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Donato Masi^a, Enrico Cagno^a & Guido J.L. Micheli^a

^a Department of Management, Economics and Industrial Engineering, Politecnico di Milano, Milan, Italy

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Developing, Implementing and Evaluating OSH Interventions in SMEs: A Pilot, Exploratory Study

Donato Masi
Enrico Cagno
Guido J.L. Micheli

Department of Management, Economics and Industrial Engineering, Politecnico di Milano,
Milan, Italy

The literature on occupational safety and health (OSH) interventions contains many debates on how interventions should work, but far less attention has been paid to how they actually do work, and to the contextual factors that influence their implementation, development and effect. The need of improving the understanding of the OSH interventions issue is particularly relevant for small and medium-sized enterprises (SMEs), since they experience worse OSH conditions, and have fewer physical, economic and organizational resources if compared to larger enterprises; thus, SMEs strongly need to focus their few resources in the decision-making process so as to select and put in place only the most proper interventions. This exploratory study is based on interviews with safety officers of 5 SMEs, and it gives an overview of the key features of the actual intervention process in SMEs and of the contextual factors making this actual intervention process similar or dissimilar to the ideal case. The results show how much qualitative and experience driven the actual intervention process is; they should be used to direct the future research towards an increasingly applicable one, to enable practitioners from SMEs to develop, implement and evaluate their OSH interventions in an “ideal” way.

OSH interventions SMEs exploratory study decision-making

1. INTRODUCTION

The literature on occupational safety and health (OSH) interventions has often focused on features of an ideal intervention process. This means that researchers have provided extensive observation and analysis of how interventions should be designed, implemented and evaluated. There is, e.g., a body of work around decision-making techniques that should support the main phases of the intervention process (e.g., see Cagno, Di Giulio and Trucco [1] and Oyewole, Haight, Freivalds, et al. [2]). Similarly, there is a wide debate pointing out how an effective intervention depends on the proper coordination of politicians, managers, safety officers and work planners involved in the control of safety by means of laws, rules and instructions (e.g., see Rasmussen and Svedung [3]).

Most of these studies suggest individual approaches to OSH interventions, which the researchers believe are or will be optimal; nonetheless, the authors often neglect what actually works for practitioners in their professional practices [4]. In fact, whenever they suggest a novel intervention approach, e.g., an algorithm for the scheduling of measures within a safety improvement programme [1], they introduce some hypotheses concerning the availability of resources, the availability of information, the presence of a proper clarification of roles and responsibilities within the enterprise, etc. However, these hypotheses only match the reality in a limited number of cases, and the actual intervention approach that works for practitioners in their professional practices is different.

The difference between the ideal and the actual approach to OSH interventions is particularly

noticeable for small and medium-sized enterprises (SMEs); this difference is underlined by the fact that regulations, control and campaigns aiming at improving the working environment in SMEs only have had limited effect [5, 6]. This raises questions about the validity, or at least the transferability, of the research findings to support the work of real, professional safety practitioners in SMEs. While theoretical studies provide considerable prescriptive advice and analyses of ideal interventions, not much empirical data exists on safety practitioners' actual daily (and often very well done) work.

A better understanding of safety practitioners' actual approaches to OSH interventions would be helpful for both practitioners and researchers. Practitioners could become more aware of the main differences between their actual approach and the suggestions of the literature, while researchers could hopefully design intervention approaches suitable to the daily reality of the working professionals.

To address this issue, this paper aims at exploring the point of view of practitioners with respect to the features of the actual intervention process and with respect to the factors distancing (barriers) or making closer (drivers) the ideal and the actual intervention process. The paper is structured as follows: section 2 presents the theoretical background of the study; section 3 describes the objectives and the methodology of the research; section 4 summarizes the results; section 5 discusses the results and, finally, section 6 draws some conclusions.

2. THEORETICAL BACKGROUND

An OSH intervention is an attempt to change something to improve the level of OSH [7]. The literature dealing with OSH interventions contains many studies on how interventions should work, namely, the "ideal" intervention process. However, far less attention has been paid to how interventions work in the real world, namely, the "actual" intervention process as well as to the factors causing differences or similarities between the ideal and the actual intervention processes. In this section, we summarize this theoretical background in three different

sections: features of an ideal intervention process (2.1.), features of an actual intervention process (2.2.) and barriers and drivers causing differences or similarities between the ideal and the actual intervention processes (2.3.).

2.1. Features of Ideal Intervention Process

There are no papers specifically addressing the features of an ideal OSH intervention process. However, many studies propose ways of designing, implementing or evaluating interventions; we based our description of the features of the ideal OSH intervention process on these studies. These studies differ in terms of specific recommendations; however, they share some intervention approaches underlying the specific recommendations. For example, if an author proposes a decision-making technique supporting the management of financial resources, the intervention approach underlying the specific recommendations is that the management of financial resources should be supported by a specific decision-making technique. We have classified the studies on the basis of the shared intervention approach, and we have considered these general intervention approaches as features of the ideal intervention process. On the basis of this analysis, an ideal intervention process is supported by decision-making techniques, based on existing knowledge from earlier research, participatory and tailored.

2.1.1. Supported by decision-making techniques

Several authors suggest that the main phases of the intervention process should be supported by decision-making techniques. Table 1 shows some examples of these techniques supporting decision makers in the intervention process.

