
D6	31	10	12	17	10	10	9(+)	0
D7	30	23	11	0	12	17	7	71(+)*
D8	16	38(+)	6	50(+)	9*	33	1	0
D9	14	14	6	33	6	0	2	0
D10	23	35	11*	36	6	33	6	33
D11	98(+)	74(+)	46(+)*	70(+)	32(+)	75(+)	20(+)	85(+)
D12	48(+)	50(+)	25(+)*	56(+)	18(+)	44(+)	5	40
D13	36	25	22(+)*	27	10	20	4	25
D14	36	14	20*	15	8	0	8	25
D15	48(+)	40(+)	26(+)*	27	9	44(+)	13(+)	62(+)*
D16	62(+)	39(+)	32(+)*	41(+)	15(+)	13	15(+)	60(+)*
D17	40	25	21*	29	15(+)	20	4	25

Table 6: Effect of the phase on the absolute (i.e., Abs Freq (H+L)) and relative frequency (i.e., Rel Freq (H/H+L)) of drivers. For each phase, the first column reports the absolute frequency of the drivers and an asterisk indicates that the driver is detected mainly (>45%) in that particular phase. The second column reports the relative frequency of the drivers perceived with a high intensity and an asterisk indicates that the difference between the relative frequency of drivers in the particular phase and in the total sample is relevant (>20%). In each column the 5 highest values are marked with (+).

Note: † Please refer to Table 1 for explanations.

Driver †	Abs Freq H+L	Norm Abs Freq (%) (H+L)	Rel Freq (%) (H+L)	Firm's size								
				Micro (MiE)		Small (SE)		Medium-small (MSE)		Medium-large (MLE)		
				Norm Abs Freq (%) (H+L)	Rel Freq (%)(H+L)	Norm Abs Freq (%) (H+L)	Rel Freq (%) (H+L)	Norm Abs Freq (%) (H+L)	Rel Freq (%) (H+L)	Norm Abs Freq (%) (H+L)	Rel Freq (%) (H+L)	
D1	12	6.9	33	8	100(+) *	5	33	5	33	12 *	20	
D2	30	17.2	30	8	100(+) *	17	18	19	36(+)	17	29(+)	
D3	29	16.7	24	17(+)	0	21	23	19	18	7 *	67(+)	
D4	42(+)	24.1(+)	17	8 *	0	30	21	26(+)	13	17	14	
D5	11	6.3	18	8	0	10	17	7	25	0 *	0 *	
D6	31	17.8	10	8	0	21	15	19	9	14	0	
D7	30	17.2	23	8	0	16	30	21	17	17	29(+)	
D8	16	9.2	38(+)	0 *	0	6	50(+)	14	38(+)	10	25	
D9	14	8.0	14	8	100(+) *	8	20	5	0	12	0	
D10	23	13.2	35	17(+)	0	16	40	12	43(+)	10	25	
D11	98(+)	56.3(+)	74(+)	25(+)	*	33	62(+)	74(+)	60(+)	82(+)	52(+)	68(+)
D12	48(+)	27.6(+)	50(+)	25(+)	33	44(+)	*	54(+)	12 *	29	24(+)	60(+)
D13	36	20.7	25	17(+)	50(+)	*	32(+)	35	18	10	10	0
D14	36	20.7	14	17(+)	0	32(+)	15	18	20	10	0	
D15	48(+)	27.6(+)	40(+)	33(+)	50(+)	25	63(+)	*	32(+)	39(+)	24(+)	0
D16	62(+)	35.6(+)	39(+)	33(+)	0	38(+)	42	37(+)	33	31(+)	54(+)	
D17	40	23.0	25	17(+)	0	24	47(+)	*	25(+)	14	21(+)	11

Table 7: Effect of the size on the absolute (normalised; i.e., Norm Abs Freq (H+L)) and relative frequency (i.e., Rel Freq (H/H+L)) of drivers. For each firm's size, the first column reports the absolute frequency of the drivers, normalised by the number of enterprises in that dimensional class; an asterisk indicates that the frequency of the driver has a great variation (i.e., >55%) with respect to the correspondent value detected for the total sample. The second column reports the relative frequency of the drivers perceived with a high intensity and an asterisk indicates that the difference between the relative frequency of drivers in the particular dimensional class and in the total sample is particularly high (>20%). In each column the 5 highest values are marked with (+).

Note: † Please refer to Table 1 for explanations.

Driver †	Abs Freq H+L	Norm Abs Freq (%) (H+L)	Rel Freq (%) (H+L)	Firm's sector					
				Rubber and plastic products (C 22)		Metal products (C 25)		Other	
				Norm Abs Freq (%) (H+L)	Rel Freq (%) (H+L)	Norm Abs Freq (%) (H+L)	Rel Freq (%) (H+L)	Norm Abs Freq (%) (H+L)	Rel Freq (%) (H+L)
D1	12	6.9	33	6	50(+)	11 *	20	5	40
D2	30	17.2	30	18	33	22	20	15	36
D3	29	16.7	24	27(+)	44(+)	13	17	15	14
D4	42(+)	24.1(+)	17	36(+)	25	33(+)	7	16	20
D5	11	6.3	18	12 *	25	13 *	17	1 *	0
D6	31	17.8	10	18	17	22	10	16	7
D7	30	17.2	23	24	38	24	27	11	9
D8	16	9.2	38(+)	15 *	20	11	40(+)	6	50(+)
D9	14	8.0	14	12	0	13 *	0	4	50(+)
D10	23	13.2	35	21 *	43	11	40(+)	11	27
D11	98(+)	56.3(+)	74(+)	70(+)	83(+)	56(+)	80(+)	52(+)	68(+)
D12	48(+)	27.6(+)	50(+)	27(+)	44(+)	36(+)	44(+)	24(+)	57(+)
D13	36	20.7	25	21	14	20	33	21(+)	25
D14	36	20.7	14	27(+)	44(+)	24	9	17	0
D15	48(+)	27.6(+)	40(+)	24	38	33(+)	27	26(+)	48(+)
D16	62(+)	35.6(+)	39(+)	52(+)	35	47(+)	52(+)	25(+)	29
D17	40	23.0	25	36(+)	8	31	36	15	29

Table 8: Effect of the sector on the absolute (normalised; i.e., Norm Abs Freq (H+L)) and relative frequency (i.e., Rel Freq (H/H+L)) of drivers. For each sector, the first column reports the relative frequency of the drivers, normalised by the number of enterprises of a given sector in the sample; an asterisk indicates that the frequency of the driver has a great variation (i.e., >55%) with respect to the correspondent value detected for the total sample. The second column reports the relative frequency of the drivers perceived with a high intensity and an asterisk indicates that the difference between the relative frequency of drivers in the particular phase and in the total sample is particularly high (>20%). In each column the 5 highest values are marked with (+).

Note: † Please refer to Table 1 for explanations.