The role of safety leadership and working conditions in safety performance in process industries

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Abstract

Previous research has shown the important role that employees play in improving the organisation's safety outcomes. This work analyses the effect of safety leadership and working conditions on employees' safety behaviours. For this purpose, the authors develop and test a structural equation model on a sample of 103 process industry organisations located in Spain. The results show that safety compliance is conditioned by work pressure, environmental conditions and occupational hazards, and co-worker support, while safety participation is conditioned by environmental conditions and occupational hazards, safety incentives, and co-worker support. The results also show that safety leadership has a negative effect on work pressure, and a positive effect on environmental conditions and occupational hazards and on safety incentives. This work offers guidelines to leaders in process industries about the behaviours and policies that they should adopt if they wish to improve their safety outcomes.

Keywords

Safety leadership, safety performance, work pressure, occupational hazards, safety incentives, co-worker support

1. Introduction

Occupational accidents, injuries and illnesses are still serious problems in organisations (Ford and Tetrick, 2011). In Spain the incidence rate reached 3,364.0 accidents in the workplace with days lost per 100,000 employees in 2016, up 3.44% on the previous year. For manufacturers the incidence rate was higher at 5,204.7 (an annual growth rate of 5.01%). These rates show that despite previous efforts accidents are still happening in the process industries, with all the costs that this implies for the firms (Fernández-Muñiz et al., 2009).

Previous research shows that unsafe employee acts and human error play an important role in the generation of occupational accidents. Williamson and Feyer (1990) analyse occupational fatalities in Australia in the period 1982-1984 and find that 91% of the occupational fatalities involve behavioural factors (Seo, 2005). In the same line, Abu-Khader (2004) argues that human factors are critical to the success of process safety schemes in chemical plants, making employee behaviour a vital issue that must be included in risk assessment.

On the other hand, employee behaviour is influenced by the environment in which the individual is working (Abu-Khader, 2004). Anderson (2005) argues that although the immediate cause of accidents often involves human error, organisational and management factors are implicated in incidents across all industries.

Many authors consider effective safety leadership and a strong management commitment to safety a prerequisite for safe behaviour among employees and improved safety performance (e.g., Anderson, 2005; Cohen, 1977; Donald and Canter, 1994; Flin et al., 2000; Hale et al., 1997; Hofmann et al., 1995; Niskanen, 1994; O'Dea and Flin, 2001; Simonds and Shafai-Sahrai, 1977; Smith et al., 1978; Zohar, 2000). But few studies suggest how leaders should interact with their subordinates to improve safety performance (Clarke and Ward, 2006), and apart from some work on transformational leadership, little is known about how leadership styles impact on safety outcomes (Kelloway et al., 2006).

In the current work the authors analyse the impact of safety leadership, via inspirational appeals (Clarke and Ward, 2006) and participative management (O'Dea and Flin, 2001), on safety performance in process industries, since process industries are high-risk industries and consequently safety critical organisations. The current authors also analyse the role that working conditions play in improving safety performance. Specifically, the authors analyse the role of work pressure, environmental conditions and occupational hazards, safety incentives and co-worker support.

Various authors stress the role of work pressure as an antecedent of unsafe behaviour (e.g., Brown et al., 2000; Hofmann and Stetzer, 1996; Seo, 2005), but their results are not conclusive. Other authors such as Parker et al. (2001) and Fernández-Muñiz et al. (2012) fail to find a significant relation between overload or pressure and safety behaviour. Moreover, most studies focus on work pressure's impact on unsafe behaviour, ignoring its effect on employees' involvement in voluntary safety-related activities. In this work, the authors analyse work pressure's impact not only on safety compliance, but also on safety participation and co-worker support.

No consensus exists about how environmental conditions and occupational hazards affect employee behaviour. Previous research suggests that hazardous work environments are associated with lower job satisfaction and organisational commitment and higher levels of task distraction (e.g., Jermier et al., 1989; McLain, 1995), which in turn lead to more unsafe acts and less involvement in safety activities. But other authors such as Tucker et al. (2008) argue that potential workplace hazards are unacceptable situations that can encourage employees to speak out to change unsafe working conditions. And Ford and Tetrick (2011) point to a lack of research analysing the influence of occupational hazards on safety compliance and safety participation.

Nor is the literature on the effect of incentives on motivation and performance conclusive. Some studies find that economic incentives can increase motivation and improve performance, but others fail to find an influence and some even find a negative relation (Mattson et al., 2014). Thus in the current work the authors aim to look more closely at the impact of safety incentives on employees' behaviour.

Finally, Chiaburu and Harrison (2008) consider that the research on co-workers' role in promoting safe behaviours among employees is inconclusive and call for more research. And Brondino et al. (2012) argue that despite their important influence on employees' behaviour, the literature tends to focus less on the co-workers than on the leaders.

Thus in this paper the authors intend to shed light on the antecedents of safety performance in process industries. Subsequently, they offer leaders guidelines about the behaviours they should follow and the policies they should implement in order to reduce unsafe acts among employees and increase effective employee involvement in safety activities and hence ultimately improve safety outcomes.

2. Conceptual framework

2.1 Employee safety performance

Borman and Motowidlo (1993) identify two major components of job performance: task performance and contextual performance. Task performance refers to patterns of behaviour directly involved in the production of goods and services or activities providing indirect support to the organisation's core technical process (Kahya, 2007). It includes activities formally recognised as part of employees' jobs. Contextual performance can be understood as individuals' efforts that are not directly related to their main task function but are important in configuring the organisational, social and psychological context in which this function is carried out.

Griffin and Neal (2000) see safety performance as an aspect of work performance and propose a model of safety performance based on theories of job performance (Borman and Motowidlo, 1993; Campbell et al., 1993). They identify two components of safety performance: safety compliance and safety participation. Safety compliance refers to the core safety activities that employees must carry out to maintain workplace safety, such as following safety rules and procedures and using personal protective equipment (PPE) properly (Griffin and Neal, 2000). Safety compliance includes employee behaviours that improve their own personal health and safety and that could be considered part of the employee's work role.

