A Sociotechnical Analysis of Accounting for Employee Health and Safety: Evidence from a Multiple Case Study

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1 Introduction

The interest concerning accounting for employee health and safety (H&S) is relatively recent (Jallon et al. 2011). The aim is 'to improve employees' workability as well as the health of the organization' (Johanson et al. 2007, p. 24) and to provide information on employees' health, so that appropriate actions can be taken, and the interplay between employee well-being and organization's targets can be promoted (DeArmand et al. 2010). In the accounting and health and safety literature, analysis is scarce as regards whether and how accounting allows the promotion of employee H&S issues and its integration into organization decision making (Cooper et al. 2011; Gröjer and Johanson 1998; Jallon et al. 2011; Rikhardsson and Impgaard 2004). Employee H&S issues have been analyzed in disclosure studies (Chan 1979; Coetzee and Van Staden 2011), in terms of the classification of direct and indirect accident costs (Feng et al. 2015) and concerning the measurement of the accident costs at the workplace through the use of dedicated instruments (e.g., Jallon et al. 2011).

In this regard, the development and use of accounting instruments related to H&S issues can enhance H&S performance as they are able to offer new and additional information to inform decision-making processes. However, the implementation and integration of an accounting instrument for H&S measurement depend on the presence of different interrelatedness and co-existing dimensions and factors (Loeppke et al. 2015; O'Neill et al. 2013, 2015; Reiman and Rollenhagen 2011) that previous academic literature has not adequately analyzed. As the analysis of the different

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dimensions and factors influences the success or failure of accounting instruments (Contrafatto 2014; Gosselin 2006; Liu and Pan 2007), the present chapter investigates the following question: Which are the technical, organizational, and cognitive factors that influence the implementation and integration of an accounting instrument for accident-cost analysis?

The empirical material was gathered through a two-year interventionist study (Jönsson and Lukka 2006) of two Italian medium-sized waste-management companies. The aim of the project was to develop an accounting instrument for measuring accident costs—an accident-cost analysis tool—and integrate it into organization decision making. The waste-management sector is among the risky sectors concerning H&S issues (Battaglia et al. 2015). The present analysis adopts a sociotechnical perspective to analyze the topic. The sociotechnical perspective focuses on the social aspects of people in a given society and on the technical aspects of organizational structure and processes. It enhances understanding of whether and how different dimensions and types of factors impact H&S practices, instruments, and outcomes (Noy et al. 2015), thus offering a structure for in-depth analysis of problems and potentialities associated with workplace safety issues (Flach et al. 2015; Kleiner et al. 2015; Robertson et al. 2015).

Chapter contributions are varied. The first is represented by an in-depth analysis of accounting for employee H&S (O'Neill et al. 2013, 2015). It adds evidence to the debate about the role and potential of accounting in the promotion of social issues (Bebbington and Thomson 2013; Parker 2005), and to H&S literature that has investigated the implementation and integration of dedicated instruments for the measurement of accidents costs. Compared to the previous studies that have mainly focused on the technical dimension and factors, the present study provides a more comprehensive analysis focusing also on the organizational and cognitive dimensions. In providing specific insights into sociotechnical barriers to, and enablers of, the development of an accounting instrument for employee H&S, the analysis adds knowledge to the understanding of the technical, organizational and cognitive aspects as regards the use of financial information for H&S decision making. It also highlights the fact that the co-existence of all three dimensions is a necessary condition for the promotion of accounting for H&S issues. Previous studies (Gond et al. 2012; Battaglia et al. 2016) have argued that integration is possible even if not all the dimensions are well developed since the high level of integration of one dimension can compensate the low level of the other(s). Put differently, on the basis of results of case studies, the study argues that this assumption may be not necessarily valid. This point contributes explicitly to the concept of co-existence/compensation between the three sociotechnical dimensions, as highlighted by Gond et al. (2012). The study analysis also provides some practical implications that can support the implementation and integration management process.