2.1.2. Based on existing knowledge from earlier research

In an ideal intervention process, the choice of the way to enhance the safety and health of the target population should be supported by knowledge stemming from earlier research. This knowledge could be of different kinds. First sources of

TABLE 1. Examples of Techniques Supporting Decision Makers in the Intervention Process

Phase	Decision-Making Techniques	References
Needs assessment	results of risk assessment	[1]
	use of accidents data	[8]
	analysis of surveillance and epidemiological data	[9]
	checklists	[10, 11]
Identification of improvement measures	conceptual models	[12]
	programme logic models	[7]
Effective management of financial, technical and human resources	risk assessment methodologies	[13]
	algorithm based on a priority index	[1]
	dynamic variables	[14]
	surface design plots	[2]
Evaluation	randomized, controlled trials	[15, 16]
	theory-based evaluation	[17]
	quasi-experimental design	[18]
	realistic evaluation	[19]
	qualitative analysis	[20]

knowledge are the results of evaluations studies. Authors such as Baker, Brockhaus, Boucier, et al. are explicitly in favour of a wide dissemination of the results of the evaluations studies, to be used to drive continuous improvement of safety and health programmes [21]. A second important contribution could be provided by theories; e.g., Sinclair, Gershon, Murphy, et al. describe how they incorporated theoretical constructs into a training intervention [22], while Leviton and Sheehy apply behavioural theory to encourage small businesses to adopt effective technologies to prevent worker exposures to health hazards [23]. A third contribution to the identification of the improvement measures could be provided by models of safety performance. Models of safety performance establish relationships between safety intervention factors and safety related outcomes. In this way, these models clarify what the intervention should change, and the mechanism by which it should happen. In the existing studies, individual factors such as personality [24, 25], environmental factors such as safety climate [26, 27], job insecurity [28, 29] and leadership [30] have been related to safety outcomes such as injury rate underreporting [31, 32], safety motivation [33], safety performance [27, 34, 35] and microaccidents [36].

2.1.3. Participatory

An ideal intervention process should be participatory. This term has two different meanings for OSH interventions. The first meaning is that the intervention should actively involve different actors within the company. It is possible to distinguish three different actors within the company that should be actively involved in OSH interventions: the OSH practitioners, the management and the workers.

The OSH practitioners are the various people who regularly conduct OSH activities within organizations. Their work involves organizational, human and technical aspects, and it influences both the strategic and the operational level [37]. The OSH practitioners play a pivotal role in the application of OSH initiatives; indeed, they are responsible of planning, implementing, monitoring and reviewing the OSH strategies of the enterprise. Their activity can be deployed in multiple different ways [37, 38, 39]; however, the different authors agree about the key importance of applying a participatory approach and of putting emphasis on human relationships. Brun and Loiselle provide a detailed portrait of the activities and role of the OSH practitioners who represent employers or workers [37]. They conclude that there is not a single correct way of conducting prevention activities, but rather a wide

array of prevention strategies that emerge from the organizational conditions, personal relationships and even the personality traits of the safety practitioners. The results of their study show that OSH practitioners are united in believing that the human dimension must take precedence, and that they prefer above all to make workers more aware. Swuste and Arnoldy state that a safety manager's personal effectiveness and the ability to influence and stimulate others are as important as the quality of an OSH management system [39].

As for the workers, evidence from several industries suggests that the involvement of the workers is a key to successful implementation of OSH changes [40, 41, 42, 43, 44, 45]. Workers close to the work are recognized as often being the best qualified to make suggestions about improvements to OSH problems [45, 46]. Further, involving workers in OSH decisions builds trust, commitment and good will, which lead to increased job satisfaction and ultimately improved performance [44]. Researchers suggest several approaches that can be used to promote the participation of the workers in the solution of OSH issues such as co-operative inquiry [47], development of a manual [42] or macro-ergonomic methods [44].

As for the management, different actors underline how the involvement of the management and the active role of managers within OSH interventions play a key role. In one of the first investigations of safety climate, Zohar found that the management's commitment to safety was a major factor affecting the success of an organization's safety programmes [48]. Other authors emphasize more precisely how the management should actively interact with the other actors within the organization to implement successful OSH interventions. For example, Vredenburg argues that the role of feedback concerning employees' performance is critical because behaviours resulting in industrial accidents are not typically new occurrences [46], while Kompier, Cooper and Geurts include the participatory approach assuring involvement and commitment of both employees and middle management and the sustained commitment of top management among

the key factors of successful OSH interventions [49]. In a similar way, Saksvik, Nytrø, Dahl-Jørgensen, et al. argue how multilevel participation and negotiation is a key process for stress and health interventions [50], while Rubenowitz indicates the lack of commitment from line managers among the key obstacles to gaining positive intervention results with ergonomics problems [51].

The second meaning of the term "participatory" for OSH interventions is that the interventions should be designed by involving different actors outside the company. Rasmussen and Svedung argue how an effective intervention depends on proper co-ordination of decision-making at six different levels: the government, regulators and associations, company, management, staff, and the work and technological system [3]. In SMEs, it is necessary to introduce the level of intermediaries between the regulators and the company level, since intermediaries play an essential role [6]. As an example, intermediaries are OSH consultants, who should pursue a working environment agenda in a complex network where other actors pursue different agendas such as productivity, economics and quality [52].

2.1.4. Tailored

It is generally agreed that it is necessary to tailor interventions to the specific needs and context of small enterprises [53]. Regulators, practitioners and researchers have, therefore, looked into the possibilities of designing interventions that meet the specific needs of SMEs [5, 6, 54, 55]. For example, Hasle, Kvorning, Rasmussen, et al. developed a systematic model for the design of tailored intervention programmes meeting the needs of small enterprises [53]. This model supports the design of interventions promoted by external actors such as national or local control authorities, and involving several SMEs.

2.2. Features of Actual Intervention Process

There are not any studies comprehensively describing the features of an actual intervention process; however, some authors have analysed specific aspects. The actual intervention process

is different from the ideal case, especially in SMEs. Indeed, traditional systematic health and safety management is considered unnecessary and bureaucratic [5, 56, 57, 58, 59], and owner-managers believe that risk is controlled and low, and that they have the necessary knowledge to control risk [56, 60].

Several studies focused on a specific aspect of the actual intervention process: the role of OSH practitioners in their actual professional practice. Theberge and Neumann describe the work of ergonomists “as it occurs” and analyse the factors that influence their practice by means of an interview study with 21 ergonomists in Canada [4]. Their findings indicate that in the course of their professional practice, ergonomists engage in a variety of types of activities. This includes consulting on risk factors as well as a proactive role of fostering the application of ergonomics in organizations. Garrigou and Peissel-Cottenaz state that a significant proportion of preventionists is in a position of great difficulty, even professional distress [61]. Hale and Guldenmund underline the extreme heterogeneity in the prevention practices, the qualifications and training levels, and even in what is being prevented [62]. This heterogeneity appears to be conditioned by the countries and the development of prevention as a career.

