Innovation in managing sustainability: a tentative integration of accounting for employee health and safety

Received
18th February 2019
Revised
2nd April 2019
Accepted
21st June 2019

Massimo Battaglia - Emilio Passetti - Lara Bianchi
Marco Frey

Abstract

Purpose of the paper: *This study analyses the implementation and integration of an accounting instrument for employee health and safety. It discusses whether and how the device and related financial information support employee health and safety decision making.*

Methodology*: The framework focuses on the technical, organisational and cognitive factors that may operate as enabling or hindering factors during the implementation and integration process of an accounting instrument. A multiple case analysis of two medium-sized Italian waste management companies was carried out following an interventionist research approach lasted two years.*

Findings*: The analysis reveals that none of the two companies integrated the instrument despite the positive outputs revealed during the implementation phase. A set of interrelated technical, organisational and cognitive barriers emerged. In particular, the difficulty of generating corporate interest in the instrument prevented its integration. Cognitive factors, such as empathy towards workers and fear of potential new injuries, operated in an unstable way, enabling the implementation but preventing the integration. The device, however, was able to support specific health and safety decisions during the test phase, even though the link between financial information and employee safety was fragile.*

Research limits: *The limitations of the study concern the potential biases of scholars related to the engagement within the organisations.*

Practical implications*: The results may support the development process of accounting instruments dedicated to employee health and safety. The results suggest that the integration of a new accounting instrument requires the simultaneous presence of technical, organisational and cognitive enablers to support the change from the company's routinised ways of acting and thinking.*

Originality of the paper: *The research offers an in-depth analysis of the development process of an accounting instrument. The study presents novel insights into the relationship between employee health and safety and accounting, which represents an unexplored and fertile area of investigation for social accounting studies.*

Key words: accident cost analysis; accounting process development; social accounting; hindering factors

sinergie
italian journal of management
Vol. 38, Issue 1, 2020

1. Introduction

Occupational health and safety management aims to ensure adequate conditions for the hygiene, safety and well-being of people in the workplace. It seeks to facilitate the identification and reduction of risks, accidents and work-related diseases. The topic has become increasingly important for companies that have developed policies, programmes and actions to respond to internal and external stakeholders' pressures and increase performance (Swuste *et al.*, 2016).

Literature has discussed accident cost classification schemes (Brody *et al.*, 1990; Veltri, 1990), developed specific methods of analysis (Aaltonen *et al.*, 1996; Rikhardsson and Impgaard, 2004) and reviewed existing methods (Rikhardsson, 2004; Tappura *et al.*, 2015). At the institutional level, the topic has been promoted in business through a win-win logic, with the argument that preventive approaches to safety can generate a financial pay-off for companies, as well as a health and safety pay-off for employees (EU-OSHA, 2010; ISSA 2013). In contrast, critical studies have underlined that imposing financial reasoning on health and safety does not address the complexity of the topic or the promotion of its ethical value (Caicedo and Mårtensson, 2010; Caicedo *et al.*, 2010; Dillard and Roslender, 2011). O'Neill *et al.* (2015), for example, criticised the logic of using gravity and frequency indicators, arguing that they are too simplistic and aggregated to guide company decisions or to inform public policy. Cooper *et al.* (2011) proposed that comprehensive reporting of the employee health and safety investment is needed to enhance the transparency on the topic.

On the other hand, studies on instrument development process have revealed the importance of organisational, technical and cultural factors in driving the dynamics of implementation and integration (Anderson, 1995; Ax and Greve, 2017; Lodhia and Jacobs, 2013; McLaren *et al.*, 2016; Domingues *et al.*, 2017). However, despite the numerous studies that have investigated the topic (Giovannoni and Maraghini, 2013; Modell, 2009; Toutounchain *et al.*, 2018; Wouters and Roijmans, 2011), an understanding of whether and how the implementation of a new device influences organisational actions and decisions is still underinvestigated, especially in the context of health and safety.

Starting by these premises, the study aims to link the analysis of the development process of a new accounting instrument with the analysis of employee health and safety prevention. In particular, the study analyses how enabling and hindering factors influenced the implementation and integration of an accounting instrument for employee health and safety analysis within two organisations. The paper adopts a framework based on technical, organisational and cognitive factors to investigate the topic (Gond *et al.*, 2012). These factors allow for an articulated understanding of the process surrounding the development of the accident cost analysis tool, enabling to discuss whether and how the instrument was able to promote employee health and safety decision making (Passetti *et al.*, 2014).

The device was named in the project *the accident cost analysis*. It provides financial information concerning accidents in the workplace to support preventive safety actions (Jallon *et al.*, 2011). It was designed by scholars,

in accordance with sample companies, to collect, measure and analyse financial information concerning the absence of safety such as the number, typology and frequency of accidents in the workplace. The device aims to consider financial data as a projection for employee health and safety-related failures, underling the prevention of accidents as a value activity (Rikhardsson, 2004). The measurement of accidents may be of critical importance because it may facilitate continuous improvement by inducing further accident investigations and appropriate actions (Ibarrondo-Dávila *et al.*, 2015). The idea underlying the tool recognises the importance to assure and enhance safe employee work conditions.

According to Cooper *et al.* (2011), to promote the right to safety in the workplace, new forms of health and safety accounting that consider both financial and health and safety aspects may be developed. The aim is providing a piece of transparent and complete information on the nature of the health and safety expenditures undertaken by the companies and on the costs for safety improvements. In such context, it is essential to underline that financial information does not undermine the ethical dimension of employee safety, which must be accepted, adopted and propagated in support of safety improvements (Cooper *et al.*, 2011). The analysis carried out in this paper contributes to the above points discussing the potential of an accident cost analysis tool to offer useful financial information intended to promote employee safety. In doing so, it provides an in-depth understanding of the implementation and integration process characteristics of such instrument, enhances, in turn, our understanding of the role that the technical, organisational and cognitive factors play in facilitating or hindering the development process of a new (accounting) instrument.

The empirical analysis refers to an interventionist study (Jönsson and Lukka, 2006) of two Italian waste management companies lasted almost two years, and aimed at experimenting the adoption of a new instrument for accidents costs measurement. The direct engagement with the organisations offered interesting theoretical and practical insights concerning the analysis of how accounting unfolded (Malmi, 2016; Jönsson and Lukka, 2006). The interventionist research approach enables to investigate employee health and safety issues as it encourages the participation of workers who are potentially exposed to the risks and thus can better perceive the lack of safety. The research focuses on waste management companies because employees are subject to several threats in the workplace (Frey *et al.*, 2013; Lopez-Arquillos *et al.*, 2019). The Italian context in particular is relevant because of the increased emphasis on health and safety management given by the waste management sector (Battaglia *et al.*, 2015).

The study adds to the previous literature on the accounting development process that illustrated the critical role of cognitive aspects in the processes of integration of new instruments within businesses (Englund *et al.*, 2013; Hall, 2016). The present analysis highlights the importance of three dimensions (technical, organizational and cognitive ones) in the processes of integration, deepening how their inter-play provides an in-depth understanding of the implementation and integration process dynamics.

In particular, the role of emotions related to the employees' cognitive health and safety issues was central in (initially) mobilising and (later) stopping the development process of the instrument. The implementation occurred in one of the companies because of the emotions related to the possibility of improving the health and safety analysis, and the employees' conditions. In contrast, the other company encountered organisational barriers. Cognitive factors played a crucial role in connecting, experimenting and maintaining the relationship between the instrument, financial information and employee health and safety decisions. However, the integration of the device was hindered in both companies by the negative interplay between various factors. In particular, employee health and safety was perceived by the case organisations as meta-value (Bouten and Hoozée, 2016), while the instrument and the related financial information, even if able to inform decision making and some preventive actions, were considered of minor importance (Smallman and John, 2001; Miller and Haslam, 2009).

The remainder of the paper is structured as follows. Section two explains the theoretical framework and part three the research method. Section four presents the findings which are discussed with conclusions and future research directions in section five.

2. The analytical framework

According to Englund and Gerdin (2008; 2015), further studies concerning the accounting development process are needed to understand how internal process dynamics occur, which dimensions and factors influence them and how they are intertwined. The development process of an instrument is articulated in the main phases of *initiation, implementation and integration* (Al-Sayed and Dugdale, 2016; Damanpour, 2014). The *initiation* phase begins when internal and external pressures to change emerge, and the internal constituents of an organisation become aware of their needs, starting with the investigation of and search for possible innovative solutions.