The following is the remaining structure of this chapter: Section 2 is the literature review, which provides an explanation of the framework of the analysis, while Sect. 3 presents the research methodology. Section 4 presents the case studies. Section 5 covers the discussion of the findings, proposes perspectives for future research, and presents the conclusion of the study.

2 Literature Review and Analytical Framework

Accounting and H&S literature have attracted considerable attention to the analysis of how companies develop accounting tools that support accident-cost analysis and related organizational decision making (Battaglia et al. 2014; Frey et al. 2014; Rikhardsson and Impgaard 2004). From a company perspective of analysis, the cost of an accident in the workplace can be defined as the effects on company costs that would not be incurred if the injury/accident did not take place (European Commission 2011). The measurement of accident-related costs and its use for decision making presents many challenges, such as the classification of costs and the related use of information by companies (Jallon et al. 2011). One crucial distinction to be made is that between external and internal costs. Some examples of internal costs include loss of productivity and the investigation time spent. Examples of external costs are the victim's medical expenses (not compensated through workers' compensation), and the time and resources expended in nursing and recuperation by the victim's household. Another distinction is that between direct and indirect costs, which highlights that not all costs are visible (Huang et al. 2007, 2011). From a sample of companies operating in the UK, Haslam et al. (2010) found that the vast majority of small to mid-size enterprises (SMEs) did not recognize any benefits in measuring costs of injury and illness in accounting terms. Most believed that the effort involved would outweigh the benefits, and many reported that, as their company already had an established commitment to H&S, such cost information would not motivate them further. In contrast, two-thirds of large companies recognized the importance of measuring accident costs in terms of specific industry figures.

Other pieces of evidence show that some companies prefer to avoid economic measurement and, instead, opt for non-financial evaluations, which better underline that safety is a core value of the organizational culture (Miller and Haslam 2009). However, an accident-cost analysis tool, when expertly designed, implemented, and used, provides a set of information that enables a comprehensive analysis of the different consequences related to an accident. The tool can increase the visibility of an accident within organizations (Jallon et al. 2011), and if linked to other instruments, such as the accident analysis report and the investigation of the root causes of the accident, it can also create a set of specific instruments for employee H&S analysis.

The analytical framework proposed by the sociotechnical analysis focuses on technical, organizational, and cognitive dimensions (Battaglia et al. 2016; Gond et al. 2012). These three dimensions and factors related to them offer an accurate and analytical view for discussing the implementation and integration of a new instrument within. Implementation refers to the design process and experimentation of a new instrument during the integration of its use in decision making. Further, a substantial level of integration in a dimension can lead to the tighter coupling on one or both of the other dimensions, compensating it or their secondary level(s) of integration. For example, collective cognition or shared practices on a specific aspect may compensate for a lack of technical integration. Conversely, effective technical integration may lead to the enhancement of organizational integration through the construction of new

shared practices and subsequently of a common cognitive understanding. According to Gond et al. (2012), this concept is co-existing/compensation, and it is fundamental for explaining and understanding the implementation and integration process.

The *technical dimension* (Anderson 1995) considers the availability of information and whether and how the information is diffused within the organization. Technical aspects indicate the possibility of tracing and observing injury-cost data and information, and of implementing and integrating the measurement instrument into the pre-existing H&S management procedures, H&S performance reports, dashboard, and investment decisions (Ibarrondo-Dávila et al. 2015). The technical dimension is essential because it allows the acquisition and sharing of information, increasing the organizational legitimacy of the instrument. When information is scarce, the decision-makers may become risk-averse, and consequently, the implementation and integration of the instrument become more complex, reducing the level of acceptance (Ansari et al. 2010). For example, Gosselin's (2006) review of activity based on costing adoption and implementation illustrated that the technical complexity of the instrument owing to the high costs of acquiring and maintaining adequate information led to its abandonment.

The second dimension is the *organizational dimension*, which refers to how mechanisms, processes, and actors are organized around a specific topic. Liu and Pan's (2007) study on activity-based costing implementation identified the training of employees as a critical organizational enabler, while Contrafatto (2014) indicated the constituency of an internal unit specifically dedicated to social and environmental issues in shaping the implementation and integration of social and environmental reporting. The organizational dimension can increase or decrease the visibility and importance of a particular instrument (Ansari et al. 2010), and in turn, may also reduce technical and cognitive barriers (Gond et al. 2012).