However, apart from this focus on the role of OSH practitioners, there are not any studies clearly defining the features of an actual intervention process. Different studies seem to agree about the challenging and varying role of practitioners; however, other aspects of the actual intervention process have not been properly described. If we assume that an actual intervention is different from an ideal one, we should define the features of an actual intervention process. Indeed, the features of an actual intervention process could be opposite to the ideal ones, partially similar or there could be other features of an actual intervention process that cannot be detected from a comparison with the ideal case. Summing up, the first gap that emerged from the analysis of the literature is that the features of an actual intervention process have not been clearly defined.

2.3. Barriers and Drivers Creating Differences or Similarities Between Ideal and Actual Intervention Processes

The actual and the ideal intervention processes are different because during the implementation of interventions within companies some contextual factors intervene making the processes harder or easier. These factors have been called in different ways [63, 64]; we will indicate them as barriers and drivers to the intervention process. In the literature, there are several studies originating from different perspectives.

As for barriers, Champoux and Brun invited the owner-managers of 223 small firms with under 50 employees in Québec, Canada, to identify the factors they felt were obstacles to OSH improvement in their firms [5]. Different types of obstacles were identified, namely, costs (37%), paperwork (36%), lack of training (31%), priority to production (29%), lack of time (28%), lack of staff (17.5%), employee attitudes (16%), employee demands (16%), planning difficulties (14%) and profitability of investments in prevention (13%) [5]. Barbeau, Roelofs, Youngstrom, et al. included employee defensiveness, language differences, low literacy and, most frequently, “the reality of production” and other time and budget constraints among barriers to OSH [65]. Whysall, Haslam and Haslam explored the process of implementing interventions to tackle occupational ill-health, and identified a set of key barriers, namely, inability to generate behaviour change among workers, gaining management’s authorization and/or commitment, management’s attitudes towards health and safety, insufficient resources, prioritization of production over safety, finding appropriate equipment and space, and industrial relations issues [63]. The European Agency for Safety and Health at Work investigated the difficulties in dealing with health and safety in establishments and concluded that the greatest difficulties experienced by companies were lack of resources such as time, staff or money (36%), lack of awareness (26%), lack of expertise (24%), culture within the establishment (24%), sensitivity of the issue (23%) and lack of technical support or guidance (21%) [64].

As for drivers, Hale, Guldenmund, Van Loenhout, et al. described the patterns of interventions distinguishing between successful and not successful projects and discuss the mechanisms lying behind them [66]. They concluded that interventions bringing about constructive dialogue between shop-floor and line management, providing motivation to line managers and strengthening the monitoring and learning loops in the safety management system appeared more successful. Walker and Tait identified several drivers of the success among which the low-cost approach and collaboration with local authorities, suppliers, commercial training organizations and internal trainers bore a particular relevance [67].

The existing studies dealing with barriers and drivers to OSH interventions neglect the context of SMEs. Only Champoux and Brun presented an interesting study, which focused on small firms with under 50 employees in Québec [5], while the other reviewed studies do not specifically address the context of SMEs. As a consequence, it is not clear whether it is possible to extend to SMEs the definitions of barriers and drivers formulated for larger enterprises, and what the relative importance of these barriers and drivers is.

Figure 1 summarizes the results of the review of the literature.

3. OBJECTIVES AND METHODOLOGY

3.1. Objectives

The review of the literature underlined two main gaps. First, the features of an actual intervention process have not been clearly defined; second, the studies dealing with barriers and drivers to OSH interventions generally neglect the context of SMEs. In the light of the gaps of the literature, the purpose of this study is twofold.

The first objective concerns the features of an actual intervention process. The study aims at analysing the actual way of developing, implementing and evaluating OSH interventions in SMEs. In particular, the research aims at investigating how the actual process is structured, which tools are used and how these tools are used, within the three phases of the whole intervention process.

The second objective concerns barriers and drivers for OSH interventions. The study aims at exploring the perception of practitioners coming from SMEs, and at providing a preliminary list of barriers and drivers specifically addressing the features of SMEs. This list of barriers and drivers can clarify whether existing definitions of barriers and drivers can be extended to the context of SMEs and whether it is necessary to add new factors.

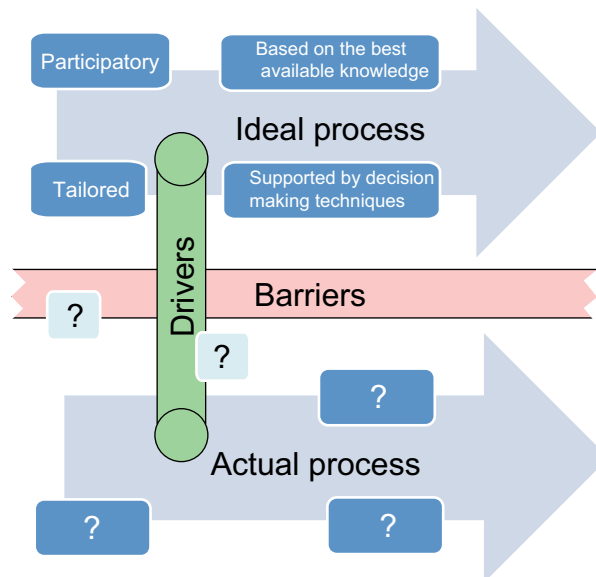


Figure 1. Summary of the review of the literature.

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Summing up, the research questions we aimed to answer are

- What are the features of an actual intervention process in SMEs?
- What are the main barriers and drivers for OSH interventions in SMEs?