The *implementation* phase represents the transition period during which an organisation becomes skillful, consistent and committed to the adoption of the innovative instrument (Klein and Sorra, 1996). In the implementation phase, the scope, objectives, data collection and possible changes in the adopted technique and the organisational structure are discussed. The trial adoption and the initial acceptance of the innovative instrument take place during this phase. Implementation, therefore, is the gateway between the decision to adopt the innovation and its routinised adoption, which is typical of the integration phase.

In the *integration* phase, there is a gradual acceptance of and search for multiple applications of the instrument. Accordingly, a common understanding of the device may emerge in the organisation, and the innovation loses its novelty. Full integration is achieved when the tool becomes entrenched and embedded, and its information is used regularly. In such a case, the instrument shows its potential - thereby improving work effectiveness.

Multiple dimensions and factors may influence the implementation and integration phases (Anderson, 1995; Ax and Greve, 2017; Busco *et al.*, 2015). Gond *et al.* (2012) identify technical, organisational and cognitive factors as the most important. The three dimensions are linked and may interact. They can foster the development process operating through enabling factors (Gond *et al.*, 2012). On the other hand, they may trigger the implementation and integration phases due to the presence of hindering factors (Barki and Pinsonneault, 2005; Battaglia *et al.*, 2016).

The *technical dimension* (Anderson, 1995) considers the availability of information and whether and how it is diffused within the organisation. In the health and safety context, technical aspects refer to tracing and observing injury cost data and information, and also to the implementation and integration of the new instrument into the pre-existing health and safety management procedures and health and safety performance reports (Ibarrondo-Davila *et al.*, 2015). The technical dimension allows for the acquisition and sharing of information, supporting the internal legitimacy of the instrument. On the contrary, when data is scarce, the decision-makers may become risk-adverse, and consequently, the implementation and integration of the device become more complex (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 led to its abandonment.

The second dimension is the *organisational dimension,* which refers to how structures, processes and actors are organised around a particular topic (Hoque and Halam, 1999). Organisational mechanisms can be specific tasks and activities or cross-unit teams that combine different perspectives, knowledge and experiences and thus permit a fruitful internal debate. Liu and Pan's (2007) activity-based costing implementation review identified the training of employees as a critical organisational enabler, while Contrafatto (2014) indicated the constituency of an internal unit specifically dedicated to social and environmental issues as an essential organisational factor. For what concerns health and safety, Battaglia *et al.* (2014) revealed that developing a collective meaning between the different corporate actors increases the importance of costs accidents measurement. The organisational dimension may increase or decrease the visibility and influence of a specific instrument (Ansari *et al.*, 2010), and also reduce technical and cognitive barriers (Gond *et al.*, 2012).

The *cognitive dimension* analyses the cognitive factors (Hall, 2016), i.e., the 'mental template that individuals impose on an information environment to give it form and meaning' (Walsh, 1995, p. 281). Cognitive factors 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 environment and drive individual and collective decisions and actions (Englund *et al.*, 2013). Cognitive factors influence how employees decide to adopt a new instrument, how they perceive the expectations and give support to a specific device and how it will foster (or inhibit) the fulfilment of their values (Major and Hooper, 2005; Klein and Sorra, 1996).

If a financial perspective is taken to measure employee health and safety issues, cognitive barriers may arise, inhibiting the implementation and integration of the instrument due to the unusual way to assess health and safety. Despite that, accounting may support preventive analysis, providing additional information on the financial impact of the accident occurred, promoting knowledge and decision making (Testa *et al.*, 2018; Kamar *et al.*, 2019; Meikandaan and Hemapriya, 2018).

3. Research method and data collection

The main characteristics of the interventionist research method

The present study implements multiple case analyses (Yin, 2003) following the logic of interventionist research. Jönsson and Lukka (2006, p. 374) define it 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 organisation, observes process and outcome, and analyses findings in view of the relevant literature'. The interventionist approach is considered particularly interesting for extending both scientific and managerial debate. The interventionist study should offer practical (i.e., *techne*), theoretical (i.e., *episteme*) and societal (i.e., *phronesis*) knowledge to be valid (Lukka and Soumala, 2014).

Interventionist research also involves the analysis of two linked perspectives. The *emic* aspect reflects the active role of the researcher during the research phase. The researcher becomes a 'member' of the host organisation, observing and participating directly. It allows the researcher to acquire an insider's view of what is going on in the case-organisation, with the potential to obtain critical information and deep insights that would otherwise be unavailable. The *etic* perspective refers to studying the case-organisation from the outside, allowing the empirical findings to be linked to a theoretical framework and relevant literature to make a theoretical contribution (Lukka and Soumala, 2014; Suomala *et al.*, 2014). Both perspectives are essential and need to be balanced to justify the interventionist research (Jönsson and Lukka, 2006).

The type of interventionist research differs according to the degree of intervention, i.e. modest or substantial. The latter is when 'the researcher -jointly with members of the target organisation- develops a new construction, tests its usability and draws theoretical conclusions based on this process' (Jönsson and Lukka, 2006, p. 377). The aim is to change the work processes or instruments, or influence the decision making of the host organisation through the design or redesign of specific aspects.

In the current research, a substantial approach was largely followed. The research team developed the instrument in collaboration with the host companies, then supported the companies during the implementation phase to foster the changes in the work processes and decision making. Finally, through a step-back process of analysis, the theoretical aspects of the research project are explored in this paper. The construction of a 'close contact zone' (Ahrens and Champan, 2006) and cooperation between the researchers and the two companies served two purposes. For the

companies, it helped to develop a practical application for their internal health and safety analysis. For the research team, the project provided an opportunity to test the scientific literature, discuss topics concerning employee health and safety analysis and exploiting research skills on the ground to gather in-depth materials and information for academic purposes. The project was also endorsed and sponsored by the Fondazione Rubes Triva (hereafter, the Foundation) which is the official Italian entity devoted to the promotion of a safety culture within the waste management sector.

The data collection process

The interventionist research was developed within two medium-sized public waste management companies operating in Italy, here referred to as Marche and Latium (Table 1). The study began in September 2014 and finished on in November 2016, with the aim to develop an instrument for measuring the costs of the accidents. The companies had not yet analysed such issue. The monitoring and measurement technology designed for this study was the accident cost analysis tool, given the noteworthy interest that accident cost analysis has attracted in the specialised health and safety literature (Jallon *et al.*, 2011). The device was designed to provide financial information concerning the activities related to the management of accidents occurring in the workplace, to support both ex-ante and ex-post-accident analyses and decisions.

Tab. 1: Main characteristics of the case organisations

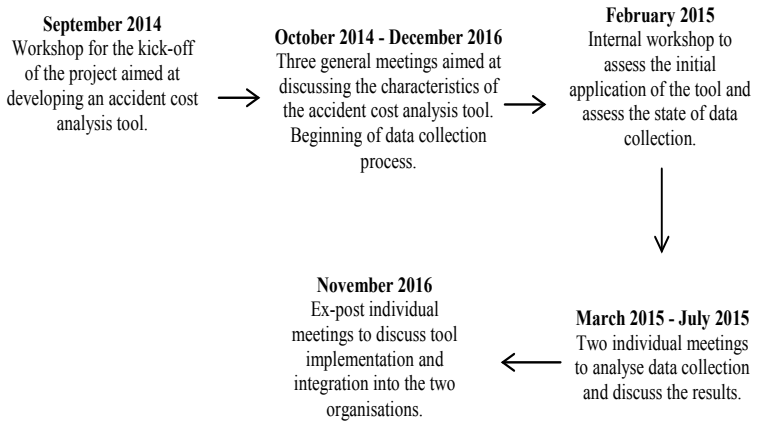
Characteristics	Latium	Marche
Municipalities served	29 municipalities and 138,000 citizens	Five municipalities and 170,000 citizens
Waste management activities characteristics	Urban waste collection by a mix of mechanised and door-to-door collections; landfill and incineration plant management	Urban waste collection by a mix of mechanised and door-to-door collections
Number of employees (2014)	414	325
Number of accidents (2014)	28	63
Safety indexes (2014)	Frequency Index: 54.97 Gravity Index: 1.28	Frequency Index: 120.15 Gravity Index: 2.36

Source: internal companies' data

Site visits, internal workshops and interviews mobilised the *etic* perspective, permitting the research team to observe and collect a considerable amount of data and information. The timeline of the project is shown in Figure 1. In most cases, to create an open and participative research environment, the meetings were not recorded, allowing for greater confidentiality and fluency between the researchers and the staff. During the meetings and interviews, extensive notes were taken and reviewed immediately after. The companies provided internal documents, which facilitated interactions that were perpetuated through e-mail and phone calls. The materials provided described the health and safety management and prevention activities of the companies. It was the case

of internal reports about accidents, planned meetings amongst employees and managers, reports of employees training initiatives, safety managerial reviews, communications to Authorities on occurred accidents, as well as documents from internal accounting divisions aimed at supporting the process of quantification of costs. The material collected was organised into a table listing the interactions with the companies and used to support the analysis. The following data were usually recorded: date of the meeting, participants, topics discussed, critical aspects, time length and link to the meeting notes.