The *cognitive dimension* analyzes the cognitive aspects (Hall 2016), i.e., the 'mental template that individuals impose on an information environment to give it form and meaning' (Walsh 1995: 281). Cognitive aspects include the knowledge that is assimilated by individuals, and that becomes part of their competencies. Cognitive frames serve to reduce the complexity of the internal and external environments and drive individual and collective decisions and actions (Englund et al. 2013). Cognitive factors also influence how employees decide to adopt an innovative instrument, how they perceive the expectations, reward, and support for a specific instrument within an organization, and how the instrument will foster (or inhibit) the fulfillment of their values (Klein and Sorra 1996). Battaglia et al. (2014) indicated the importance of creating a collective meaning between the different organizational actors concerning the relevance of measuring the cost of accidents at work.

The three dimensions are linked to and may interact with each other. To foster the development process, each dimension and its specific factors should operate in an enabling way (Gond et al. 2012). However, the three dimensions can also trigger the implementation and integration process because hindrance factors can be present (Barki and Pinsonneault 2005; Battaglia et al. 2016). The following sections describe the research methodology and the characteristics of the instrument development.

3 Research Methodology

This study follows an interventionist research approach in two case organizations (see Table 1 for a summary of their characteristics). The aim was to develop a safety accounting instrument for measuring the costs of accidents, namely the *accident-cost analysis tool*. The tool provided financial information concerning the management of accidents and should be able to inform accident analyses and managerial decisions.

Jönsson and Lukka (2006, p. 374) defined interventionist research as 'a kind of field experimentation where the researcher […] seeks to determine the experimental situation through observation, acts on that situation in concert with the host organization, observes the process and outcome, and analyzes findings in view of the relevant literature'. The type of interventionist research differs according to the degree of intervention, i.e., modest or strong. A strong case is one in which 'the researcher—jointly with members of the target organization—develops a new construction, tests its usability, and draws theoretical conclusions based on this process' (Jönsson and Lukka 2006: 377). In this case, the aim is to change the work processes or instruments or to influence the host organization's decision making through the design or redesign of specific aspects.

A strong case orientation characterized a large part of the research. The research team developed the accounting instrument in collaboration with the host companies, and then supported the companies in different ways during the project. The construction of a close 'contact zone' and cooperation between the researchers and the two companies served to develop a new applicative instrument for H&S analysis. It also represented an opportunity to test the scientific literature, discussing employee H&S measurement issues and exploiting research skills on the ground to gather in-depth materials and information for academic purposes.

Table 1 Characteristics of companies

Characteristics	Alpha	Beta
Municipalities served	Five municipalities and 170,000 citizens	29 municipalities and 138,000 citizens
Number of employees	325	414
Number of accidents	63	28
Safety indexes	Frequency index: 120.15 Severity index: 2.36	Frequency index: 54.97 Severity index: 1.28

3.1 Data Collection and Analysis

The interventionist research occurred within two medium-sized public waste-management companies operating in Italy characterized by a different level of H&S performances, here referred to as *Alpha* and *Beta*. Site visits and interviews allowed the research team to observe and collect a considerable quantity of data and information. To create an open and participatory research environment, in most cases, the meetings were not recorded, allowing for greater confidentiality and fluency between the researchers and staff. During the meetings and interviews, extensive notes were taken and reviewed immediately after. The companies provided internal documents and interactions that occurred through e-mail and phone calls. The material collected was organized in a table in which there was a listing of the interactions with the companies with the following date (when applicable): date of the meeting, participants, topics discussed, critical aspects, time length, and link to the meeting notes.