3.2. Methodology

To answer these two research questions, five semistructured interviews have been performed [68]. This methodology seemed the most appropriate to the two research questions of the study. As for the first research question, there are not any models listing the features of an actual intervention process, and it is difficult to understand these features from previous studies. As a consequence, it is necessary to create a list of these features, at least in the form of a set of propositions for further research. As for the second research question, a semistructured approach allows practitioners to freely express and to suggest barriers and drivers that have not been considered in previous studies. The adequacy of this approach is demonstrated by the fact that interviews have been successfully used in previous safety studies analysing the industrial practice “as it occurs” (e.g., see Theberge and Neumann [4] and Whysall et al. [63]).

The companies chosen for the case study are SMEs present in the Italian market, in the sectors of manufacture of furniture, manufacture of machinery, and textiles. The idea in the selection of the sample was to explore the “average” situation of SMEs, considering companies of the most representative sectors of the Lombardia region, Italy. There are differences among the five companies due to their size. However, the hypothesis of the study is that there are some features of the

intervention process in SMEs that are not dependent on the number of employees. In this perspective, it is possible to deal with SMEs as a whole, while further research could detail the exploratory analysis and underline the differences existing because of the size [69]. The different sizes have been chosen to create a sample that is representative of the different situations. Table 2 summarizes the features of the companies.

The interviews were realized with the safety officers during a period of one hour, considering in some cases a period of informal discussion after the formal registered interview. A semistructured interview schedule was formulated to explore the intervention process. The core set of questions asked was

- Could you describe the process of developing/ implementing/evaluating interventions to tackle OSH?
- Which kind of tools do you use for developing/ implementing/evaluating interventions to tackle OSH?
- Could you describe the drivers/barriers involved in developing/ implementing/ evaluating such interventions?

Each interview was conducted on the premises of each organization, usually in the interviewee’s office. Interviews were tape recorded, with the agreement of the participants. All recorded material was fully transcribed, verbatim. We analysed the interviews with two different approaches, one for the identification of the features of the actual intervention process and another for the exploration of barriers and drivers.

As for the identification of the features of the actual intervention process, a preliminary analysis of the interviews led to a preliminary list of features of the ideal process. This preliminary list

TABLE 2. Features of Companies

Company	Sector	Employees	Turnover ^a
1	manufacture of machinery	160	n/a
2	textiles	60	30
3	manufacture of furniture	160	115
4	manufacture of machinery	25	6
5	manufacture of furniture	240	55

Notes. a = million EUR; n/a = data not available.

did not depend on the frequency with which a particular feature was detected and by its relevance. A feature of the process was considered in the results if explicitly mentioned by the interviewee or if perceived on the basis of related sentences. As an example, the interventions development process has been described as “qualitative” because the interviewee said that “the development of interventions is carried on in a qualitative way” (feature explicitly mentioned by the interviewee) or because the interviewee said that “I do not reduce the problem to the objectivity of a number, I always try to make the contact, maybe with the head of the department for which the intervention is done” (feature perceived on the basis of related sentences). A second analysis led to the selection of the features shared by all the companies and relevant, through which it became possible to effectively describe the peculiarities of the OSH intervention process in SMEs.

To identify barriers and drivers, a unique analysis of the interviews led to the identification of all barriers and drivers. Again, a barrier or a driver was considered in the results if explicitly mentioned by the interviewee or if perceived on the basis of related sentences. However, a barrier or a driver was included in the results even if mentioned by only one of the companies under analysis: this decision stems from the fact that, with respect to barriers and drivers, this study aims at representing a first step in the creation of a new taxonomy, specifically addressing the features of SMEs.

Coherently with the positivist tradition, four criteria have been used to assess the rigor of the research: internal validity, construct validity, external validity and reliability [70]. To enhance internal validity, during the data analysis phase, empirically observed patterns have been compared with the results of the literature, verifying that the identified patterns can be plausibly related to the hypothesized results. To ensure construct validity, results progressively emerging, have been organized through a chain of evidence, representing the way from the initial research questions to the final conclusions. With respect to external validity, or generalizability, it has firstly to be clarified that neither single nor multiple case studies allow for statistical generalization;

rather, they allow for analytical generalization that refers to the generalization from empirical observation to theory, rather than to a population [68]. Eisenhardt argues that case studies can be a starting point for theory development, and suggests that a cross-case analysis involving 4–10 case studies may provide a good basis for analytical generalization [71]. Reliability implies transparency and replication in the research process. Transparency has been ensured through a careful documentation and clarification of the research procedures, while replication has been accomplished by creating and updating a database including the case study notes, the case study documents and the narratives collected during the study, organized in such a way as to facilitate retrieval for later investigators.

4. RESULTS

The results will be presented in three sections: features of an actual OSH intervention process in SMEs (4.1.) main drivers (4.2.) and main barriers among the analysed SMEs (4.3.).

4.1. Features of Actual OSH Intervention Process in SMEs

By means of few keywords, the actual OSH intervention process in SMEs can be defined as participatory within the company, qualitative, regulation based and experience driven.

4.1.1. Participatory within company

Coherently with part of the theoretical recommendations, the OSH intervention process is based on the active participation of the different actors within the company. As for the needs assessment, the interviewees underline how the need for intervention generally arises from the interaction of actors of different kind: typically the employees, the physician and those responsible for occupational safety. Similarly, the involvement of end users seems to be the rule for the choice of the materials, activities and technologies of interventions. One of the interviewees, while referring to a speech made on the prevention of hearing loss, has confirmed that

“speaking with the workers and with the workers’ representative in safety, ... we have decided to use protective headphones”, because the old personal protective equipment (PPE) “implied several problems”.

4.1.2. Qualitative

A qualitative approach characterizes the design, implementation and evaluation of the interventions. As for the design, a qualitative approach is used by the safety officers to make decisions dealing, e.g., with the optimal scheduling of interventions or the allocations of resources. It was clearly verified that numerical techniques or techniques borrowed from project management are not used. One of the interviewees, while referring to the scheduling of interventions, has confirmed that “we are linked to human relationships, with dialogue” and that “I do not reduce the problem to the objectivity of a number, I always try to stay in close contact [with workers], for instance with the head of the department for which the intervention is done”. The quantitative tools and the algorithms proposed in the literature for the design of OSH interventions do not seem to be employed in SMEs: the only formalized documents are the ones strictly required to comply with regulations.