Safety participation, on the other hand, refers to behaviours that do not directly improve workplace safety but help to create an atmosphere that supports safety, such as voluntary participation in safety activities or attendance at safety meetings (Griffin and Neal, 2000). Safety participation includes behaviours that support the organisation's objectives and goals in this area (Vinodkumar and Bhasi, 2010), and therefore, involves a greater voluntary element than safety compliance, including behaviours that go beyond the employee's formal role, in other words organisational citizenship behaviours (Clarke, 2006).

2.2 Safety leadership

Cohen (1977) finds that the factors most frequently contributing to the success of safety programmes in organisations are management's commitment to safety, top managers' frequent, informal visits to the workplace and daily contact between supervisors and line workers. Later research stresses the important role the leaders play in improving employees' safety behaviour and safety outcomes (Cooper and Phillips, 2004; Hofmann and Morgeson, 1999; Hofmann et al., 1995; Hofmann et al., 2003; Kelloway et al., 2006; Martínez-Córcoles, 2011; Wu, 2005; Wu et al., 2008; Zohar, 1980, 2002). Safety leadership can be defined as the process of interaction between leaders and followers, through which leaders could exert their influence on followers to achieve organisational safety goals under the circumstances of organisational and individual factors (Wu, 2005).

Barling et al. (2002) contribute by introducing the transformational leadership concept in the field of workplace safety. Safety-specific transformational leadership requires managers' personal commitment to, and active interest in, occupational safety and employee well-being.

For Clarke and Ward (2006), the transformational leadership style includes inspirational appeals, which use emotional language to achieve employee commitment by transforming their value system to realign it with organisational objectives. But good words are not enough to modify employees' behaviours; visible acts from the managers are also necessary.

Management behaviours related to safety can be included in the term participative management (O'Dea and Flin, 2001). Participative management incorporates a series of interrelated activities such as managers' personal involvement in safety activities and frequent, informal communication between employees and management. Managers can demonstrate this personal involvement by attending and contributing to safety seminars and training courses, participating in safety inspections, and/or regularly visiting the workplace to enquire about working conditions.

Hofmann and Morgeson (1999) suggest that employees are more likely to maintain a safe behaviour when they feel that their organisation supports them and when they enjoy high-quality relationships with their leaders (Eid et al., 2012). When managers and supervisors behave in a way that shows a sincere concern for employees' safety, the latter tend to feel more supported in their concern for safety (Tucker et al., 2008). Consequently, and using social exchange theory (Blau, 1964), when employees perceive that their employer values and supports them, an implicit obligation is generated among the employees that creates a future reciprocity of benefit to the organisation (DeJoy et al., 2004). In other words, through the norm of reciprocity (Gouldner, 1960), when the employees are treated well by others they feel obliged to return the favour. Thus when managers or supervisors demonstrate their commitment to safety and their concern for employees' well-being, the employees will be willing to reward their organisation by complying with the safety procedures and expanding their role to include organisational citizenship behaviours (Clarke, 2006; Hofmann et al., 2003), in other words, behaviours that improve the organisation's overall safety (Clarke and Ward, 2006; Inness et al., 2010). With this, the authors propose their first hypotheses:

Hypothesis 1a: Safety leadership, via inspirational appeals and participative management, has a direct, positive effect on safety compliance.

Hypothesis 1b: Safety leadership, via inspirational appeals and participative management, has a direct, positive effect on safety participation.

2.3 Working conditions

Following Demerouti et al.'s (2001) model, Nahrgang et al. (2011) categorise working conditions in the context of workplace safety as job demands and job resources. Job demands include risks and hazards present in the workplace, physical demands and the complexity of the work, while job resources include organisational, social and psychological aspects that help employees to face their job demands and achieve their work goals. Job resources are a source of motivation for employees and include pay and co-worker support. In this work the authors consider four components of working conditions: work pressure and environmental conditions and occupational hazards, which are linked to job demands, and safety incentives and co-worker support, which are linked to job resources. These four variables are conceivably conditioned by managers' decisions and policies because the managers have the power to define the demands and resources of the job. The next hypotheses follow:

Hypothesis 2a: Safety leadership, via inspirational appeals and participative management, has a direct, negative effect on work pressure.

Hypothesis 2b: Safety leadership, via inspirational appeals and participative management, has a direct, positive effect on environmental conditions and occupational hazards.

Hypothesis 2c: Safety leadership, via inspirational appeals and participative management, has a direct, positive effect on safety incentives.

Hypothesis 2d: Safety leadership, via inspirational appeals and participative management, has a direct, positive effect on co-worker support.

Perceived work pressure includes excessive workload, required work-pace and time pressure and is considered a determinant of accidents and unsafe behaviour among employees (Bronkhorst, 2015; Li et al., 2013; Seo, 2005). Hofmann et al. (1995) find that production pressures increase the probability that employees will violate safety rules. Similarly, Hofmann and Stetzer (1996) find a negative relation between overload and safety behaviour.

On the other hand, Brown et al. (2000) find that perceived work pressure mediates the effect of perceived safety climate on unsafe work behaviour. Perceived work pressure could lead to an increase in psychological stress among employees (Karasek and Theorell, 1990), which, in turn, could increase the probability of behaving unsafely or committing an error (Seo, 2005). Thus the authors expect to find a negative relation between work pressure and employees' behaviour with regards safety in the organisation, in other words, safety compliance, safety participation and co-worker support:

Hypothesis 3a: Work pressure has a direct, negative effect on safety compliance.

Hypothesis 3b: Work pressure has a direct, negative effect on safety participation.

Hypothesis 3c: Work pressure has a direct, negative effect on co-worker support.

Jones (1992) defines a hazard as a physical situation with a potential for human injury, damage to property, damage to the environment or some combination of these. It can also simply be defined as something with the potential to cause harm. Various researchers find a significant relation between the perceived occupational hazard level and employees' behaviour and the occurrence of accidents (Ford and Tetrick, 2011; Rundmo, 1992; Seo, 2005; Simonds and Shafai-Sahrai, 1977; Tomas et al., 1999).

Ford and Tetrick (2011) analyse the influence of occupational hazards on two attitudinal outcomes – psychological empowerment and organisational identification – as well as the effect of these two variables on safety performance. These authors suggest that dangerous working environments make employees less likely to perceive that their organisation is concerned about their well-being and consequently less concerned about the result of their work and their impact on the organisation. Thus occupational hazards have a negative effect on employees' psychological empowerment and identification with their organisation and hence on safety behaviour.