After the end of the project, the research team concentrated its efforts on developing the theoretical analysis through an ex-post reverse analysis (Jönsson and Lukka 2006). In this phase, the materials and experiences collected were interpreted and analyzed through readings concerning accounting instrument implementation and the occupational H&S. An in-depth analysis of the notes, materials, and experiences took place around some key themes: H&S performance measurement, accident analysis, H&S reporting, technical factors, organizational and cognitive factors, and decision making.

It is important to note that the problematic story narrated in the present chapter corroborates the authenticity, plausibility, and critical aspects of the two cases (Golden-Biddle and Locke 1993). The narration of the positive and negative aspects of an interventionist analysis avoided a second potential drawback of the research method, i.e., the biased representation of a successful story. The latter occurs when the research team unduly guides the empirical research process toward the expected positive findings (in the case of this research, the full integration of the instrument within the two organizations) and search selectively for empirical evidence to confirm a positive story. In the next section, the analysis of the case informed by the theoretical aspects is illustrated.

4 Comparative Analysis

An initial meeting was held between the research team and the two companies to present the project. A discussion about accident costs and their measurement occurred, during which the research team explained that in medium-sized enterprises with a relatively low number of accidents per year, the absence of a measurement process and the lack of dedicated instruments might lead to a misperception of the accident risk and of the costs associated with it.

The design of the instrument followed three meetings. In the first meeting, both companies presented their profiles, explaining their operational characteristics and how they managed employee H&S, as well as how they measured accidents. The research team showed the potential costs associated with accidents, including the cost of replacing an injured worker, of the staff involved in the accident, of investigations, of sanctions against the company, of insurance, of training new employees, the costs associated with the plant shutdown, and so on. The differences in costs between severe and non-severe accidents were an important issue discussed. The first meeting familiarized the companies with the aims of the project. It also revealed the H&S units' high commitment to enhancing the work safety of employees in everyday life.

During the second and third meetings, three methods for measuring the costs of accidents were discussed: insurance-based, activity-based, and labor capacity-based methods (Battaglia et al. 2014). The strengths, weaknesses, and potential for implementation and integration within the two organizations were the objects of analysis. The H&S units were particularly interested in the activity-based method owing to the possibility of mapping all activities associated with an injury. Activity-based methods document all of the activities (consequences) generated by accident and evaluate the costs of the activities (Battaglia et al. 2014). The accounting manager of Alpha also sponsored this method, indicating that correct identification of the activities would facilitate data acquisition and representation. Accordingly, the research team and the companies' representatives decided to focus on this method. The new instrument developed was named the *accident-cost analysis tool*. It is composed of 31 specific items related to the management of an accident and grouped into five main categories of potential costs. Category A focuses on those activities associated with the initial consequences of the accident, category B on the administrative consequences, category C on the possible effects on the equipment, category D on the costs of resuming business activities, and category E on compensation and penalties.

To facilitate the data collection and analysis, a set of 'rules of thumb' was defined. First, not all of the items had to be analyzed for each accident because their presence depended on the severity of the accident—the higher the level of severity, the higher the number of items to be included. Second, the value of each item should be calculated as a total amount or unit amount of time, depending on the nature of the item. Third, the owner of the data collection process was the H&S unit, owing to its local knowledge of practices and procedures related to accidents. Finally, the companies would flexibly experiment according to the time they could dedicate to data collection and analysis. The discussion also underlined that the data acquisition did not strictly depend on the accounting information system because some information had to be collected appositively.

Alpha

For Alpha, the data collection process concerned a pilot phase and the main phase. The pilot phase focused on the analysis of four accidents to test the clarity of the items that composed the tool, the time required to acquire the data, and to increase the H&S unit's confidence in the data collection process. Despite some difficulties related to data acquisition, the pilot phase allowed new analyses, and the general

director of Alpha decided to extend the analysis to a broader set of 20 accidents. It represented a large set because it included half of all accidents that occurred in the previous years. The main phase included a selection of different accidents to ensure a complete representation of all kinds of accidents (not severe, severe and acute, depending on the number of days lost).