Also the implementation process is not systematic; rather, it depends on the particular intervention considered. Barriers and drivers play an important role in determining how interventions are implemented.

As for evaluation, the presence or the absence of guidelines for the evaluation in mandatory or voluntary standards affects the features of the evaluation process.

When mandatory or voluntary standards do not provide guidelines for the evaluation, the evaluation process is not structured and is essentially qualitative. Indeed, decision makers do not properly clarify the steps of the evaluation, the different roles in the evaluation process and the indicators considered in the evaluation process. The evaluation is based on the feedback given by workers or on the subjective perception of safety officers. One of the interviewees, while describing the evaluation of an interventions in his com-

pany, said that “I receive feedback from the head of the department, since he checks that the interventions are actually implemented over time and that it has not simply been a way for obtaining the documentation indicating the elimination of the unconformity”. Another safety officer, while referring to the installation of a hood for the improvement of air quality, reported that “with respect to the evaluation of the intervention ... the benefit is clear, since you feel a better smell, and the workers are happier”. This kind of evaluation applies to most interventions: one of the interviewees, while trying to quantify the number of qualitative and quantitative evaluations, concluded that “the evaluation is almost totally qualitative ... with a little quantitative part, but I would say that the evaluation is qualitative”.

When mandatory or voluntary standards provide guidelines for the evaluation, the evaluation process is more structured. Decision makers better clarify the steps of the evaluation, the different roles in the evaluation process and the indicators considered in the evaluation process. Moreover, the indicators are in several cases quantitative. One of the interviewees, while referring to the evaluation of a training intervention implemented according to International Organization for Standardization (ISO) standards, reported that “if the workers benefit from a training intervention, a document is produced and, after two months, the evaluation of the effectiveness of training is done according to the ISO procedure”. Similar examples have been provided for the interventions aiming at preventing some occupational diseases. In these cases, the OSH practitioners follow the clinical parameters indicated by regulations and they evaluate these parameters before and after the execution of the intervention. However, even if the whole evaluation process is better structured, the quality of the evaluation is far from the standards suggested in the literature.

4.1.3. Regulation based

The approach to OSH interventions in the companies under scrutiny is based on compliance with national regulations. Apart from compliance with regulations, a specific policy outlining the company’s strategy in terms of safety is

absent. Both in the needs assessment and in the design of interventions, the group of people involved in the decision-making process always refer to regulations and so the overall approach to OSH interventions could be define as “reactive” with respect to regulations, rather than as “pro-active” in the search of improved OSH conditions. Regulations may be a barrier or a driver for the OSH interventions: this double role will be clarified in the following sections.

4.1.4. Experience driven

The qualitative approach adopted for OSH interventions relies on employees’ experience and on their awareness of safety issues. The design of an

intervention starts from the experience collected from previous interventions within the company. One of the interviewees reported that “in each [safety] meeting, we begin from the report of the previous meeting and we see if the interventions have or not been implemented. For sure, this is sequential work”. On this basis, it can be argued that historical data are used for the development of interventions; however, these data originate uniquely from the company itself and they are not numerical, but formalized in narrative text.

4.2. Drivers

Table 3 lists the drivers identified during the interviews.

TABLE 3. Overview of Perceived Drivers and Barriers

Drivers	Company				
	1	2	3	4	5
Person related					
management’s positive attitude	✓				
workers’ positive attitude	✓		✓		✓
Organization related					
involvement of management in production process		✓			
communication	✓	✓			
Regulation related					
guidelines	✓	✓			
Resources related					
availability of economic resources		✓		✓	
External actors related					
presence of associations				✓	✓
presence of consultants		✓	✓	✓	
Barriers	Company				
	1	2	3	4	5
Person related					
management’s negative attitude	✓				✓
workers’ negative attitude	✓	✓	✓	✓	
lack of training	✓				
Organization related					
presence of geographically delocalized activities	✓				
Regulation related					
bureaucracy			✓	✓	
ineffective or excessive legal requirements		✓	✓	✓	✓
Resources related					
lack of time	✓	✓	✓	✓	✓
lack of economic resources			✓		
lack of human resources		✓			✓

4.2.1. Positive management's attitude towards health and safety

The safety officer of company 1 indicated management's positive attitude as a driver for the interventions. The safety officer focused on two indicators of management's positive attitude: the exhibit of high commitment for health and safety issues and the open-minded approach to suggestions coming from safety officers. This positive attitude seems to be prevalent among younger managers; that safety officer underlined that "the [safety] culture of younger managers is changing, since they are more interested in safety [than older managers]".

4.2.2. Positive workers' attitude towards health and safety

Several safety officers perceived workers' positive attitude as a driver for the interventions. The interviewees underlined two main workers' attitudes facilitating the OSH interventions. The first one is motivation. This attitude has been detected for training interventions; the safety officer of company 1 argued that "the training interventions are always welcome, there is always curiosity, there is always willingness to know" and "workers are curious, interested and favourably inclined". The second one is proactivity; the safety officer of company 3 underlined that many improvements to OSH issues can only be suggested by proactive workers, since "in most cases the needs [in terms of safety] are perceived by the workers, rather than by the management". In a similar way, the safety officer of company 5 said that "the behaviour of the workers is extremely participative. There is a high sensitivity and a high attention to risks".

4.2.3. Availability of guidelines

The intervention process has been defined as "regulation based". The role of regulations is complex: indeed, regulations are perceived as drivers for some aspects and as barriers for other ones. The safety officer of company 2 argued that "it is not possible to generalize, some regulations are extremely useful [for OSH interventions], while others seem designed to make us waste time and money". Regulations seem to be per-

ceived as drivers when they provide operational standards and guidelines for the implementation of interventions. For example, safety officers and practitioners use guidelines coming from both mandatory and voluntary standards during the evaluation of interventions. The safety officer of company 1, while making reference to a mandatory standard used for the evaluation of interventions, stated that "this has been the most useful parameter I have ever experienced".