Employees who identify with their organisation are more motivated to achieve organisational goals and improve organisational outcomes and are more inclined to work for the general well-being. These employees tend to behave in a way that focuses on improving the context of the organisation, cooperating to achieve individual and organisational safety goals and carrying out extra-role behaviours that can lead to organisational citizenship behaviours (Ford and Tetrick, 2011). All this improves safety in the workplace. Employees' empowerment and control over their work is also important because it helps them to feel influential in their organisation in that they see their behaviours as instruments of change and are confident in their ability to initiate changes relating to safety. This makes them more likely to become involved in activities of safety participation. These employees are also more likely to talk about their working conditions and encourage safety behaviours in their co-workers (Ford and Tetrick, 2011).

At the same time, occupational hazards may limit employees' ability to carry out their work, especially when risks lead to interruptions in tasks. This lowers employees' perception of control over their work and work environment, and hence reduces not only psychological empowerment, but also the quality of the employee-employer relationship (Ford and Tetrick, 2011).

In addition, workplace conditions such as noise, temperature, poor lighting, vibration and dust can affect employees' job performance (Kahya, 2007). These conditions make it more difficult for employees to concentrate on their tasks, which can lead to lower productivity, poorer quality and/or physical and emotional stress. The same author also suggests that unpleasant environmental conditions decrease cooperation among co-workers to solve task problems. And Nahrgang et al. (2011) argue that risks and hazards, physical demands and complexity act as barriers that make employees less likely to engage in safety activities, comply with safety procedures or be satisfied.

With the above, a pleasant working environment and the perception of low levels of occupational hazards will conceivably favour employees' safety compliance, safety participation and co-worker support. The next hypotheses follow:

Hypothesis 4a: Good environmental conditions and low occupational hazards have a direct, positive effect on safety compliance.

Hypothesis 4b: Good environmental conditions and low occupational hazards have a direct, positive effect on safety participation.

Hypothesis 4c: Good environmental conditions and low occupational hazards have a direct, positive effect on co-worker support.

Incentive systems (compensation, rewards, recognition) can reinforce safe behaviours and prevent risky behaviours among employees, hence improving occupational safety (Barling and

Zacharatos, 1999; Eiff, 1999; Yeow and Goomas, 2014). Economic incentives or bonus systems, which reward safe behaviours could therefore reduce the frequency of accidents (Goodrum and Gangwar, 2004), because they could increase employees' motivation to perform safe behaviours (Saracino et al., 2015).

But other authors (Cooper, 2001; Lawrence and Flanders, 2000) argue that bonus systems that reward employees for working accident-free in a particular period of time could discourage employees from reporting injuries or illnesses. Thus Mattson et al. (2014) argue that safety bonus systems should not focus on outcomes like accident rates but rather on the behaviours required to attain these outcomes, such as participation in safety training activities and/or risk identification and making viable suggestions to prevent risks. And Lawrence and Flanders (2000) consider that such behaviour-based incentives also help raise employees' interest in and awareness of safety. Incentives – via a properly designed safety programme – reinforce information about risks, and hence can reduce the number of unsafe acts that lead to injuries and motivate employees to participate actively in the decision-making processes (Fernández-Muñiz et al., 2012). Finally, Clarke (2006) finds that organisational rewards such as recognition and feedback for making safety suggestions encourage employees' safe behaviour. The next hypotheses follow:

Hypothesis 5a: Safety incentives have a direct, positive effect on safety compliance.

Hypothesis 5b: Safety incentives have a direct, positive effect on safety participation.

Hypothesis 5c: Safety incentives have a direct, positive effect on co-worker support.

Co-workers can be seen as individuals at the same hierarchical level, with whom an employee carries out tasks and maintains routine interactions (Chiaburu and Harrison, 2008). Niskanen (1994) finds that co-workers' attitudes have a significant influence on employees' attitudes to safety. According to Meliá (2004), the group of co-workers defines an informal environment of acceptable and unacceptable, usual and unusual behaviours and hence can affect the behaviour of a specific employee. Tucker et al. (2008) argue that although managers and supervisors have more formal power, experienced work colleagues may be perceived as sources of referent and expert power, so they have an important effect on employees' behaviour. Chiaburu and Harrison (2008) find strong relations between co-workers' actions and on the one hand, higher employee satisfaction and involvement in their work and on the other, a stronger commitment to their organisation. And according to Schneider (1987), co-workers are not only a fundamental part of the social environment, but they also define that environment. Moreover, the transformation of job content from repetitive and individual tasks to more complex, group tasks has increased the importance and the potential influence of co-workers (Chiaburu and Harrison, 2008).

According to Hayes et al. (1998), if an employee perceives that their colleagues are concerned about safety, the group as a whole will tend to perform safe behaviours. Thus employees' safety behaviour is conditioned by the safety attitudes and response of their work group, with a horizontal influence being evident (Meliá, 2004). All this leads to the final hypotheses of this work:

Hypothesis 6a: Co-worker support has a direct, positive effect on safety compliance.

Hypothesis 6b: Co-worker support has a direct, positive effect on safety participation.

Figure 1 illustrates the hypotheses about the relations among the constructs in this study. The specification of the structural equation model to be estimated follows the path graph depicted in the figure. This model will be estimated following the methodology described in the next section.

(Figure 1 inserted here)

3. Methodology

3.1 Data collection

The authors carried out an empirical study of a target population consisting of firms from process industries located in Spain. The population includes firms of a diverse range of sizes in order to ensure the greatest possible generalisability of the results, although particularly small firms are ignored – i.e., micro-firms with fewer than 10 workers – because they have particular characteristics and some of the aspects studied here do not apply in them.

To collect the information the authors designed a questionnaire and sent it to the safety officer in each firm. The safety officer occupies an intermediate position between the management and the employees, and since the authors required information from both parties the information that this officer could give would conceivably be less biased and more accurate (Fernández-Muñiz et al., 2012). The authors would therefore be able to evaluate the employees' and management's involvement more objectively. The safety officer is also responsible for carrying out risk control and safety activities, so he or she is the organisation member with the most information about the specific practices and procedures being carried out in the firm. The safety officer also has access to all types of information concerning harm to employees' health.

In order to ensure that the questionnaire was indeed filled in by the safety officer, the authors contacted each firm previously by phone. They made 1,040 phone calls in total. They eventually sent out 683 questionnaires and respondents returned 103 satisfactorily completed. This represents a response rate of 15.08% of the questionnaires sent.