The main phase was more demanding than expected. An employee had to collect manually almost all of the information on each of the 20 accidents. As expected, neither the accounting information system nor the specific H&S instruments already in force, such as the OHSAS 18001 and the accident report analysis, contained enough information to complete most of the items that composed the tool. For half of the accidents, the costs were calculated following ex-post logic (i.e., after the accident occurred), while for the other half the costs were calculated concurrently with the accident. In this second case, the data collection was more fluid and manageable compared with the ex-post reconstruction because of the real-time data collection. The research team and the internal health unit screened all 20 cards that were compiled to check the data validity and reliability. Technically, for each accident, an average of 10 out of the 31 available items was compiled, most of which were in categories A and B, with acute accidents being particularly relevant from an economic point of view.

From an organizational perspective, the data collection process partially involved the human resources office and technical service (i.e., the area that directly manages the waste-collection activities). The human resources office supplied some information concerning the items in categories B and C. However, the need for a series of reminders from the H&S unit highlighted the difficulty of modifying the accounting information system to collect the information *automatically.* The operational service had a minor role in the data collection for category A, in that, it increased the difficulty of collecting complete information. The operational service units usually compiled a short accident report for the H&S unit containing necessary information on the accident. Instead, the tool required a more active approach by the technical service toward the H&S unit, requesting a higher level of accountability concerning the ex-post activities related to the accident. The operational service manager contested the trade-off between, on the one hand, managing the accident and the completion of the shift, and on the other, the difficulty of supplying the information requested.

As a consequence of technical and organizational difficulties, the development of the instrument was in grave danger of being interrupted owing to the joint effects of a lack of time, some organizational differences, and a lack of clarity on how the data would be used. The research team explained that merely visualizing the costs of accidents could be considered a real effort because it permitted a more in-depth analysis of employee H&S performance. The analysis of the accidents shown enabled the identification of some micro-organizational efforts that the H&S unit had not previously been fully considered. An example was the time taken by staff to manage administrative duties and to carry out extra activities so as to comply with ad hoc external audits by public authorities, information of all of which was not present before the application of the instrument. The cost information related to the injuries concerning climbing and descending the lorries highlighted the possibility of

making comparisons between new preventive investments in employee H&S and the potential incoming costs of the accidents associated with the status quo. An economic simulation was also performed on the data to calculate the total costs of accidents analyzed. The analysis showed a total cost of just over €55,000 for the sample of accidents analyzed (with a unit cost for injuries slightly lower than €2000 for an accident of medium severity), corresponding to an estimated annual value of about €120,000 for all of the accidents.

After the analysis, the general director expressed the desire to integrate the tool to support planning and control activities related to employee H&S. His appreciation was essential to support as well as promote the H&S unit employees' efforts due to the significant commitment that they made to collect the data. Accordingly, despite the presence of technical and organizational barriers, the assessment of the implementation phase was considered prospective. To integrate the instrument, Alpha decided to follow an incremental implementation path.

Beta

Beta decided to collect information in a single phase on all 28 accidents of the previous year. The data collection process was similar to that of Alpha. The cost of accidents was manually collected because a large portion of the data and information was not available. The H&S unit made a painstaking analysis of the internal documents to obtain as much information as possible. Other information was collected in collaboration with the human resource office while the operational unit was not involved in this phase. According to the H&S unit, the operational unit required specific ex-ante training concerning the aim and purpose of the tool. Otherwise, the analysis could be interpreted as an attempt to decrease, rather than to increase, aspects of safety.

The research team actively supported the internal staff during the data collection, progressively checking each accident report produced and helping them to clarify the meaning of some items. The H&S unit highlighted the fact that despite an initial problem with the data collection, and especially the information related to the time the operational unit dedicated to the management of the accident, the analysis of the accidents gradually became more standardized and reproducible. The H&S unit noted that similar accidents required similar management time. The same observation was made by the human resources office, which noted that the administrative time dedicated to the management of the activities listed in the tool was very similar among the various accidents. Both offices thus gave a constructive evaluation of the data collection process. They underlined that, with some modification of the items in the accident report usually compiled by operational units, the cost analysis process could become faster. The H&S manager was also confident that the incoming OHSAS 18001 certification would favor a more organic collection of H&S information.