4.2.4. Involvement of management in production process

The safety officer of company 2 suggested how the fact that the management was very close to the other workers facilitated OSH interventions, because of a higher awareness of safety issues and a better knowledge of possible solutions.

4.2.5. Availability of economic resources

The safety officers mentioned the economic resources especially in terms of incentives coming from associations or from the government. For example, the safety officer of company 2 argued that "these [economic] incentives are extremely useful, because [using them] we are investing only time [and not money], which is not lost". In a similar way, the safety officer of company 4 stated that "we are interested in external funding for research and development interventions, since the annual expenditure is ~800 000 euros, while the expenditure for an OSH intervention varies between 15 000 and 20 000 euros".

4.2.6. Communication

Good communication between the safety officer and operational and technical workers facilitates the intervention process for two main reasons. First, thanks to good communication, the managers receive feedback on the intervention and suggestions for improvements. The safety officer of company 1 described the improvement of an intervention on the prevention of hearing loss, and he said that "talking with the workers, I understood the problems of the previous solutions ... workers do not use it [the PPE] if they have to

talk with a colleague, or they remove it [the PPE] and then they forget to use it again”. Second, thanks to good communication, workers are aware of their tasks and duties. The safety officer of company 2 remarked that communication was essential for the creation of a proper safety culture; he said “this [safety] culture should be created, specially by controllers and head of departments; ... if a worker says: ‘I am not able to work with the gloves on’, it is necessary to reply ‘you will see that you will be able to do it, you will get used with it’”.

4.2.7. Presence of associations

According to the interviewees’ opinion, associations of SMEs facilitate the implementation of interventions because they enable the sharing of resources and information. The safety officer of company 4 said “we rely on API [Associazione Piccole Imprese, Association of small enterprises] for training courses, first aid courses, fire prevention courses, ... , because the price is quite low”. The safety officer of company 5 said “we are part of several associations related to our sectors ... which enable benchmarking with other companies”.

4.2.8. Presence of consultants

The presence of consultants was one of the two most frequently cited drivers. The safety officer of company 2 said “I need the professionalism of an external consultant, ... , we meet once per month and we update several things, environmental analyses, documentation, and so on”. In a similar way, the safety officer of company 3 argued that interventions were facilitated by the help of external consultants, especially for technical analyses and documentation, while the safety officer of company 4 noticed how the contribution of external consultants was necessary because of the difficulty to comply with regulations, “especially for a small enterprise”.

4.3. Barriers

Table 3 lists the barriers identified during the interviews.

4.3.1. Negative management’s attitude towards health and safety

The management’s attitude towards health and safety could represent a barrier for OSH interventions. One negative attitude consists in the lack of awareness of the relevance of safety. Some interviewees (company 1 and 5) underlined how often managers perceive safety “as a waste of time” if compared to production needs, thus hindering the improvement process. The safety officer of company 1 pointed out that this attitude was prevalent among the older managers. Another negative attitude is the reluctance to follow safety directives; the safety officer of company 1 underlined how often senior managers were reluctant to follow the safety directives coming from younger managers, because these directives were perceived as disrespectful and as a way of denying the experience of senior managers.

4.3.2. Negative workers’ attitude towards health and safety

Workers’ attitude towards health and safety can represent a driver or a barrier to the implementation of OSH interventions. It represents a barrier when the workers are reluctant to modify their behaviours, since they have consolidated working behaviours that are difficult to modify. They assume that their behaviours are correct, despite the suggestions coming from safety practitioners. The safety officer of company 1 stated that “each person tends to think only of his own job, and a generalized culture of safety is missing”. According to the interviewee, the absence of this barrier would facilitate the implementation of the interventions. The safety officer of company 3 underlined how experienced workers underestimated the risks related to their tasks and they were resistant to changing their behaviour. When the safety officer asks the workers to introduce some changes, they often reply “I’ve been doing this job for years, and nothing has ever happened!” In a similar way, the safety officer of company 4 said that “in many cases it is a problem of negligence. The workers know that they should use protective gloves, but they say ‘since I left the gloves there, I will do this without them’. During

the last verification on the lathe, we realized that the protection had been removed ... the workers removed the protection since it was uncomfortable, every time they should close the protection, do their work, open the protection again. ... And this is normally happening in the machining workshops". In the same way, the safety officer of company 2 stated that "the problem arises when we identify a risk and we introduce a barrier, when we impose the use of PPE. Changing people's attitudes is a problem".

4.3.3. Ineffective or excessive legal requirements

Regulations are perceived as a barrier when the requirements are perceived as ineffective or excessive. The safety officer of company 4 argued that "the number of standards has increased, I have a list of the things that we should update this year and it is impressive for a small enterprise, ... , the risk assessment, the planning of activities for continuous improvement, the designation of the safety officer are useful without any doubt, but a different instrument is necessary". He reported how during an inspection necessary for a certification, "inspectors only looked at the safety signs", which are not representative of the OSH conditions of the enterprise. Other practitioners share this opinion. According to the safety officer of the textile company (company 2) "some regulations are extremely useful [for OSH interventions], while others seem designed to make us waste time and money"; similarly, the safety officer of company 3 said "there are standards that are too stringent for the actual condition of the enterprise". Also the safety officer of company 5 underlined the difficulty of complying with legislation, stating that "some things [required by law] are difficult to implement, but we have to respect legislation in any case".

4.3.4. Bureaucracy

Among the aspects of regulations that represent a barrier, several interviewees emphasized the issue of bureaucracy. The documentation required by some mandatory standards seems excessive to

several practitioners. The safety officer of company 4 stated that "the list of the documentation that should be updated by the end of the year is impressive". Similarly, the safety officer of company 3 said "imagine a small company that has to produce a risk assessment document, an analysis of noise, analysis of toxic substances, antidrug tests, ... , all these things are extremely expensive. I think that all could be leaner, while many things are extremely formal, ... , also because when an accident happens, the first thing that the inspectors check is compliance of the documentation".