Fig. 1: The timeline of the research project



Source: own elaboration

One of the main risks of the interventionist research is the possibility that the researchers, through their involvement with the organisation, lose their independence and autonomy concerning the evaluation of results (Arnaboldi, 2013). In this regard, the role of the research team evolved and changed during the project. Initially, the group operated as a technical translator (Arnaboldi, 2013) to offer the necessary knowledge to the participants and to favour the implementation process. This phase involved the design of the instrument, testing of its applicability and discussion of the potential usefulness of the information for decision making. Then, during the pivotal implementation phase, the research team became a sidelined mediator (Arnaboldi, 2013), operating to guarantee convergence of interests between the researchers and the companies. As indicated by Arnaboldi (2013), if the convergence of interests fails, the value of the project may decrease. In particular, the research team produced two interim reports on the technical aspects and delivered two formal presentations on the academic literature between September 2014 and February 2015. Such analysis laid the foundations for both the theoretical analysis and the practical implications. From July 2015 to November 2016, the role of the research team changed again to one of an assembling explorer (Arnaboldi, 2013). In this phase, the findings were openly and extensively discussed with the companies and compared with

the initial aims of the project. This dialogue with the companies helped to create a balance between the *emic* and the *etic* perspectives (Soumala *et al.*, 2014), to refine the initial ideas and concepts and to produce the second intermediate step related to the theoretical analysis. A book was written and presented at a public conference as one of the outputs of the project (Frey *et al.*, 2013). The book discussed the importance of managing and measuring employee health and safety performance, the tools available in the literature for measuring accidents and the social impacts of injuries in the workplace. It also presented the financial data concerning the accidents collected and analysed during the project.

Once the project was completed in November 2016, the research team concentrated its efforts on developing the theoretical analysis through an ex-post reverse analysis (Eisenhardt, 1989; Jönsson and Lukka, 2006). In this phase, the materials and experiences collected during the project were triangulated, interpreted and analysed through extensive reading of the accounting development process and the occupational health and safety literature. An in-depth analysis of the notes, materials and experiences was also developed around eight key themes: health and safety performance measurement, accident analysis, health and safety reporting, technical factors, organisational factors, cognitive factors, interaction mechanisms and decision making. The research team discussed the different elements, attitudes, motivations and meanings underpinning the observed actions and behaviour. Discussions were held on whether and how the dimensions and factors were bundled together, how they influenced the development process and the link between financial information and employee safety issues. As there was an interactive movement between the two perspectives throughout the entire project, the ex-post reverse analysis of reflection and interpretation allowed for the analytical unbundling of the emic and the etic views (Soumala *et al.*, 2014).

The final phase of the research coincided with the writing of the present academic output and was also characterised by a knowledge exchange and transfer activities (Parker and Northcott, 2016). The complex narrative of this paper evidences that the process of qualitative data positioning accurately corroborated the authenticity, plausibility and critical aspects of the two cases (Golden-Biddle and Locke, 1993). The narration of both the strength and weakness aspects of the research project avoided a second potential drawback of interventionist research, i.e. the biased representation of a successful story. The latter occurs when the researchers unduly guide the empirical research process toward the expected positive findings (in the case of this research, the full integration of the instrument within the two organisations), and selectively look for empirical evidence to confirm a positive story (Rautiainen *et al.*, 2016).

4. Comparative analysis

This section details the analysis of each company's data, starting with a discussion of the initial situation, followed by the implementation and integration phases.

4.1 Initial situation

Marche

Marche began to focus on employee health and safety management during the first decade of the new century with the creation of a small internal unit dedicated to health and safety. The OHSAS 18001 was officially acquired in 2011 and was considered an important instrument to communicate, both internally and externally, the increased importance of health and safety management. Investments in technical and training aspects were made to improve employee safety at an operational level. The general director, however, was not completely satisfied with the way health and safety performance was measured. He did not consider the indicators (gravity, frequency, near misses, etc.) sufficient to explain how the organisation was managing the issue adequately. For example, the company still did not know the exact expenditure on health and safety management over the years. Also, the analysis of health and safety performance was too localised within the health and safety unit and not fully shared within the organisation.

Latium

Latium first began to invest significantly in a more proactive management of health and safety issues in 2007, as a consequence of a large number of accidents that had occurred in the previous years. In 2008, an internal unit for the management of health and safety issues was created. It promoted a series of new health and safety-related initiatives over the years: new training courses for employees, replacement of old waste collection vehicles with more technologically advanced ones and the creation of a health and safety management system (without certification). The implementation of the health and safety management system allowed regular measurement of the frequency and gravity indicators and near accidents. In 2010, the number of accidents was reduced by a half, and in 2014 by a two-thirds based on 2008 data.

4.2 Preliminary acts

Marche and Latium

In April 2014, the Foundation promoted a public conference dedicated to the promotion of a safety culture within the waste management sector. Several themes were discussed, including the importance of developing health and safety management systems amongst environmental hygiene companies, the role of training at the operational level and the importance of measuring and analysing accidents in the workplace with new instruments. The Foundation's director considered the measurement and analysis of work accidents a pivotal topic for improving a preventive health and safety management approach.

Accordingly, a project articulated in two phases was launched during the conference. The first phase consisted of a desk study about the level of diffusion of health and safety management systems in the sector, and the level of diffusion of sustaibability amongst companies belonging to the

waste management industry. The second phase aimed to develop a project for the design of a new instrument dedicated to the analysis of the costs of the accidents. Such proposal captured the initial interest of four companies, and in particular of Marche and Latium.

After a series of preliminary contacts to validate the initial interest in the project, in September 2014 an initial meeting was held between the Foundation, the research team and the two companies, represented by the general director of Marche, the human resources manager of Latium and their health and safety managers. The meeting defined the main aim of the project and its timeline. 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.

4.3 Implementation phase

Marche and Latium - The initial implementation phase

The design of the instrument was discussed during three meetings held between October and December 2014. In the case of Marche, two employees of the health and safety management unit and the accounting manager participated. Two Latium employees of the health and safety unit, and the operational services middle-manager were present. In the first meeting, both companies presented their profiles, explaining their functional characteristics and how they managed employee health and safety, as well as how they measured accidents. The research team presented the potential costs associated with accidents, including the cost of replacing an injured worker, the cost of the staff-employee involved in the accident, the cost of investigations, the cost of sanctions against the company, insurance costs, the costs associated with the plant shutdown, the cost of training new employees and so on. The differences in costs between severe and non-severe accidents were discussed. The first meeting helped the companies to familiarize with the project's aims. It also revealed the health and safety 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 labour capacity-based methods (Battaglia *et al.*, 2014). The strengths, weaknesses and potentials for the implementation and integration within the two organisations were discussed. The health and safety units were particularly interested in the activity-based method due to the possibility of mapping all activities associated with an injury. An activity-based method documents all the activities (consequences) generated by an accident and evaluate the costs of it (Battaglia *et al.*, 2014). The accounting manager of Marche also sponsored this method, indicating that an exact identification of the activities would facilitate data acquisition and representation. Accordingly, the research team and the companies' representatives decided to focus on this method.

Three specific instruments were discussed to identify the most suitable. The first was the accident consequence tree method (Aaltonen *et al.*, 1996). The second was the systematic accident costs analysis (Rikhardsson and Impgaard, 2004). Finally, the accident cost calculator developed by the Workplace Safety and Health Council of Singapore was analysed[1]. The three instruments showed very similar characteristics. However, none of them completely satisfied the requirements of the research project for a flexible and comprehensive device. Individually, the accident consequence tree was considered to be too complex with too many categories and items, also considering the time needed to collect data and information. The systematic accident costs analysis lacked some details concerning the consequences of accidents, and thus it was deemed to be unsuitable. The meanings of some of the things in the accident cost calculator were unclear, and some information was considered difficult to find. An internal report was produced by the research team highlighting the pros and cons of each of the approaches.