From an economic point of view, the calculation showed a total cost of approximately €50,000 and an average cost per medium-severity accident of €1900 (very similar to Alpha). The vast majority of the costs (more than 90%) were related to category A, then to category B, and, in the case of severe accidents (lasting more than 35 days), to category C of the tool. When compared with previous studies, the

average cost of a common accident was minor. The OSH study (European Commission 2011) reported a value of €1651 for a low-severity accident, of €4985 for one of medium severity and of €11,760 for cases with high severity. The results of the OSH study indicated that the most critical consequences of accidents concerned the human-related aspects which accounted for 80% of the total cost.

The reaction to the new information was different from that at Alpha, whereas at Alpha the H&S office was initially more interested in the numeric value, and at Beta, the attention progressively moved to the analysis of the organizational aspects. The two offices of Beta recognized the value relevance of the financial information, but they underscored that the majority of the cost concerned employees' absence from work after the accidents. They highlighted the fact that most of the costs in category B were related to administrative time. In their view, the new information was interesting not only because it explained the economic value of an accident but also because it indicated the areas and operational activities that were riskier. The analysis of accident-cost reports revealed the importance of focusing on equipment, procedures, and machines as the core aspects for improving employee H&S. The experimental adoption of the accident-cost analysis tool showed a different view of H&S performance compared to the previous analysis implemented. Beta, however, questioned whether the economic measurement of accidents might be conceptually too risky because its aim could easily be misinterpreted as a way to reduce, rather than to improve, safety.

The data were then presented to the head of the operational unit in a meeting in July 2013. The head of the operational unit agreed on the value-added of the information because of the possibility of increasing safety awareness. However, the proposal was only partially implemented because the H&S unit, in conjunction with the operational unit manager, subsequently decided to show only the list of activities related to the accident and not the financial information. This precautionary approach occurred because the operational units were not confident about the usefulness of financial information when referring to safety aspects. The idea of integrating the instrument is discussed in the following section.

Alpha—The (no)-integration phase

In 2013, more than a year subsequent to the experimental implementation, a one-day meeting was organized to understand whether and how the integration had occurred. The meeting revealed that the H&S unit operated to promote organizational integration at the operative level. The activities map was used during the training of the workforce to inform all employees of the organizational consequences associated with accidents, underscoring the value-added of an active collaboration during the ex-post analysis of the accident. As reported by the safety manager, the operational workers were astounded when they learned the set of consequences related to an accident. The financial information was also presented to promote more rigorous conduct among the employees. It was expressed that such information could be considered a waste of company resources that could otherwise be used for preventive interventions and actions. According to the H&S unit, the visualization of financial information would encourage the operational staff to pay more considerable attention

to specific safety procedures. The internal union representatives also recognized the ability of the activities map to raise awareness concerning accident-related effects.

Also, the H&S unit adopted the accident-cost information to forecast the potential costs of accidents for 2013. The determination and visualization of the incoming costs underlined the importance of searching for new and effective safety operative solutions. The H&S unit also adopted the information to support small investment decisions. It compared the data on the manual handling of loads and door-to-door waste-collection accidents with the potential benefits (measured in terms of cost reductions as a consequence of fewer accidents) derived from increasing the level of safety and technology of the employees' equipment. The data analysis was carried out following a cost–benefit logic in which the measurement of benefits also took into consideration the economic benefits related to the reduction of accidents. Nevertheless, the H&S manager clearly expressed that the financial information was secondary and not the primary criterion on which to make decisions. This point resonates with Hall's (2010) view that accounting information can be used not only in terms of well-defined decision scenarios but also for improving knowledge regarding work environments.

Despite that, the H&S unit recognized a difficulty in regularly updating the instrument when an accident occurred. It revealed that an official tentative update aimed to share some aspects of the data collection process that occurred in collaboration with the accounting unit, but neither the technical unit nor the human resources office replied positively. The technical unit indicated that the tool was not entirely appropriate for analyzing safety aspects, while the human resources office was only willing to act in a supportive role because they did not want to assume any responsibility with respect to the topic. The presence of intertwined technical and organizational barriers and the difficulties of overcoming them prevented the integration of the instrument. On the one hand, the financial information was not powerful enough to enable a robust interaction and discussions concerning employee safety improvement. On the other, the presence of technical and organizational barriers hindered the integration.