The questionnaire included classification questions to identify the most important characteristics or profile of the firms in the sample. Table 1 shows the distribution of the firms in function of sector of activity, firm size, ownership and nationality of capital, target markets, and possession of ISO 9001 quality certificate, ISO 14001 environmental certificate, and OHSAS 18001 safety certificate.

(Table 1 inserted here)

The sample includes process industry firms in diverse activities in order to ensure the greatest generalisability of the results, such as the chemical industry, pharmaceutical industry, manufacture of rubber and plastic products, metallurgy and food industry. Medium-sized firms predominate, since 47.6% of them have between 50 and 249 employees, while 39.8 % have fewer than 50 employees. Consequently, the great majority (87.4%) of the sample firms are SMEs, which is in line with the Spanish economy as a whole. The firms have private capital and for a majority (63.1%) the capital is Spanish. A large majority of the firms (85.4%) operate in the international market.

Most of the firms have ISO 9001 certified quality management systems (86.4%) and ISO 14001 certified environmental management systems (65%) in place, while only 34% have OHSAS 18001 certified occupational health and safety management systems. These data suggest that because these firms operate internationally, possessing quality and environmental certification is more important for them than occupational health and safety (OH&S) certification. Nevertheless, the authors should note that the ISO 45001, which establishes the requisites for implementing an OH&S management system, is being developed currently and is expected to be published in 2018. This fact may have affected interest in the OHSAS 18001 standard among the sample firms.

3.2 Measurement scales

The authors built the measurement scales of the concepts used in this work following a multiple indicator approach. Thus each concept was measured using various items or variables. This process for generating items involved successive stages. First, the authors exhaustively reviewed previous studies on safety leadership (e.g., Barling et al., 2002; Clarke and Ward, 2006; Kelloway et al., 2006; O'Dea and Flin, 2001; Wu, 2005; Wu et al., 2008), working conditions (e.g., Brown et al., 2000; Nahrgang et al., 2011; Seo, 2005) and safety performance (e.g., Griffin and Neal, 2000; Vinodkumar and Bhasi, 2010). This process provided a pool of potential items to measure the concepts considered in this research.

After drawing up a preliminary list of items and a draft version of the questionnaire, the authors refined the questionnaire to eliminate redundant items. Various doctors in business management participated in this process, and a number of modifications were made to the initial items. The authors then organised a series of in-depth interviews with senior safety professionals with a long experience in the identification and control of occupational risks. These interviews revealed the need to make further modifications to some of the items. All items were worded neutrally to avoid causing biases, and measured on 5-point Likert scales ranging from 1 (strongly disagree) to 5 (strongly agree). Table 2 shows the final composition of the scales.

(Table 2 inserted here)

Safety leadership measures the extent to which the managers promote safety behaviour among their subordinates. This concept was measured using two dimensions: Inspirational appeals and Participative management. Inspirational appeals uses 10 items relating to managers' actions aimed at motivating employees to get involved in safety activities (e.g., "Managers show concern for working conditions"), while Participative management uses eight items measuring managers' personal involvement in health and safety activities (e.g., "Managers participate in safety inspections and audits" and "Managers tend to visit workplace to check conditions and communicate with employees"). These items were adapted from scales developed by Barling et al. (2002) and Wu et al. (2008).

The **Working conditions** concept measures the environment in which the employees do their jobs. It was measured using four dimensions: Work pressure, Environmental conditions and occupational hazards, Safety incentives, and Co-worker support, which were assessed using 4, 7, 5 and 5 items, respectively. These items were adapted from Brown et al. (2000) and Seo (2005). Example items are: “Employees are often pressurised to finish tasks quickly”, “Lighting in work areas is adequate”, “Supervisors/managers praise employees who pay particular attention to safety” and “Employees try to ensure that their workmates comply with safety procedures”. The authors should point out that for the Environmental conditions and occupational hazards dimension, higher values mean better environmental conditions and lower perceived risk.

Safety performance measures employees’ safety behaviour. This concept was measured using two dimensions: Safety compliance and Safety participation. Safety compliance and Safety participation were assessed with 4 and 9 items, respectively, adapted from Griffin and Neal (2000). Example items are “Employees always wear right personal protective equipment” and “Employees make suggestions to improve safety in firm”.

4. Results

4.1 Estimation of measurement model

The proposed scales were subjected to a process of evaluation, focusing on the study of their psychometric properties. The authors analysed their dimensionality, examined the reliability of their composition and evaluated the content, convergent and discriminant validity of each scale, following Anderson and Gerbing’s (1988) and Churchill’s (1979) original proposals. Table 3 reports the means, standard deviations, Cronbach α coefficients and inter-correlations among all the dimensions.

(Table 3 inserted here)

Structural equation modelling (SEM) was used to perform confirmatory factor analyses on the proposed measurement scales, employing the statistics program EQS version 6.2 for Windows. The estimation method used was robust maximum likelihood (Bentler, 1995; Chou et al., 1991; Hu et al., 1991; West et al., 1995).

Confirmatory factor analyses involved a number of stages. First, a first-order confirmatory factor model was estimated for the constituent dimensions of Safety leadership: Inspirational appeals and Participative management. Table 4 reports the results obtained in the estimation of this model. This model has an acceptable model-to-data fit (Bentler, 1995; Hair et al., 1998). The chi-square value of the Safety leadership model is 191.000 for 134 degrees of freedom and is statistically significant at $p<0.01$, below the minimum level of 0.05. Nevertheless, it should be borne in mind that the chi-square is sensitive to sample size and model complexity (Bentler and Bonnet, 1980; DeJoy et al., 2010; Hair et al., 1998). Consequently, other fit indices were also examined: the root mean square error of approximation (RMSEA), Bollen's incremental fit index (IFI), the comparative fit index (CFI), the Bentler-Bonett non-normed fit index (BBNNFI) and the goodness-of-fit index (GFI). Table 4 shows that these indices meet the recommended minimums: RMSEA is below 0.08, IFI, CFI and BBNNFI are above 0.9, and GFI is very close to 0.8, the minimum value recommended by Dawes et al. (1998), Jöreskog and Sörbom (1993) and Mueller (1996).