Given the limitations of the available methods, the participants decided to develop an ad-hoc instrument based mainly on the existing ones, but without their disadvantages. The new device was named the *accident cost analysis tool.* It was composed of thirty-one specific items related to the management of an accident, grouped into five main categories of potential costs. Category A focused on those activities associated with the initial consequences of the accident, category B on the administrative results, 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. The table 2 shows the tool developed.

During the meetings, the company's representatives presented two main types of observation. Technical observations concerned the possibility of obtaining specific data and information that were not usually traced. It was also underlined a lack of knowledge and experience in applying the instrument and in discussing the related information. In this regard, to facilitate the data collection process and analysis, a set of 'rules of thumb' were collectively defined as follows. First, not all the items had to be analysed for each accident because their applicability depended on the gravity of the accident, i.e. the higher the gravity level, the higher the number of items to be included. Second, the value of each item had to be calculated as a total amount or as a unit amount of time depending on the nature of the item. Third, the owner of the data collection process should have been the health and safety unit, due to its knowledge of practices and procedures related to accidents. Fourth, the companies would have conducted the experiment in a flexible way 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 specifically.

[1] The Accident Cost Calculator (ICC) is an interactive electronic tool. Please see the official website of the Workplace Safety and Health Council of Singapore (https://www.wshc.sg/) for further details.

Tab. 2: The structure of the accident cost analysis tool

A - Cost of the accident management	B - Cost of the accident root cause analysis	C - Cost of damages caused to and replacement of equipment	D - Cost for resuming business	E - Compensation and penalties
First aid of the injured worker by colleagues	Accident's cause analysis using field investigations	Evaluation of damages to equipment	The reorganisation of production post-accident	Compensation for damages caused (increased insurance)
Cost of materials/ equipment used to manage the accident	Completion of accident reports for accident management	Cost of damaged structure (impairment)	Overtime to recover production losses	Contractual penalties
Transport of the injured person to the healthcare structures	Completion of the documentation needed for A) accident management (e.g. report model by the Prevention and Protection Service Manager); B) completion of documentation for public authorities (INAIL report models); C) other types of documentation	Cost for repairs/ replacement/hire of means/equipment/ plants	Training of internal staff replacing injured persons to perform new duties	Orders cancelled or lost
Period of absence by the injured worker on the day of the accident		Cost for starting up new equipment, including cleaning and disposal	Staff training for resuming business after an accident	Legal expenses for lawsuits
Interruption of activities by other company workers due to the accident (e.g. production downtime)	Meetings with public authorities to analyse the events (specifying whether or not the sessions involve the Supervisory Body)		Time for selecting new staff	Fines/ administrative sanctions
Making the area of the accident safe	Time dedicated by the team involved for internal meetings related to the analysis of the cause of the accident		Cost of staff hired for the period in which the injured person is absent from work	Increased social security insurance premiums
Social security fees: - first three days of absence - between 20 and 90 days of absence - beyond 90 days of absence	Cost of any external consulting for analysing the accident			Other (specify)
Loss of productivity due to internal strikes				
Total A	Total B	Total C	Total D	Total E

Source: own elaboration

The map of activities was considered necessary for discussing the complexity of accidents, especially the most severe ones. It was used as a checklist that could help to coordinate the different organisational areas involved in the management of an accident. The participation of the accounting manager of Marche helped to clarify how to measure the various activities related to an accident. The operational services middle management of Latium underlined some potential difficulties with the day to day activities because he considered the adoption of the instrument a significant change to the employees' routines. A discussion of data availability was followed by a plan for setting up the data collection process. In this regard, it was decided that each company would operate separately.

Marche - The specific implementation phase

For Marche, the data collection process was divided into a pilot phase and the primary phase. The pilot phase focused on the analysis of four accidents with the aim to clarify the items that composed the tool, the time required to acquire the data and to increase the health and safety

unit's confidence in the data collection process. Despite some difficulties related to data acquisition, the general director of Marche decided to extend the analysis to a broader set of 20 accidents which included almost half of all accidents that occurred from mid-2014 to mid-2015. The main phase included a selection of different accidents to ensure a complete representation of all of the accidents which were divided into 'not severe', 'severe' and 'acute', depending on the number of days lost.

The main phase, however, was more demanding than expected, as clarified in the subsequent meetings that occurred between February and July 2015. An employee had to manually collect almost all the information on each of the 20 accidents. As expected, neither the accounting information system nor the specific health and safety instruments already in force, such as the OHSAS 18001 and the accident report analysis, contained enough information to complete most of the items in 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 process was more fluid and manageable compared to the ex-post reconstruction because the data were collected in real-time. The research team and the internal health unit screened all 20 of the tables 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 collected, most of which was in categories A and B, with acute accidents being particularly relevant from a financial point of view.

From an organisational perspective, the data collection process was characterised by the partial participation of the human resources office and the 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 health and safety unit highlighted the difficulty of modifying the accounting information system to collect the information automatically. The technical service had a minor role in the data collection for category A, increasing the difficulty of collecting complete information. The technical service units normally compiled a short accident report for the health and safety unit containing necessary information on the accident. Instead, the tool required a more active approach by the technical service towards the health and safety unit, requesting a higher level of cooperation concerning the ex-post activities related to the accident. The technical service contested the trade-off between managing the accident and the completion of the shift, and the difficulty of supplying the information requested.

The technical service manager explained that in the case of a minor and non-severe accident, the work-shift team was oriented to finish the shift anyway as the accident would not generate physical consequences on the employees. Conversely, in the case of a severe accident, attention was directed towards the injured person with no time to collect and analyse the different activities listed in the tool. Further, the request to participate in data collection was perceived as 'politically' driven, as a way to further control employees' behaviour rather than to increase the accountability

process. The technical service did not understand the purpose of collecting information concerning the activities in category A (i.e. the cost of the accident management) of the instrument. The new analysis was perceived to be in contrast to the traditional organisational routines concerning the supervision of an accident because the aim of the analysis was not properly communicated. The health and safety unit reported these two criticisms during the March meeting. In the meeting, Marche's representatives underlined the difficulty of engaging the technical service in a more in-depth discussion about the implementation of the instrument because it was considered an inappropriate tool for managing accidents.

As a consequence, the development of the instrument was in grave danger of being stopped due to the joint effects of a lack of time, organisational obstacles and a lack of clarity on data use. Managing this latter cognitive aspect was critical during the implementation phase. The research team noted that the health and safety manager had some difficulties concerning how to exploit the data collected for decision making. The manager wanted to avoid wasting time in a pure data collection exercise but instead wanted to use the information collected. The research team explained that merely visualising the costs of accidents could be considered a positive effort because it would have permitted a deeper analysis of employee health and safety performance. The results were subsequently presented to the general director in an official meeting during which the new information was widely discussed.

The analysis of the accidents showed which types were more costly. For example, the information on the door to door waste collection accidents indicated that these types of injuries were the most expensive and consequently needed specific interventions, such as a more accurate training. From an organisational perspective, the information enabled the identification of some micro-organisational efforts that the health and safety unit had not previously been fully aware of. An example was the time taken by staff for managing administrative duties and the time to carry out extra activities to comply with ad hoc external audits by public authorities. All this information were hidden before the application of the instrument. The cost information on the injuries occurred in climbing and descending the lorries highlighted the possibility for a comparison between new preventive investments in employee health and safety and the potential incoming costs of the accidents associated with the status quo. A financial simulation was also performed on the data, to calculate the total costs of accidents in 2012. The analysis showed a total cost of just over €55,000 for the sample of accidents analysed (with a unit cost for injuries slightly lower than €2,000 for an accident of medium gravity), corresponding to an estimated annual value of about €120,000 for all of the accidents.

The general director expressed the desire to integrate the tool to support planning and control activities related to employee health and safety. His endorsement was essential to support the health and safety unit employees' efforts due to the significant commitment that they made to collect the data. Accordingly, despite the presence of technical and organisational barriers, the assessment of the implementation phase was considered

prospective. Progressively, the internal unit appeared to be much more cognitively confident about how and when to use the instrument. The role of the device in supporting operational and performance analysis and decisions on investments was thus relevant. The experimental use of the tool clarified when and how to use it during decision making, escaping from the potential trap of considering the financial information as the leading information. To integrate the instrument, Marche decided to follow an incremental implementation path. It meant that a series of small initiatives needed to be taken. It was also established that the integration phase should be conducted autonomously by the company with the research team as 'external observers'.