Beta—The (no)-integration phase

A one-day meeting was also organized at Beta for more than a year subsequent to the experimental implementation to understand whether and how the integration had occurred. Some steps occurred for sharing the instrument. The activities map related to the accidents was the object of specific training initiatives for the operational-level employees to illustrate the organizational effects of an accident. Although the financial information was not presented, the map was considered an improvement in the process of measuring H&S performance. A technical cost center was also created within the accounting information system to collect financial information related to H&S aspects.

However, the H&S unit at Beta made fewer efforts to adopt and integrate the instrument than the unit at Alpha. A first organizational barrier that emerged was the non-prioritization of the project despite the positive results achieved during the implementation phase. The H&S office concentrated its analysis on waste-management

services, which changed progressively from a mixed system of the collection (automatic and door-to-door collection) to a complete door-to-door collection system. This change implied a re-organization of employees' jobs and also an analysis of the implications of such a change on employees' safety owing to the advanced average age of the workforce. The buyer process concerning safety equipment was also changed to reduce the costs of equipment and to increase the delivery aspects. These activities, in addition to ordinary ones, did not allow time to be dedicated to stabilizing the implementation phase and to promoting the integration phase. Also, it emphasized the difficulty of paying sufficient attention (on an ongoing basis) to the new instrument within the company.

Other obstacles were also present. The general director did not consider the idea of promoting economic literacy with respect to employee safety to be relevant. The experimentation and results of the project were finally presented to the general director, who recognized that it was necessary but not sufficiently relevant to promote its regular use. According to the H&S manager, the general director considered the low number of accidents reported over the years to be sufficient information to measure H&S performance and the related effectiveness of the decisions and activities implemented, without the need to commit further resources to develop other tools. Beta's performance safety indexes were better than the national statistics for the sector. A further obstacle was the company's general approach to health and one safety issue, which was normatively oriented. The instruments adopted over time to manage and measure the H&S performance were coherent with the normative requirements of the framework requirements, with a low predisposition toward the adoption of optional tools. The H&S team revealed that the company approach toward safety and the related use of the accident-cost analysis did, in fact, hinder the integration of the instrument. The staff noted the difficulties of using the information and of sharing the information relevance within some company units. The lack of relevant feedback for decision making was stressed as a barrier in promoting future analysis and the use of the instrument (Benn et al. 2009).

5 Discussion and Conclusion

The study sought to determine and analyze the technical, organizational, and cognitive factors that influence the implementation and integration of an accounting instrument for accident-costs analysis within organizational decision making. In particular, it provides specific insights into sociotechnical barriers to, and enablers for, the development of an accounting instrument for employee H&S adds knowledge to the understanding of the technical, organizational, and cognitive aspects as regards the use of financial information for H&S decision making.

The instrument was implemented, yet weakly integrated and then discontinued by the two companies. The instrument supported, in some instances, employee H&S decisions, even though the link between financial information and employee safety was considered ambiguous and not able to support decision making (Battaglia et al.

2014; Jallon et al. 2011; Rikhardsson and Impgaard 2004). The failure of the integration was not due to the inadequacy of the instrument per se but to the ineffective management of the integration phase. While the study provides evidence of the conceptual relevance of the instrument (Mättö and Sippola 2016), the final phase of integration was not managed with the consistency, skill, and care required, so that the various organizational members could derive its expected benefits (Contrafatto 2014).