(Table 4 inserted here)

Subsequently, a second-order model was specified to test whether both dimensions (Inspirational appeals and Participative management) underlie a single principal factor, Safety leadership. Table 5 shows that the model fit is satisfactory.

(Table 5 inserted here)

Finally, first-order confirmatory factor analyses were run for the constituent dimensions of Working conditions and Safety performance. Tables 6 and 7 report the results of these analyses. These tables show a good fit for both measurement models.

(Table 6 inserted here)

(Table 7 inserted here)

The reliability indicates the degree of internal consistency between the multiple variables that make up the scale, and represents the extent to which the indicators or items of the scale are measuring the same concepts. The authors evaluated the measurement scale reliability by calculating Cronbach's α coefficient (Cronbach, 1951) and the Composite Reliability Index. As Table 3 shows, all the dimensions present Cronbach α's above 0.7, considered to be an adequate level of reliability to test causal relations (Nunnally, 1978). Likewise, tables 4, 6 and 7 show that for all factors the composite reliability index exceeds Bagozzi and Yi's (1988) minimum recommended level of 0.6.

The validity of the scales was verified by considering the content validity, convergent validity and discriminant validity. The content validity is confirmed bearing in mind that the proposed scales were designed following an exhaustive review of the literature and subjected to a process of revision involving in-depth interviews with safety experts (Fernández-Muñiz et al., 2007). The convergent validity of a concept evaluates the extent to which two measurements of the concept may be correlated (Hair et al., 1998). Convergent validity can be analysed by means of standardised factor regression coefficients relating each observed variable with the latent one (Anderson and Gerbing, 1988), in other words, by means of standardised lambda parameters. A strong condition of convergent validity is that those coefficients are over 0.5

and significant at a confidence level of 95%, which requires t-values greater than 1.96. The values of the coefficients and the t-values of the first-order confirmatory factor models appear in tables 4, 6 and 7. These tables show that all subscales fulfil both conditions. Likewise, Table 5 shows that the standardised factor regression coefficients relating Inspirational appeals and Participative management with the Safety leadership second-order factor are over 0.5 and significant at the 95% confidence level. The discriminant validity indicates the extent to which two conceptually similar concepts differ, and was verified by Anderson and Gerbing's (1988) methodology, which involves estimating the confidence interval around the parameters that indicate the correlation between the two one-dimensional factors of Safety leadership, between the four one-dimensional factors of Working conditions and between the two one-dimensional factors of Safety performance. These intervals were estimated using the correlation coefficient between the factors and the corresponding standardised errors, to check that no interval includes 1 (Tables 4, 6 and 7).

4.2 Estimation of proposed structural model

Structural equation modelling (SEM) was used to test the model shown in Figure 1. This statistical technique, frequently used in the literature on safety performance (e.g., Al-Refaie, 2013; Brown et al., 2000; Fernández-Muñiz et al., 2012; Martínez-Córcoles and Stephanou, 2017; Seo, 2005; Silva et al., 2004; Turner et al., 2012; Vinodkumar and Bhasi, 2010; Zaira and Hadikusumo, 2017), allows authors to test complex models of relations between variables considering all the model relations simultaneously. This makes it possible to assess the significance and strength of a particular relation in the context of the complete model (Dion, 2008). In addition, the hypothesised model can then be tested statistically in a simultaneous analysis of the entire system of variables to determine the extent to which it is consistent with the data (Wu et al., 2015).

Thus SEM allows the researcher to statistically quantify relations between variables and it helps in validating the overall model rather than just the subsets of the model. Modelling via structural equations is based on the knowledge previously available to the research. Every component of the model, relation between variables, or the lack of such relations, must be founded in the theory or on the previous evidence. Subsequently, the model is tested and evaluated via goodness-of-fit tests. The use of structural models to test theories does not prove causalities, but it is possible to reject causal hypotheses that are contradicted by the structure of co-variances or correlations between the model variables. Inference of a causal relation between variables should be supported by the theoretical model (McCoach, Black and O'Connell, 2007). Researchers do not derive causal relations from a structural equation model. Rather, the model represents and relies upon the causal assumptions of the researcher (Bollen and Pearl, 2013). Causality is an assumption rather than a consequence of SEM (Brannick, 1995).

Because of the modest sample size the authors opted to carry out a path analysis. This required calculating the mean of each of the dimensions considered. Figure 2 shows the estimation of the proposed model. The goodness-of-fit indices of this model are good, since they satisfy the recommended criteria: S-Bχ^2 (4)=5.482, p=0.241, RMSEA=0.060, IFI=0.995, CFI=0.995, BBNNFI=0.973 and GFI=0.987.

(Figure 2 inserted here)

The coefficients given in Figure 2 show that the effects of Safety leadership on Safety compliance and on Safety participation are not statistically significant. Thus the results do not support either H1a or H1b. In contrast, Safety leadership has a direct, negative influence on Work pressure and a direct, positive influence on Environmental conditions and occupational hazards and on Safety incentives, but not on Co-worker support. These results support hypotheses 2a, 2b and 2c, but not 2d.

The results also point to a direct, negative relation between Work pressure and Safety compliance, providing support for H3a. But Work pressure does not have a significant effect on either Safety participation or Co-worker support, so the results do not support H3b or H3c.

The variable Environmental conditions and occupational hazards has a direct, positive effect on employees' behaviour in the form of Safety compliance, Safety participation and Co-worker support, providing support for hypotheses 4a, 4b and 4c.

And Safety incentives has a direct, positive effect on Safety participation, but a non-significant effect on Safety compliance and Co-worker support. These results provide support for H5b but not for H5a or H5c.

Finally, Co-worker support is found to have a direct, positive effect on both Safety compliance and Safety participation, supporting the final two hypotheses of the model, H6a and H6b.

5. Discussion

Employees have an important role in improving safety outcomes according to previous research (e.g., Thompson et al., 1998). In the current work the authors have analysed the role of safety leadership and working conditions in determining employees' behaviour in relation to safety. Safety leadership was measured via inspirational appeals and participative management following Clarke and Ward (2006) and O'Dea and Flin (2001).