4.3.5. Lack of time

Lack of time was the most frequently cited barrier; this emerged in all the interviews. The interviewee from company 1 underlined how it could be very difficult to find the right amount of time for OSH activities, especially because of the priority given to the production issues. The safety officer of company 4 underlined how the time spent on safety meetings had to be minimized, since the workers should dedicate their time to the production. The safety officers of company 2 underlined how his time was scarce and how he would prefer to dedicate his time "either to the management of safety or to the management of maintenance". Similar remarks emerged during all interviews.

4.3.6. Lack of training

The safety officer of company 1 noticed how lack of specific training implied wrong behaviours, which affected the proper implementation of interventions. He pointed out how this barrier was particularly relevant for external workers and temporary workers, since the training they received was often inadequate for the standards of the host company.

4.3.7. Lack of economic resources

Only one interviewee mentioned lack of economic resources as a barrier. The safety manager of company 3, while reporting examples of some previous interventions, reported that "the main

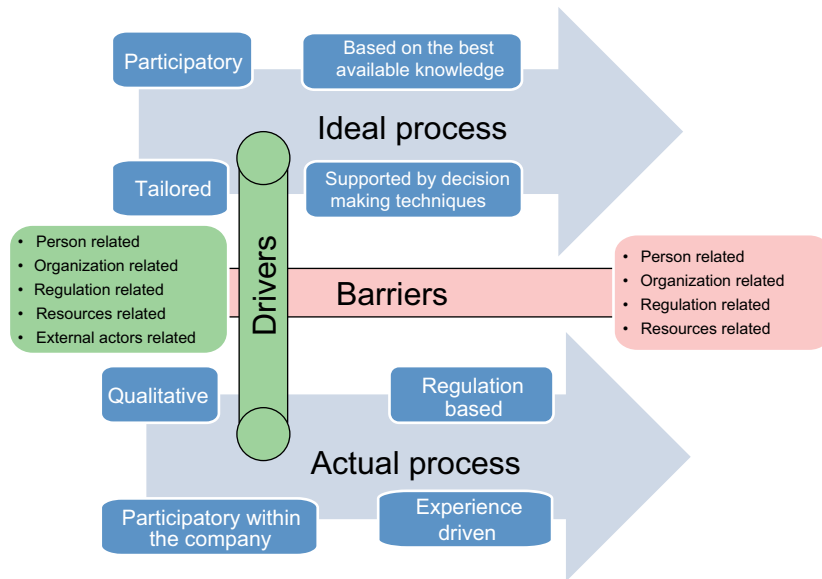


Figure 2. Summary of the results of the exploratory study.

problem is the money! Sometime you have to deal with some legal requirements, but you are aware of the fact that ... they require huge maintenance costs ... this is the main problem”.

4.3.8. Lack of human resources

Several interviewees perceived a limitation in terms of the availability of human resources. The safety officer of company 5, e.g., said “often the problem is not economic, but related to the [human] resources. Several projects are delayed in time because of saturated resources. ... This leads in several cases to the use of external resources. The use of external resources enables to quickly comply with the standards, but it causes the loss of know-how. People directly executing the interventions are aware of what they are doing, of the value of the intervention and of the reason for its implementation. If the intervention is executed by an external resource, once this external resource leaves the company, he/she takes away with him/her this added value”. The safety officer of company 2 also reported similar considerations.

4.3.9. Presence of geographically delocalized activities

The presence of geographically delocalized activities implies difficulties in the implementation

and monitoring of interventions. The safety officer of company 1 mentioned this barrier in relation to training interventions; he said that if the company was working in a yard that was far from the company, “it could be hard to call the worker [from the yard in which he is working] and to train him”.

The identified barriers and drivers have been classified into the following groups: person related, organization related, regulation related, resources related, external actors related. Table 3 shows an overview of the perceived barriers and drivers. Figure 2 summarizes the results of the exploratory study.

5. DISCUSSION

The comparison between an ideal and the actual intervention process gives an overview of the needs of SMEs and suggests some future intervention and research patterns.

A first comparison between an ideal and the actual intervention process shows that the actual intervention process is participatory within the company, while an ideal process is participatory both inside and outside the enterprise. An ideal and the actual intervention process are similar in terms of participation of internal actors, since the participation of workers, OSH practitioners and

managers seem to be quite developed in the analysed SMEs. On the other hand, there are two main differences between ideal and actual intervention processes: first, workers are mainly involved in the design of interventions, while they seem less active during the further implementation of interventions; second, the participation of external actors is poorly developed: indeed, the contribution of the government, associations and intermediaries presents some controversial aspects.

The involvement of the workers during the design of interventions represents an advantage because of their unique knowledge on some aspects of the job, as underlined in the literature [45, 72]; however, other benefits suggested in the literature such as increased trust, commitment and good will [44] have not been detected, especially in the implementation of interventions. On the other hand, the poor co-ordination with external actors implies an increased difficulty in implementing OSH interventions—the legal requirements are perceived as a barrier in four of the five cases—and some opportunities are lost, since the contribution of associations is perceived as a driver in only two cases, and only in relation to the sharing of information and resources.

This situation suggests some patterns of intervention. First, it is necessary to improve the participation of the workers not only in the design, but also in the implementation of interventions. The workers' attitude seems to be a relevant barrier if it is negative and an important driver if it is positive. As a consequence, the participation of the workers after the design of the intervention is currently a relevant issue. Second, it is necessary to improve the co-ordination of external actors. The associations currently play a role only in the sharing of information and resources, while they could become an effective mediator between the needs of SMEs and government regulations.

Continuing the comparison between an ideal and the actual intervention process, it is possible to observe that the actual intervention process is regulation based, while an ideal intervention process is based on the best available knowledge and it is tailored.