Latium - The specific implementation phase

After the design of the tool, in February 2015 Latium decided to collect information on all the 28 accidents occurred in 2014. The data collection process was similar to the one of Marche. The cost of accidents was manually calculated because a large portion of the data and information was not available. The health and safety unit made a painstaking analysis of the internal documents with the aim of obtaining as much information as possible. The other information was collected in collaboration with the human resources office, while the operational unit was not involved. According to the health and safety unit, the operational unit required specific training concerning the aim and purpose of the tool. Otherwise, the analysis could be interpreted as an attempt to diminish, rather than to increase, safety management.

The research team actively supported the internal staff during data collection, progressively checking each accident report produced and helping it to clarify the meaning of some items. The health and safety unit highlighted 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 standardised and reproducible. The health and safety unit noted that similar accidents required similar management time. The same observation was made by the human resources office, which pointed out 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 positive evaluation of the data collection process. They underlined that with some tweaks in the accident report -usually compiled by operational units-, the cost analysis process could become faster. The health and safety manager was also confident that the upcoming OHSAS 18001 certification would favour a more organic collection of health and safety information.

From a financial point of view, the calculation showed a total cost of approximately €50,000 and an average cost per medium-gravity accident of €1,900 (very similar to Marche). As noted during a meeting in April 2015, 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 benOSH

research (European Commission, 2011) reported a value of €1,651 for a low severity accident, of €4,985 for a medium severity and €11,760 for cases with high seriousness. The results of the benOSH study indicated that the most critical consequences of accidents were linked to the human-related aspects, which accounted for 80% of the total cost.

The reaction to the new information was different from that in Marche. Whereas in Marche the health and safety office was initially more interested in the quantitative value, in Latium the attention progressively moved to the analysis of the organisational aspects. The two Latium offices recognised the value related to the financial information. Still, they underlined that the majority of the cost was caused by the employees' absence from work after the accidents. They highlighted that most of the expenses in category B were related to the administrative time that could also be considered too much time. In their view, the new information was interesting not only because it explained the financial value of an accident, but also because it indicated the riskier and operational activities. The analysis of the accident cost reports revealed the importance of focusing on equipment, procedures and machines as the core aspects for improving employee health and safety. The analysis, therefore, indicated the importance of enhancing organisational processes and the relevance of continuing to invest in equipment and machines to reduce the number of accidents. In sum, the experimental adoption of the accident cost analysis tool was regarded as satisfactory because it showed an alternative and complementary view of health and safety performance and related managerial aspects. Latium, however, also questioned whether the financial 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 aspects.

The data were then presented to the head of the operational unit in a meeting in July 2015. The discussion that took place concerned the possibility of showing the organisational complexity of an accident and the cost of accidents during the training course for the operational staff. The head of the operational unit agreed on the added value of the information, thanks to the possibility to increase safety awareness. However, the proposal was only partially implemented because the health and safety unit, in conjunction with the operational unit manager, subsequently decided to show only the list of activities related to the accident, without any reference to the financial information. This precautionary approach was taken because the operational units were not confident enough on the usefulness of financial information when referring to safety aspects. In Latium, the implementation was regarded as satisfactory by the human resources manager, although the project was not openly endorsed by the head of the company. The idea of integrating the instrument was therefore considered, as discussed in the following section.

4.4 Integration phase

Marche - The (non)-integration phase

In 2015, more than a year after the end of the implementation phase, a one-day meeting was organised to understand whether and how the

integration of the tool had occurred. The meeting revealed that the health and safety unit operated to promote organisational integration at the operational level. The activities' map was used during the workforce training to inform all employees on the organisational consequences associated with accidents, underlining the added value of an active collaboration in the ex-post analysis of the accident. As reported by the safety manager, the operational workers were astonished by the organisational consequences related to an accident. The financial information was also presented to promote a more rigorous conduct among the employees. It was stressed that such information could be considered as a waste of company resources that could otherwise be used for preventive interventions and actions. According to the health and safety unit, the visualisation of financial information could encourage the operational staff to pay greater attention to certain safety procedures. The internal union representatives also appreciated the ability of the activities' map to raise awareness on accident-related effects.

In terms of decision making, the health and safety unit adopted the accident cost information to forecast the potential costs of accidents for 2015. The determination and visualisation of the incoming costs underlined the importance of searching for new and effective safety operative solutions. The health and safety unit also adopted the information to support small investment decisions. It compared the data on 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 were analysed following a cost-benefit logic, in which the measurement of benefits also took into consideration the financial advantage related to the reduction of accidents. Nevertheless, the health and safety manager reiterated that the financial information was complementary, and not the main 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.

However, the initial positive reception of the instrument and its use were not sufficient conditions to eventually integrate the tool. The health and safety unit recognised the difficulty in regularly updating the instrument when an accident occurred. They revealed that an official attempt aimed at sharing some aspects of the data collection process was made in collaboration with the accounting unit. Still, neither the technical unit nor the human resources office reacted positively. The technical unit indicated that the tool was not entirely appropriate for analysing safety aspects, while the human resources office was only willing to act in a supportive role because they did not want to take any direct responsibility.

A further barrier to the integration was the change of the general director, which occurred twice in a year, creating a sense of uncertainty in the company. As underlined by the internal unit: 'the absence of the past general director was detrimental to positively conclude the final development phase of the instrument'. The former director had known and sponsored the entire process. It was clear that the health and safety

unit was somewhat isolated in pushing for the integration of the tool due to a lack of support and endorsement within the organisation. A sense of demotivation was evident during the meeting, as expressed by the health and safety manager. The research team made some attempts to re-open the discussion, stressing how dropping the use of the tool in its final stage could have been counterproductive. Nonetheless, the health and safety unit did not change its decision to stop the integration process.

The presence of intertwined technical and organisational barriers prevented the integration of the instrument. On the one hand, the financial information was not powerful enough to improve organisational interaction and discussions concerning employee safety improvement. On the other hand, the interactions between technical and organisational barriers hindered the integration. The technical factors (e.g., the availability of health and safety information within information systems, and the possibility of collecting accident information from established company reports) contributed less than the organisational barriers. The cognitive barriers were very important in opening the discussion concerning the potential improvement of employee health and safety, and to ensure that financial information did not prevail on the ethical aspects related to employees. The empathy towards workers and the fear of potential new injuries expressed by the health and safety unit staff enabled the implementation but not the integration. The same attitude towards the promotion of employee safety through a new instrument was not diffused within the organisation, representing a significant challenge. The health and safety unit appeared fragile and, due to a lack of organisational charisma and power, unable to design and promote the definitive steps necessary for integration (see also Hasle and Jensen, 2006).

Latium - The (non)-integration phase

A one-day meeting was organised at Latium more than a year after the end of the implementation phase to understand whether and how the integration had occurred. The company took some steps to share the instrument at an organisational level. The activities' map related to the accidents was the object of specific training initiatives for the operational level employees, with the aim of illustrating the organisational effects of an accident. Although the financial information was not presented, the map was considered an improvement in the process of measuring health and safety performance. During the year, a cost centre was also created within the accounting information system to collect financial information related to health and safety aspects. However, the health and safety unit at Latium made fewer efforts to adopt and integrate the instrument than the unit at Marche. The first organisational barrier that emerged was the non-prioritisation of the project despite the positive results achieved during the implementation phase. In the last year, the health and safety office concentrated its analysis on waste management services, which changed progressively from a mixed system of collection (automatic and door to door collection) to a complete door to door collection system. This change implied a re-organisation of employees' jobs and an analysis of related implications on employees' safety due 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 improve the delivery aspects. These additional activities hinder the implementation phase and the promotion of the integration phase. Also, it underlined the difficulty of maintaining the focus on the new instrument within the company.

Other obstacles were also present. The general director did not consider the idea of promoting financial literacy on employee safety to be relevant. The experimentation and results of the project were presented to the general director in a closed meeting run by the health and safety manager with the presence of the health and safety unit. Despite recognizing the usefulness of the tool, the general director considered not appropriate to promote its diffusion. He considered the low number of accidents reported over the years to be a proxy of the good health and safety performance, and a confirmation of the effectiveness of the existing activities, without the need to commit further resources to develop additional tools. On safety, Latium perfomed indeed better than the national average.