According to the results of the structural equation model proposed here, safety leadership has a direct, negative effect on work pressure, and a direct, positive effect on environmental conditions and occupational hazards and on safety incentives. In other words, the stronger the managers' commitment to safety is, the more investment is dedicated to this area. This translates into the availability of safer equipment and the existence of more pleasant environmental conditions for the employees. Stronger management commitment also encourages managers to resort more to safety incentives to reward employees' safe behaviours, and reduces work pressure, in other words managers tend to organise and plan tasks carefully with the aim of avoiding situations of overwork or occupational stress.

In contrast, safety leadership does not have a significant direct effect on co-worker support, although it does have an indirect effect via environmental conditions and occupational hazards. This result suggests that employees are concerned about their workmates' actions when management commitment has been translated into a tangible improvement in the health and safety conditions and sufficient investment has been made to make the installations as safe and comfortable as possible. Nor does safety leadership have a significant direct effect on either safety compliance or safety participation.

Safety compliance is conditioned by work pressure, environmental conditions and occupational hazards, and co-worker support, according to the results obtained here. As expected, work pressure has a negative effect on employees' compliance with safety policies and procedures; it can lead them to commit unsafe acts. In contrast, safe and healthy working conditions and workmates' involvement in safety activities promote safe behaviours in employees, encouraging compliance with safety procedures and the correct use of equipment and personal protective equipment. But the authors have not found a significant relation between safety incentives and safety compliance.

The results show that safety participation is conditioned by environmental conditions and occupational hazards, safety incentives, and co-worker support. As expected, all three variables have a positive effect on safety participation. In other words, safe and pleasant working conditions, rewards for assuming an extra-role or making efforts over and above the requirements, and workmates' concern for the safety of the organisation, encourage employees to get involved effectively in voluntary safety activities, or organisational citizenship behaviour. In contrast, the authors find that work pressure does not have a significant influence on safety participation.

Thus work pressure affects employees' compliance with the firm's safety rules and procedures but not their personal involvement in activities improving safety in the organisation. This result suggests that when managers or supervisors increase the workload or pressurise employees to work more quickly, the managers may be more permissive with regards safety rules and the employees may consequently violate some safety procedures. In the absence of work pressure the employees are conceivably more careful and respect the rules and procedures, this being part of their contractual relation with the organisation. But the absence of pressure alone does not lead to employees' effective participation in voluntary activities improving safety in the organisation. For the employees to be ready to assume an extra-role or make efforts over and above the requirements safety motivation is needed (Neal et al., 2000).

As mentioned above, safety incentives have a positive effect on safety participation but a non-significant effect on safety compliance. This result shows that rewards can increase employees' engagement and is consistent with Vinodkumar and Bhasi's (2010) finding that safety promotion policies have a significant direct effect on safety participation. The latter result suggests that employees must comply with the safety rules and procedures regardless of any incentives in place, this obligation being part of the employees' contractual relationship with the organisation. Incompliance could lead to sanctions or even job loss. In contrast, safety incentives motivate the employees to carry out tasks not explicitly part of their contract, such as improving safety in the organisation as a whole.

The results also show that no significant relation exists between safety incentives and co-worker support. This result may be due to the fact that the incentives measured in this work are individual incentives. To increase co-worker support the incentives must reward team achievements.

According to Tucker et al. (2008), the co-workers are an important factor that influences employees' behaviour, although this social influence often remains unnoticed, with more attention going to leadership. Meliá et al. (2008) identify co-workers as a safety agent that is as important as the organisation and the supervisor. The current work confirms the important role of co-worker support in determining employees' safety behaviour, showing that the variable has a positive effect on both safety compliance and safety participation. The mutual influence between workmates encourages others to comply with the rules and get involved in voluntary safety activities. Co-workers criticise how tasks are carried out, show behavioural support for desired practices while discouraging others, help employees to achieve their goals and facilitate social transactions, which makes tasks easier to carry out, and may also shape their co-workers' roles by offering lateral mentoring (Brondino et al., 2012; Chiaburu and Harrison, 2008).

Social exchange theory (Blau, 1964) sheds light on how co-workers influence employees' behaviour. When safety-related exchanges among co-workers involve information on dangers and concern for the safety of others, the norm of reciprocity suggests that the probability of future safety-related exchanges and safety voice increases (Tucker at al., 2008).

These findings support Brondino et al.'s (2012) and Chiuburu and Harrison's (2008) results and suggest that interventions to improve safety communication between employees and co-workers' commitment to safety can improve safety performance. The results are also consistent with Tucker et al.'s (2008) finding that perceived co-worker support for safety fully mediates the relation between perceived organisational support for safety and employees' safety voice.

Finally, the results confirm the importance of environmental conditions and occupational hazards in encouraging safe behaviours among employees, since the variable has a direct, positive effect on safety compliance, safety participation and co-worker support. It should be recalled that the environmental conditions and occupational hazards construct was coded to represent low levels of hazards. Thus safe and pleasant working conditions have a positive effect on employees' compliance with safety procedures, their involvement in voluntary safety activities, and support and co-operation between co-workers. When employees believe that their working environment is safe they reciprocate by making extra efforts in voluntary activities relating to safety in the firm (Brondino et al., 2012).

These results are consistent with Ford and Tetrick's (2011) findings that occupational hazards are associated with lower psychological empowerment and lower organisational identification, which in turn are associated with lower levels of safety participation. These authors suggest that employees in more injurious situations tend to feel less autonomous and efficacious, perceive that they have less influence on the organisation's strategy, operations and performance, identify less with the organisation and are less likely to perceive safety as a priority. They are consequently less likely to perform safety behaviours.

Ford and Tetrick (2011) fail to find a direct relation between occupational hazards and safety performance and suggest that although occupational hazards have a negative influence on safety performance via psychological empowerment and organisational identification, occupational hazards may also increase employees' perceptions of risk, leading them to pay more attention to safety concerns and hence counteracting the negative effect on safety performance. In other words, individuals may be more likely to perform safe behaviours when they perceive the existence of risk of injury (Rogers, 1983). In the current work the authors propose a direct relation between environmental conditions and occupational hazards and safety performance and co-worker support. The results confirm that the lower the dangers and the more pleasant the working conditions, the greater the employees' involvement. These results are consistent with Mearns et al.'s (2010) finding that investment in health is associated with employees' commitment. If the employees perceive that their managers do not make efforts to remove hazards, they get the message that the organisation has other priorities (Brown et al., 2000).