An approach based on regulations offers several advantages. First, this approach is simple. It is difficult to design an OSH policy tailored to the needs of the company, and the adoption of an OSH policy based on simple compliance with regulations reduces the amount of work of safety practitioners. Second, it is easy for OSH practitioners to obtain resources for OSH interventions if they justify their requests to the management with the need to comply with regulations. Third, it is easy to show compliance in inspections. However, a first shortcoming of an intervention approach based on compliance with regulations is that it hinders tailoring OSH interventions to the needs of the enterprise. The risk is that OSH practitioners do not make the effort to think proactively about the particular needs of their enterprise, and they focus on showing compliance with regulations, which is often perceived as excessive and bureaucratic. A second shortcoming of an approach based on simple compliance with regulations, is that the OSH practitioners are not stimulated in looking for the best solution available, but they will likely focus on the less expensive solution ensuring compliance with regulations.

This situation suggests some patterns of intervention. As for regulations, it is necessary to develop tailored legislation for SMEs or, at least, it is necessary to modify some aspects of regulations that are considered a barrier for SMEs, e.g., paperwork and bureaucracy. As for the need for tailored interventions, it is necessary to develop tools for tailoring interventions according to the need of SMEs. Indeed, currently, there are no instruments supporting decision makers in tailoring interventions to the needs and features of the enterprise. These tools for tailoring OSH interventions should, in particular, help to change the workers' behaviour, since it seems that the promotion of this change is a key issue in the current intervention process.

A third comparison between the two processes shows that the actual intervention process is experience driven, while an ideal intervention process is based on the best available knowledge and is supported by decision-making techniques.

A benefit of an experience driven intervention approach is that it allows some kind of process of tailoring interventions to the needs of the company. Indeed, OSH practitioners are aware of some features of the company thanks to their experience, and they can use this knowledge in selecting the best solutions. However, this tailoring process is neither systematic nor knowledge driven, and its effectiveness can be questioned, e.g., looking at the low involvement of the workers during the implementation of interventions.

To improve this experience driven approach, it is necessary to render the theoretical knowledge available to OSH practitioners. Indeed, lack of time is a barrier to the improvement of interventions, and the identification of the best solution among different sources of knowledge could be extremely time-consuming. Approaches such as databases for sharing OSH solutions [73, 74] could be improved and better promoted among SMEs. These databases currently include descriptions of technical solutions. In the future, they could be improved by including, in addition to the technical or organizational modifications introduced, a description of the factors that promote behavioural changes in the workers. On the other hand, it is necessary to stimulate safety officers to go beyond simple compliance with regulations, and to look for the best available solutions.

A fourth comparison between the two processes shows that the actual intervention process is qualitative, while an ideal intervention process is supported by decision-making techniques.

The main advantage of a qualitative approach is its flexibility. A flexible approach is particularly suited to the features of SMEs, where the organization system is, in many cases, poorly structured, where necessary information is not always available, and where the role and the responsibilities could be better clarified. On the other hand, the advantages of a structured approach are widely acknowledged in the literature.

This situation suggests some patterns of intervention. On the one hand, decision-making techniques should be simplified to match the needs of SMEs, since lack of time is one of the main barriers to the improvement of the intervention process.

On the other hand, the techniques available in the literature should be better known among OSH practitioners, since during the interviews it seemed that they were well prepared in terms of regulations, but they ignored most of the tools supporting the decision-making process available in the literature.

The detected barriers and drivers confirmed the main factors previously detected in the literature. On the basis of this result, it is possible to make two alternative hypotheses. The first one is that the barriers and drivers for OSH interventions in SMEs and in large enterprises are the same, and that they differ possibly in terms of frequency only. The second hypothesis is that barriers and drivers for OSH interventions in SMEs and in large enterprises are different, but the safety officers in SMEs do not perceive these differences.

Looking at the frequency, some factors seem to be particularly relevant. Among drivers, it is possible to notice the presence of consultants and workers' positive attitude; among barriers, workers' negative attitude, ineffective or excessive legal requirements, and lack of time seem to be more relevant. As a consequence, these factors should be carefully investigated.

6. CONCLUSIONS

This exploratory study based on interviews with the safety officers of five SMEs gives an overview of the key features of the actual intervention process in SMEs and of the drivers and barriers making the actual intervention process more or less similar to an ideal case.

The actual OSH intervention process in SMEs can be defined as participatory within the company, qualitative, regulation based and experience driven.

The barriers and drivers are different and they can be classified as person related, organization related, regulation related, resources related and external actors related.

Among drivers, the presence of consultants and workers' positive attitude are particularly relevant, while workers' negative attitude, the ineffective or excessive legal requirements, and lack of time seem to be the most relevant barriers.

TABLE 4. Future Intervention and Research Patterns

Process		Intervention and Research Patterns
Actual	Ideal	
Participatory within the company	participatory	Improve workers' participation not only in the design, but also in the implementation of interventions. Improve the co-ordination of external actors, eventually relying more on associations.
Regulation based	based on the best available knowledge	Develop tailored legislation for SMEs or, modify some aspects of regulations like bureaucracy.
	tailored	Develop tools for tailoring interventions to the needs of SMEs, helping in particular to change workers' behaviour.
Experience driven	based on the best available knowledge	Render theoretical knowledge available to OSH practitioners, possibly with databases for sharing OSH solutions. These databases could include a description of factors that promote social change among the workers.
	supported by decision-making techniques	Stimulate safety officers to go beyond simple compliance with regulations, and to look for the best available solutions.
Qualitative	supported by decision-making techniques	Decision-making techniques should be simplified to match the needs of SMEs.
		The techniques available in the literature should be better known among OSH practitioners.

Notes. SME = small and medium-sized enterprise; OSH = occupational safety and health.

A comparison between an ideal and the actual intervention process and an analysis of the barriers and drivers suggest the need for some future intervention and research patterns (Table 4).

Although the study was exploratory in nature, its findings can be used to direct future research towards an increasingly applicable one to enable practitioners in SMEs to develop, implement and evaluate their OSH interventions in an "ideal" way.

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