The cases show similar results. In both companies, economic measurement of the accidents was carried out, but the tool was only occasionally used. Neither of the two companies continued to use the instrument regularly after the initial phase. In the case of Alpha, it was used to support decision analysis concerning the acquisition of new protective equipment for the employees. In both companies, it was then used to show the amount of economic data generated related to the accidents. The similar results of the two cases emphasized that the lack of more systematic and stable integration of the tool was due to the predominance of technical, organizational, and cognitive barriers with respect to the corresponding enablers (Barki and Pinsonneault 2005; Battaglia et al. 2016) (see Table 2 for a summary). From a technical point of view, neither company had an accounting information system nor any procedure in place to collect and emphasize automatically the costs associated with accidents. This point bears some similarities with the Gosselin's (2006) review of activity based on costing adoption and implementation, which revealed that the high costs of acquiring and maintaining adequate information led to instrument abandonment. At the cognitive level, the uncertainty associated with the new type of analysis, as clearly evidenced in the case of Beta, and the confidence in using traditional indicators discouraged the integration of the tool. The cognitive barriers were due to the scarce relevance that accounting information concerning employee H&S had within companies, which influenced employees' decisions concerning the use of the instrument (Klein and

Table 2 Technical, organizational, and cognitive enablers, and barriers identified

Technical enablers	**Technical barriers**
• Availability of accident reports containing qualitative information on the accidents	• Lack of adequate information system for a complete collection of accident data • Lack of skills and training of the operative staff to collect the necessary data
Organizational enablers	**Organizational barriers**
• Organizational commitment toward employee H&S management • Good H&S performance	• Difficulties in sharing information between H&S and other offices regarding the importance of measuring accidents costs • Focus on already existing employee H&S performance and decision-making mechanisms
Cognitive enablers	**Cognitive barriers**
• Desire to experiment with new ways to improve H&S aspects	• Uncertainty by the H&S office in valorizing and using the economic information collected

Sorra 1996). This specific point empirically confirms the argument of Hahn et al. (2014) for which, in the case of high uncertainty related to social and environmental issues, managers prefer to continue with traditional forms of analysis and decision making.

This chapter contributes to advancing accounting and H&S literature and provides an in-depth analysis of how companies have tried to develop a specific accounting tool aimed to support accident-cost analysis and related organization decision making (Battaglia et al. 2014; Frey et al. 2014; Rikhardsson and Impgaard 2004). The findings suggest that integrating an accounting instrument within an organization requires the concurrent presence of technical, organizational, and even cognitive enablers. The three dimensions are interdependent and constitute a unified whole that the new instrument shapes. This argumentation, supported by the empirical analysis, is different from that of Gond et al. (2012), according to which integration can also occur when just one of the dimensions is more developed than the others, and thus can push and drive the others toward integration. As the two cases showed, the integration and use of the instrument require a cognitive understanding, technical feasibility, organizational acceptance, and availability to change. The interplay between the different dimensions and related factors may then support its regular use and the feedback mechanisms to support future decisions, whereas during the implementation phase, the presence of all the dimensions and the related enablers maybe not present or hindered; they need to be managed over the process in order to support the integration (Battaglia et al. 2016). Accordingly, the management of the entire process is a crucial issue to monitor so as to enable a potential integration and use of a new instrument (Anderson 1995; Liu and Pan 2007). In terms of practical implications, the study reveals the complexity involved in supporting H&S analysis with financial information (Jallon et al. 2011). Additionally, it informs on some of the factors that should be considered to support the effective implementation and integration of an accounting instrument for H&S analysis.

However, the research is subject to some limitations. The findings align with the social and organizational context in which they emerged. Also, despite the strategies employed to promote the ethical perspective during the case analyses, some potential biases, such as the selective interpretation of information, may be present owing to the subjectivity of the analyses. While the findings of the study move forward the debate on accounting for employee H&S, there remains a worrying lack of knowledge of what it means to use accounting information in this field. Future research avenues could continue to analyze the three dimensions of factors and how they impact, singularly or collectively, on the implementation and integration of accounting instruments as well as the resistance to change. In particular, the analysis of compatibility between organizational culture and accounting instruments related to employee H&S could be a further avenue to study. The level of adoption of different safety accounting instruments, such as safety performance indicators, accident-cost analysis tools, budget and investment criteria for H&S management, could also be investigated.

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