Finally, the results of this work are also consistent with Nahrgang et al.'s (2011) results because they suggest that reducing risks and hazards and establishing a supportive environment are among the best ways to improve safety.

The current study contributes to knowledge on the determinants of safety behaviour in process industries. This work shows that safety leadership has an indirect effect on safety performance via working conditions. Managers' attitudes and behaviours alone are insufficient to achieve more proactive behaviours among employees. Managers must prevent employees from performing risky behaviours, reinforce safe behaviours, promote employees' voluntary participation in safety activities, and encourage support and co-operation among co-workers by improving working conditions, which can be done by reducing work pressure, improving the environmental conditions and reducing the occupational hazards, and designing an adequate system of safety incentives.

Consequently, this work shows how leaders must interact with their subordinates if they wish to improve safety performance. Likewise, it sheds light on various aspects where the previous research results have been inconclusive:

- The role of work pressure as an antecedent of safety behaviour. The authors analyse work pressure's impact not only on safety compliance, but also on safety participation and co-worker support.
- The role of environmental conditions and occupational hazards in employees' behaviour.
- The effect of incentives on safety performance.
- The role of co-workers' support in promoting safe behaviours among employees.

This work offers guidelines to leaders in the process industries about the behaviours they should adopt if they wish to improve safety outcomes in their organisations. Managers could use the results presented here to identify the most important factors among the working conditions behind the employee behaviours and to design intervention strategies to modify them accordingly.

Nevertheless, this work suffers from a number of limitations. First, the design of the study was cross-sectional, and all measures were collected during the same time period. Estimating parameters using cross-sectional data does not allow the researcher to demonstrate the existence of causality (Bollen, 1989; Bullock, Harlow and Mulaik, 1994). Temporal ordering is critical in determining the direction of variable influence (Bollen, 1989; Bullock, Harlow and Mulaik, 1994). Although temporal sequence is not an infallible guide to causal relations (Anderson and Gerbing, 1988), a stronger inference of causality may be made when the temporal ordering of variables is demonstrated (Kelloway, 1995). Thus, the connections empirically identified yield evidence for relations believed to be consistent with hypothesised causal relations as far as they go but not sufficiently strong enough to suggest causality (Bagozzi and Yi, 2012). In such cases, therefore, strong theoretical underpinnings are critical to causality inferences (Bergh et al., 2016).

Second, although the authors defined the constructs used in this research as precisely as possible, based on the available relevant literature, and carried out a meticulous process of generation and revision of items, the measures developed should be understood as an approximation to latent phenomena, which cannot be measured in full.

Third, the relations were evaluated from the perspective of the firm's safety officer, in other words according to their perceptions. But managers', engineers' and employees' opinions would have helped complete the picture of these phenomena.

Fourth, the model was tested using a sample of firms from process industries, so the results obtained are limited to that type of organisation. Likewise, the authors have only looked at organisations located in Spain. Although the theoretical framework was built on the basis of previous research carried out in other countries, a greater generalisability of the results would require that the model developed be tested on a sample of firms from other geographical areas.

Finally, the sample size did not allow the authors to identify possible differences between industries or between Spanish and international firms. Replication of this study for different industries and countries would increase the generalisability of its findings.

6. Conclusions

This work analyses the role that safety leadership and working conditions play in promoting employees' safety behaviours. Safety leadership is measured via inspirational appeals and participative management. On the other hand, the authors consider four components of working conditions: work pressure, environmental conditions and occupational hazards, safety incentives and co-worker support.

The results of the structural equation model proposed show that safety leadership has a direct, negative effect on work pressure, and a direct, positive effect on environmental conditions and occupational hazards and on safety incentives. Likewise, safety leadership has an indirect effect on co-worker support via environmental conditions and occupational hazards.

The results also show that safety compliance is conditioned by work pressure, environmental conditions and occupational hazards, and co-worker support, while safety participation is conditioned by environmental conditions and occupational hazards, safety incentives, and co-worker support. Safety leadership does not have a significant, direct effect on either safety compliance or safety participation. But safety leadership does have an indirect effect on safety performance via working conditions.

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(Safety culture in Spanish firms: an analysis of the effect of social, organisational and management factors on the occupational accident rate), Ref.: ECO2012-36469.

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Figure 1. Proposed structural model