As a consequence, the health and safety unit reported that the human resources manager stopped the full implementation of the tool. A further obstacle was the company's general approach to health and a safety issue, which was normatively oriented despite the incoming OHSAS 18001. The instruments adopted over time to manage and measure good health and safety performance were coherent with the legal requirements, with a low predisposition towards the adoption and integration of new and voluntary tools, despite their proven effectiveness. The organizational unit was not open to the adoption of a new device, hindering the beneficial value of the instrument. The health and safety office also missed the opportunity to collect financial information on accidents usable within the on-going OHSAS 18001 system. The OHSAS 18001 implementation might have represented a trigger for changing procedures, involving different units in the data collection process. However, the health and safety unit did not consider this as a possibility, despite having discussed it in previous meeting. The unit missed the opportunity to reduce the technical difficulties concerning data collection with the operational and human resources units. At an organisational level, the administrative unit responsible for book keeping and financial accounting analysis did not give any attention to safety aspects. The absence of an organisational awareness-raising process was also detrimental. The project was officially managed by the human resources office, developed by the health and safety unit, but not shared with the general director from the beginning, and based on a sporadic involvement of the technical-operational unit.

During the last meeting, the health and safety team revealed that its conservative approach toward the new tool and the related exploitation of the accident cost analysis had stopped the project. The presence and mix of technical, organisational and cognitive factors inhibited the integration of the instrument, which after an initial enthusiasm was eventually considered not too relevant and scarcely sponsored within the organisation. Latium appeared to be 'paralysed' by the health and safety unit and the role of the Director, unwilling to foster the instrument integration due to the efforts involved in abandoning a routinised and well-known approach.

5. Discussion and conclusions

The aim of the study was to analyse the implementation and integration of an accounting instrument related to employee health and safety, providing evidence on whether and how the instrument was able to support employee health and safety decision making. The analytical framework revealed different technical, organisational and cognitive barriers related to the implementation and integration of the instrument that was implemented, yet weakly integrated and eventually abandoned by the two companies. The instrument, when adopted, supported employee health and safety decisions, even though the link between financial information and employee safety was uncertain, and the learning aspects related to the use of the information were fragile. 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 provided evidence of the instrument's conceptual relevance (Mättö and Sippola, 2016), the integration phase was not managed with the consistency, skill and care required to achieve its expected benefits by the various organisational members, indicating a common pitfall (Klein and Knight, 2005). In the following table, a synthesis of the main barriers emerged in both companies is provided.

Tab. 3: Main barriers emerged during the project

Integration phase analysis	LATIUM	MARCHE
Technical barriers	- Almost all of the information on accidents were manually collected	- The OHSAS18001 management system and accident reporting and analysis did not support data collection process - Almost all of the information on accidents were manually collected
Organisational barriers	- The project was not considered a priority within the company - The new analysis was perceived to be in contrast with the traditional organisational procedures - Different perspectives between the health and safety unit and the operational unit concerning the scope and use of the tool	- The data collection process was carried out by the health and safety management unit - Partial support of the internal accounting unit during the data collection process - Lack of support from the human resources office - Change of the general director, which occurred twice in a year, creating a sense of uncertainty in the company
Cognitive barriers	- The instrument was perceived as a way to control employee behaviour rather than to increase the reporting and decision making process - Scarse interest by the general director to integrate the instrument into organizational processes	Lack of a shared understanding on concerning how the data would be used

Source: own elaboration

The failure to move from implementation to integration underlined the importance of the organisational climate as a core factor in fostering integration, despite the perception that employee health and safety provides meta-value for organisations (Bouten and Hoozée, 2016). In Marche there was a more significant participation in and discussion of the project, evidencing a more positive organisational attitude. In contrast, in Latium the status quo dominated, as indicated by the health and safety manager, stopping the instrument's implementation when he perceived the necessity of involving other areas in the data collection process to ensure complete and reliable information. The findings reveal that even though technical barriers were present, they were less problematic than the organisational barriers, which differs from previous findings in which the role of data collection was emphasised (Gosselin, 2006; Ibarrondo-Davila *et al.*, 2015). The interplay between the technical and organisational dimensions also hindered the integration phase, suggesting a problematic relationship between the two.

Cognitive factors played a fundamental role in shaping the development process. The moral stance of the health and safety units favoured the project playing a critical role. The idea of further improving employee safety conditions through the experimentation and application of the new instrument was a strong cognitive enabler. This condition was particularly evident in Marche, while in Latium the weak efforts towards the integration of the instrument inhibited the activation of colonising mechanisms at an organisational level. In Marche, the passionate commitment of the health and safety unit and their cognitive openness on connecting health and safety with financial analyses helped to start the integration phase but was eventually insufficient to overcome the organisational barriers. In the case of Latium, the interplay between a low cognitive propensity to fully use the tool and the organisational inertia stopped the process at the implementation phase. The evidence from Latium adds empirical weight to the theoretical argument of Hahn *et al.* (2014), according to whom individual managers or employees may prefer to continue with traditional forms of analysis and decision making in cases of high uncertainty related to social (and environmental) issues.

In revealing these findings, this study informs the accounting development process literature by providing the first empirical explanation of the impact that cognitive aspects have on the use of accounting to improve employee safety decision making. The analysis of cognitive factors indicates the critical fit between the mind-set of the organisational actors and decisions at work. The accident cost analysis tool was adopted, even if only temporarily, because of a shared and enhanced the importance of employee health and safety. This analysis suggests that the instrument acted as a mediating instrument: it created a space for considering cost-saving issues while addressing the broader topic on employee health and safety improvements.

The cases analysis suggests that integrating an accounting instrument within an organisation may require the simultaneous presence of technical, organisational and cognitive enablers. The simultaneous activation of different facilitators is critical when the new instrument represents a

steady, even radical, change from the routinized way of thinking and acting on a specific topic (Fraser, 2012). The activation of organisational mechanisms concerning the new instrument (organisational dimension) requires the device to be understood by different areas of the organisation, the activation of individual and organisational learning mechanisms (cognitive dimension) and the modification of technical aspects (technical dimension). The three dimensions are interdependent and may constitute a unified whole. This argumentation is different from that of Gond *et al.* (2012), according to whom integration can also occur when one of the dimensions is more developed than the others, as it drives and leverages on the other dimensions.

The findings promote the idea of importance prioritization among the enabling factors, which represents the epistemic contribution of this interventionist research (Lukka and Soumala, 2014). The order of importance reflects a level of proximity, in figurative terms, of the three dimensions as enablers of employee safety. The cognitive aspects were the most critical enablers, followed by the organisational and the technical factors. Such order of importance indicates that each dimension may stimulate employee health and safety-related decisions in different ways. In the two case companies, the idea of further reducing accidents using a new instrument primarily influenced the cognitive dimension, and was then translated, despite several difficulties, into organisational and technical managerial aspects. Accordingly, while the integration of a particular instrument may be achieved when the three dimensions are concurrently activated, the study revealed that the cognitive dimension is the most important in the case of employee health and safety. It means that the presence of cognitive enablers represents the initial condition upon which the other dimensions could be developed. The idea of an order of importance between facilitators represents a venue to discuss further how the implementation and integration of a specific instrument can take place (Ditillo and Lisi, 2016) in the presence of multiple and interrelated factors.

Similarly, an order of importance may also exist between the hindering factors, as indicated by the central role played by the organisational dimension in the cases analysed. The barriers were related to a small change in the management processes (i.e. data collection process, coordination and shared responsibility) and management techniques (accident report analysis and safety certifications) related to the new accounting instrument (see also Hoque and Halam, 1999). The order of importance may also depend on the type of device analysed. McLaren *et al.* (2016), for example, indicated the critical importance of technical factors in studying the development and abandonment of the EVA™.

From a societal (phronesis) perspective (Lukka and Soumala, 2014), the research provides evidence of the fragility of evaluating employee health and safety using financial information. As revealed, even if accounting instruments can contribute to the creation of a healthier workplace, the ethical dimension should always prevail when employee health and safety aspects are evaluated. While financial analyses represent a shared language within organisations, in the case of health and safety matters, they should be accurately defined to avoid misleading effects. Accordingly,

the promotion of a win-win safety logic at the institutional and policy level (EU-OSHA, 2010; ISSA 2013) may risk producing counter effects if there is a failure in recognising the importance of the ethical dimension of employee safety. This point may support the debate among institutions and regulators concerning ways to enhance and stimulate employee health and safety issues at an organisational level.

The research is subject to some limitations. The findings are tied to the social and organisational context in which they emerged. Also, despite the strategies employed to promote a neutral perspective during the case analyses, some potential biases, such as the selective interpretation of information, may be present due to the subjectivity of the analyses. While the findings of the study move forward the debate on accounting for employee health and safety, there remains a worrying lack of knowledge of what it means to practise accounting in this context.

Future research avenues can continue to analyse the interplay between the three dimensions of factors and how they impact, singularly or collectively, on the implementation and integration of specific accounting instruments. In particular, the analysis of compatibility between organisational culture and the values and beliefs embedded in accounting instruments related to employee health and safety could be an exciting avenue to study safety accounting innovation. The level of adoption, the difficulties of implementation and integration, as well as the organisational and social meanings of different safety accounting instruments such as safety performance indicators, accident cost analysis tools, budget and investment criteria for health and safety management could also be investigated.

References

AALTONEN M.V., UUSI-RAUVA E., SAARI J., ANTTI-POIKA M., RÄSÄNEN T., VINNI K. (1996), "The accident consequence tree method and its application by real-time data collection in the Finnish furniture industry", *Safety Science*, vol. 23, n. 1, pp. 11-26.

AHRENS T., CHAPMAN C.S. (2006), "Doing qualitative field research in management accounting: Positioning data to contribute to theory", *Accounting, Organizations and Society,* vol. 31, n. 8, pp. 819-841.

AL-SAYED M., DUGDALE D. (2016), "Activity-based innovations in the UK manufacturing sector: Extent, adoption process patterns and contingency factors", *The British Accounting Review*, vol. 48, n. 1, pp. 38-58.

ANDERSON S.W. (1995), "A framework for assessing cost management system changes: the case of activity based costing implementation at General Motors, 1986-1993", *Journal of Management Accounting Research*, vol. 7, n. 1, pp. 1-51.

ANSARI S.M., FISS P.C., ZAJAC E.J. (2010), "Made to fit: How practices vary as they diffuse", *Academy of Management Review*, vol. 35, n. 1, pp. 67-92.

ARNABOLDI M. (2013), "Consultant-researchers in public sector transformation: An evolving role", *Financial Accountability and Management*, vol. 29, n. 2, pp. 140-160.

AX C., GREVE J. (2017), "Adoption of management accounting innovations: Organizational culture compatibility and perceived outcomes", *Management Accounting Research*, vol. 34, March, pp. 59-74.

BARKI H., PINSONNEAULT A. (2005), "A model of organizational integration, implementation effort, and performance", *Organization Science*, vol. 16, n. 2, pp. 165-179.

BATTAGLIA M., FREY M., PASSETTI E. (2014), "Accidents at work and costs analysis: a field study in a large Italian company", *Industrial Health*, vol. 52, n. 4, pp. 354-366.

BATTAGLIA M., PASSETTI E., FREY M. (2015), "Occupational health and safety management in municipal waste companies: A note on the Italian sector", *Safety Science*, vol. 72, February, pp. 55-65.

BATTAGLIA M., PASSETTI E., BIANCHI L., FREY M. (2016), "Managing for integration: a longitudinal analysis of management control for sustainability", *Journal of Cleaner Production*, vol. 136 part A 10 November, pp. 213-225.

BOUTEN L., HOOZÉE S. (2016), "Let's do it safely: how Altrad Balliauw configured a package of control systems", *Journal of Cleaner Production*, vol. 136 part A 10 November, pp. 172-180.

BUSCO C., CAGLIO A., SCAPENS R.W. (2015), "Management and accounting innovations: reflecting on what they are and why they are adopted", *Journal of Management and Governance*, vol. 19, n. 3, pp. 495-524.

BRODY B., LÉTOURNEAU Y., POIRIER A. (1990), "An indirect cost theory of work accident prevention", *Journal of Occupational Accidents,* vol. 13, n. 4, pp. 255-270.

CAICEDO M., MÅRTENSSON M., ROSLENDER R. (2010), "Managing and measuring employee health and wellbeing: a review and critique", *Journal of Accounting and Organizational Change*, vol. 6, n. 4, pp. 436-459.

CAICEDO M.H., MÅRTENSSON M. (2010), "Extensions and intensions of management control-The inclusion of health", *Critical Perspectives on Accounting*, vol. 21, n. 8, pp. 655-668.

CONTRAFATTO M. (2014), "The institutionalization of social and environmental reporting: An Italian narrative", *Accounting, Organizations and Society,* vol. 39, n. 6, pp. 414-432.

COOPER C., COULSON A., TAYLOR P. (2011), "Accounting for human rights: Doxic health and safety practices-The accounting lesson from ICL", *Critical Perspectives on Accounting*, vol. 22, n. 8, pp. 738-758.

DAMANPOUR F. (2014), "Footnotes to research on management innovation", *Organization Studies,* vol. 35, n. 9, pp. 1265-1285.

DILLARD J., ROSLENDER R. (2011), "Taking pluralism seriously: embedded moralities in management accounting and control systems", *Critical Perspectives on Accounting,* vol. 22, n. 2, pp. 135-147.

DITILLO A., LISI I.E. (2016), "Exploring sustainability control systems' integration: The relevance of sustainability orientation", *Journal of Management Accounting Research*, vol. 28, n. 2, pp. 125-148

DOMINGUES J.P.T., SAMPAIO P, AREZES P.M. (2017), "Analysis of certified occupational health and safety management systems in Portugal", *International Journal of Occupational and Environmental Safety,* vol. 1, n. 1, pp. 11-2

EISENHARDT K. M. (1989), "Building theories from case study research", *Academy of Management Review*, vol. 14, n. 4, pp. 532-550.

ENGLUND H., GERDIN J. (2008), "Transferring knowledge across sub-genres of the ABC implementation literature", *Management Accounting Research*, vol. 19, n. 2, pp. 149-162.

ENGLUND H., GERDIN J. (2015), "Developing enabling performance measurement systems: on the interplay between numbers and operational knowledge", *European Accounting Review*, vol. 24, n. 2, pp. 277-303.

ENGLUND H., GERDIN J., ABRAHAMSSON G. (2013), "Accounting ambiguity and structural change", *Accounting, Auditing and Accountability Journal*, vol. 26, n. 3, pp. 423-448.

EU-OHSA (2010), "Mainstreaming OSH into business management", *European Agency for Safety and Health at Work*, Bilbao, Spain, available at: https://osha.europa.eu/en/tools-and-publications/publications/reports/mainstreaming_osh_business (accessed 20 January 2015).

FRASER M. (2012), "Fleshing out" an engagement with a social accounting technology", *Accounting, Auditing and Accountability Journal,* vol. 25, n. 3, pp. 508-534.

FREY M., BATTAGLIA M., PASSETTI E. (2013), *Investire in sicurezza nel settore dell'igiene ambientale* (Investing in safety in the environmental hygiene sector), Franco Angeli, Milan, Italy.

GIOVANNONI E., MARAGHINI P. (2013), "The challenges of integrated performance measurement systems: Integrating mechanisms for integrated measures", *Accounting, Auditing and Accountability Journal,* vol. 26, n. 6, pp. 978-1008.

GOLDEN-BIDDLE K., LOCKE K. (1993), "Appealing work: An investigation of how ethnographic texts convince", *Organization Science*, vol. 4, n. 4, pp. 595-616.

GOND J.P., GRUBNIC S., HERZIG C., MOON J. (2012), "Configuring management control systems: Theorizing the integration of strategy and sustainability", *Management Accounting Research*, vol. 23, n. 3, pp. 205-223.

GOSSELIN M. (2006), "A review of activity-based costing: technique, implementation, and consequences", in Chapman S.C., Hopwood, A.G., Shields M.D (Ed.), *Handbooks of Management Accounting Research,* (Vol. 2, pp. 641–671), Elsevier, December.

HALL M. (2010), "Accounting information and managerial work", *Accounting, Organizations and Society*, vol. 35, n. 3, pp. 301-315.

HALL M. (2016), "Realising the richness of psychology theory in contingency-based management accounting research", *Management Accounting Research,* vol. 31 June, pp. 63-74.

HAHN T., PREUSS L., PINKSE J., FIGGE F. (2014), "Cognitive frames in corporate sustainability: Managerial sensemaking with paradoxical and business case frames", *Academy of Management Review*, vol. 39, n. 4, pp. 463-487.

HOQUE Z., ALAM M. (1999), "TQM adoption, institutionalism and changes in management accounting systems: a case study", *Accounting and Business Research*, vol. 29, n. 3, pp. 199-210.

HASLE P., JENSEN P.L. (2006), "Changing the internal health and safety organization through organizational learning and change management", *Human Factors and Ergonomics in Manufacturing and Service Industries,* vol. 16, n. 3, pp. 269-284.

IBARRONDO-DÁVILA M.P., LÓPEZ-ALONSO M., RUBIO-GÁMEZ M.C. (2015), "Managerial accounting for safety management. The case of a Spanish construction company", *Safety Science,* vol. 79 November, pp. 116-125.

KAMAR I.F.M., AHMAD A.C., DERUS M.M., KASIRON M.Y., ABU BAKAR M.A. (2019), "Exploring the Relationship between Safety and Health Cost Dimensions and Accident Costs to the Employer of Urban Rail Infrastructure", *Projects MATEC Web of Conferences.* DOI: https://doi.org/10.1051/matecconf/2019 I 2018 266 26603014

ISSA (2013), "Calculating the international return on prevention for companies: Costs and benefits of investments in occupational safety and health", *Final report, Geneva, ISSA,* available at: http://publikationen.dguv.de/dguv/pdf/10002/23_05_report_2013-en--web-doppelseite.pdf (accessed 06 July 2016).

JALLON R., IMBEAU D., DE MARCELLIS-WARIN N. (2011), "Development of an indirect-cost calculation model suitable for workplace use", *Journal of Safety Research*, vol. 42, n. 3, pp. 149-164.

JÖNSSON S., LUKKA K. (2006), "There and back again: doing interventionist research in management accounting", in Chapman S.C., Hopwood A.G., Shields M.D (Ed.), *Handbooks of Management Accounting Research,* Elsevier, vol. 1, pp. 373-397.

KLEIN K.J., SORRA J.S. (1996), "The challenge of innovation implementation", *Academy of Management Review*, vol. 21, n. 4, pp. 1055-1080.

KLEIN K.J., KNIGHT A.P. (2005), "Innovation implementation overcoming the challenge", *Current Directions in Psychological Science*, vol. 14, n. 5, pp. 243-246.

LIU L.Y., PAN F. (2007), "The implementation of activity-based costing in China: An innovation action research approach", *The British Accounting Review,* vol. 39, n. 3, pp. 249-264.

LODHIA S., JACOBS K. (2013), "The practice turn in environmental reporting: a study into current practices in two Australian commonwealth departments", *Accounting, Auditing and Accountability Journal*, vol. 26, n. 4, pp. 595-615.

LOPEZ-ARQUILLOS A., RUBIO-ROMERO J.C., CARRILLO-CASTRILLO J., SUAREZ C.M., GALINDO R.F. (2019) "Occupational accidents in municipal solid waste management (MSWM) companies", *Environmental Engineering and Management Journal (EEMJ),* vol. 18, n. 5, pp. 1029-1038

LUKKA K., SUOMALA P. (2014), "Relevant interventionist research: balancing three intellectual virtues", *Accounting and Business Research,* vol. 44, n. 2, pp. 204-220.

MALMI T. (2016), "Managerialist studies in management accounting: 1990-2014", *Management Accounting Research*, vol. 31, n. 1, pp. 31-44.

MAJOR M., HOPPER T. (2005), "Managers divided: Implementing ABC in a Portuguese telecommunications company", *Management Accounting Research,* vol. 16, n. 2, pp. 205-229.

MÄTTÖ T., SIPPOLA K. (2016), "Cost management in the public sector: Legitimation behaviour and relevant decision making", *Financial Accountability and Management,* vol. 32, n. 2, pp. 179-201.

MCLAREN J., APPLEYARD T., MITCHELL F. (2016), "The rise and fall of management accounting systems: A case study investigation of EVA™", *The British Accounting Review,* vol. 48, n. 3, pp. 341-358.

MEIKANDAAN T.P., HEMAPRIYA M. (2018), "Cost benefit analysis of accident prevention in construction industry", *International Journal of Pure and Applied Mathematics*, vol. 119, n. 12, pp. 8831-8842

MILLER P., HASLAM C. (2009), "Why employers spend money on employee health: Interviews with occupational health and safety professionals from British Industry", *Safety Science,* vol. 47, n. 2, pp. 163-169.

MODELL S. (2009), "Bundling management control innovations: A field study of organisational experimenting with total quality management and the balanced scorecard", *Accounting, Auditing and Accountability Journal*, vol. 22, n. 1, pp. 59-90.

O'NEILL S., MCDONALD G., DEEGAN C.M. (2015), "Lost in translation: Institutionalised logic and the problematisation of accounting for injury", *Accounting, Auditing and Accountability Journal,* vol. 28, n. 2, pp. 180-209.

O'NEILL S., MARTINOV-BENNIE N., CHEUNG A., WOLFE K. (2013), "Issues in the measurement and reporting of work health and safety performance: a review", available at: http://www.safeworkaustralia.gov.au/sites/SWA/about/Publications/Documents/834/Issues-Measurement-Reporting-WHS-Performance.pdf (accessed 10 September 2015).

PARKER L.D., NORTHCOTT D. (2016), "Qualitative generalising in accounting research: concepts and strategies", *Accounting, Auditing and Accountability Journal,* vol. 29, n. 6, pp. 1100-1131.

PASSETTI E., CINQUINI L., MARELLI A., TENUCCI A. (2014), "Sustainability accounting in action: Lights and shadows in the Italian context", *The British Accounting Review*, vol. 46, n. 3, pp. 295-308.

RAUTIAINEN A., SIPPOLA K., MÄTTÖ T. (2016), "Perspectives on relevance: The relevance test in the constructive research approach", *Management Accounting Research,* http://dx.doi.org/10.1016/j.mar.2016.07.001.

RIKHARDSSON P.M. (2004), "Accounting for the cost of occupational accidents", *Corporate Social Responsibility and Environmental Management,* vol. 11, n. 2, pp. 63-70.

RIKHARDSSON P.M., IMPGAARD M. (2004), "Corporate cost of occupational accidents: an activity-based analysis", *Accident Analysis and Prevention*, vol. 36, n. 2, pp. 173-182.

SMALLMAN C., JOHN G. (2001), "British directors perspectives on the impact of health and safety on corporate performance", *Safety Science*, vol. 38, n. 3, pp. 227-239.

SUOMALA P., LYLY-YRJÄNÄINEN J., LUKKA K. (2014), "Battlefield around interventions: A reflective analysis of conducting interventionist research in management accounting", *Management Accounting Research*, vol. 25, n. 4, pp. 304-314.

SWUSTE P., VAN GULIJK C., ZWAARD W., LEMKOWITZ S., OOSTENDORP Y., GROENEWEG J. (2016), "Developments in the safety science domain, in the fields of general and safety management between 1970 and 1979, the year of the near disaster on Three Mile Island, a literature review", *Safety Science*, vol. 86 July, pp. 10-26.

TAPPURA S., SIEVÄNEN M., HEIKKILÄ J., JUSSILA A., NENONEN N. (2015), "A management accounting perspective on safety", *Safety Science*, vol. 71 part B January, pp. 151-159.

TESTA F., CORSINI F., GUSMEROTTI N.M., IRALDO F. (2018), "Predictors of organizational citizenship behavior in relation to environmental and health & safety issues", *The International Journal of Human Resource Management*, in press, Doi: 10.1080/09585192.2017.1423099

TOUTOUNCHAIN S., ABBASPOUR M., DANA T., ABEDI Z. (2018), "Design of a safety cost estimation parametric model in oil and gas engineering, procurement and construction contracts", *Safety Science*, vol. 106, pp. 35-46.

VELTRI A. (1990), "An accident cost impact model: The direct cost component", *Journal of Safety Research,* vol. 21, n. 2, pp. 67-73.

WALSH J.P. (1995), "Managerial and organizational cognition: Notes from a trip down memory lane", *Organization Science*, vol. 6, n. 3, pp. 280-321.

WOUTERS M., ROIJMANS D. (2011), "Using prototypes to induce experimentation and knowledge integration in the development of enabling accounting information", *Contemporary Accounting Research,* vol. 28, n. 2, pp. 708-736.

YIN R.K. (2003), "Case study research. Design and Methods - Third edition" *Applied Social Research Methods*, Vol. 5 SAGE Publications, London, UK.

Academic position and contacts

Massimo Battaglia
Assistant Professor of Management
Sapienza University of Roma - Italy
e-mail: massimo.battaglia@uniroma1.it

Emilio Passetti
Associate Professor of Accounting
University of Padova - Italy
e-mail: emilio.passetti@unipd.it

Lara Bianchi
Assistant Professor of Business and Society
Nottingham University Business School
University of Nottingham (UK)
e-mail: lara.bianchi@nottingham.ac.uk

Marco Frey
Full Professor of Management
Sant'Anna School of Advanced Studies – Pisa - Italy
e-mail: frey@sssup.it

sinergie
italian journal of management

ISSN 0393-5108
DOI 10.7433/s111.2020.06
pp. 73-101