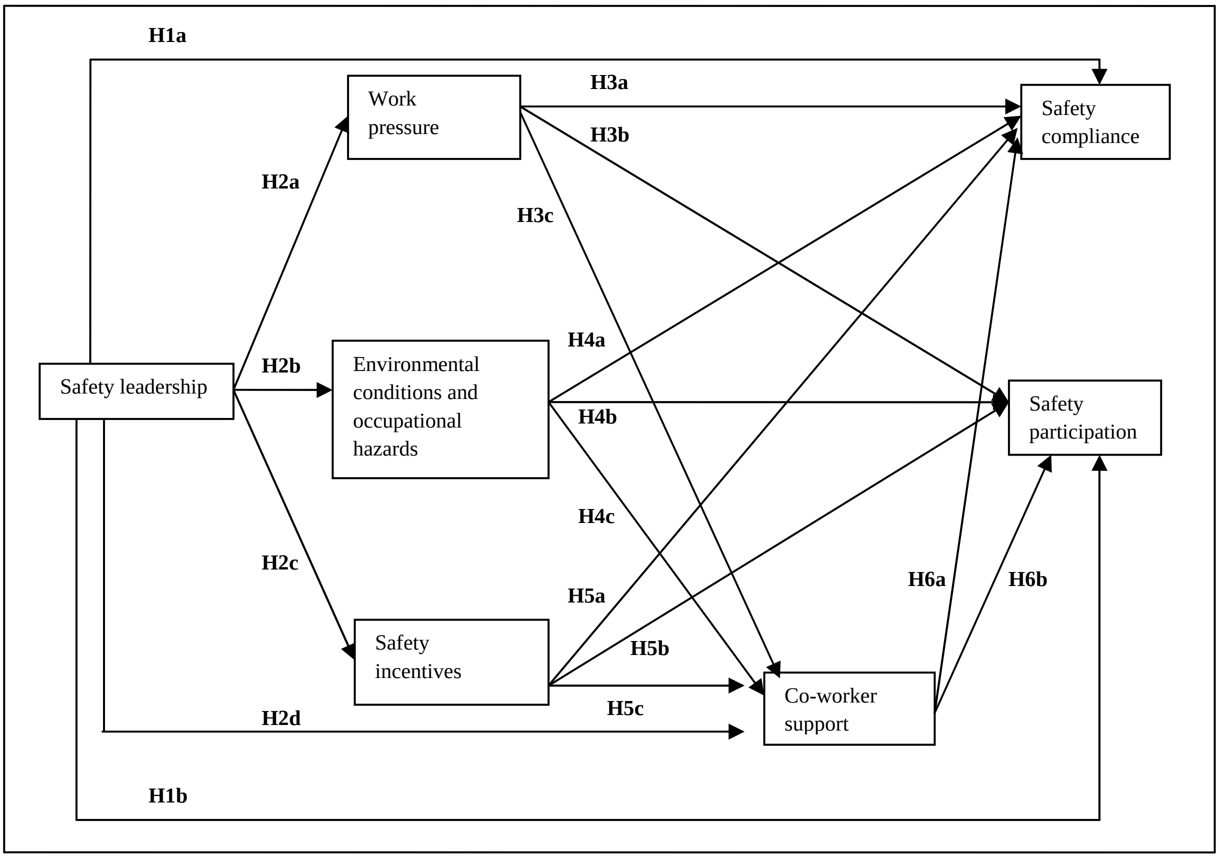
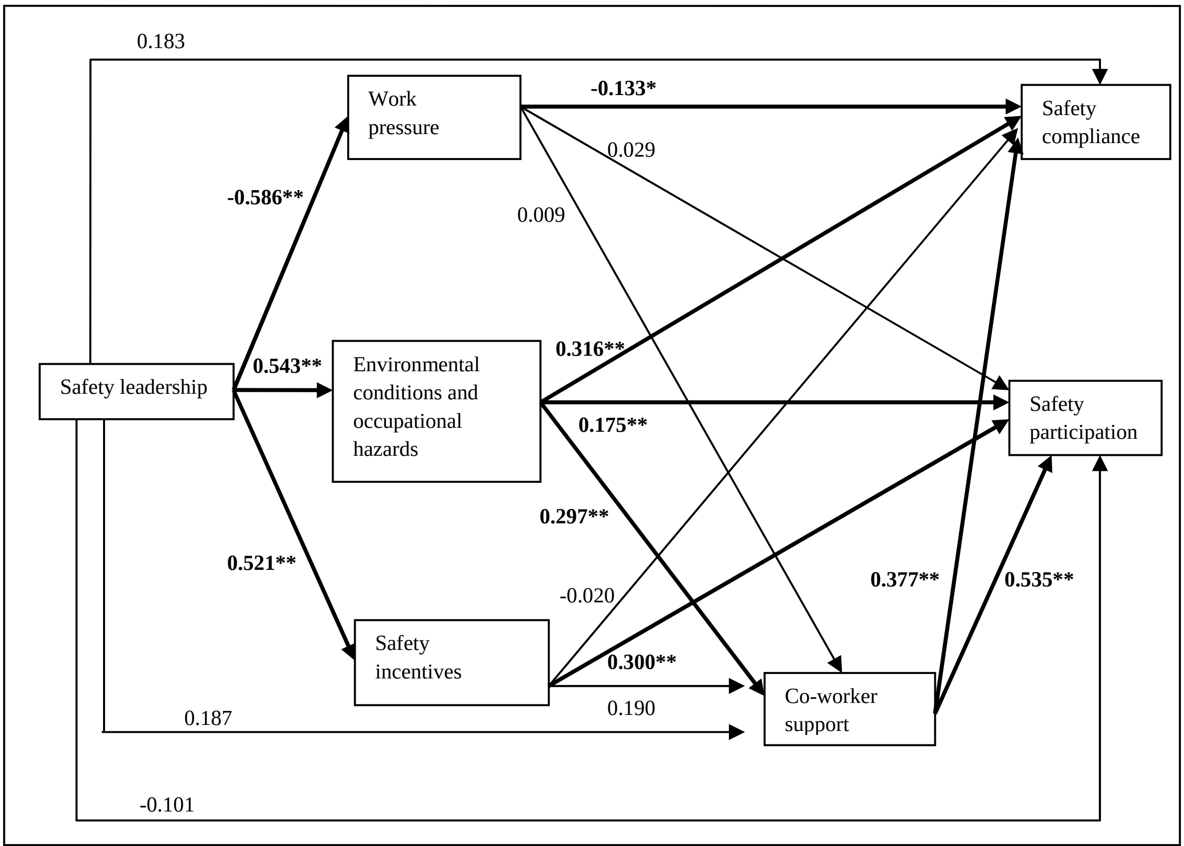


Figure 2. Result of proposed structural model



Results of Model Fit: **S-Bχ^2 (4) = 5.482 p=0.241** **RMSEA= 0.060** **BBNNFI= 0.973** **IFI= 0.995** **GFI=0.987** **CFI= 0.995**

Note: ** indicates significant at 95% confidence level; * indicates significant at 90% confidence level

Table 1. Profile of sample firms (N=103)

Characteristics		Frequency	%
Sector of activity	Manufacture of basic chemical products, nitrogenous compounds and fertilisers; pesticides	17	16.5
	Manufacture of plastics in primary forms	6	5.8
	Manufacture of paints, varnishes and similar coatings	8	7.8
	Manufacture of soaps, detergents; perfumes, cosmetics	7	6.8
	Manufacture of other chemical products	15	14.6
	Manufacture of pharmaceutical products	7	6.8
	Manufacture of rubber products and plastics	12	11.7
	Manufacture of iron and steel products	5	4.9
	Production of precious metals and other non-ferrous metals	12	11.7
	Metal smelting	9	8.7
	Food Manufacturing	5	4.9
Size (no. employees)	10-49	41	39.8
	50-249	49	47.6
	> 249	13	12.6
Ownership of capital	Private	103	100.0
	Public	0	0
	Mixed	0	0
Nationality of capital	Spanish	65	63.1
	Non-Spanish	36	35.0
	Mixed	2	1.9
Targets markets	Spanish market	15	14.6
	International market	88	85.4
ISO 9001 Quality certificate	Yes	89	86.4
	No	14	13.6
ISO 14001 Environmental certificate	Yes	67	65.0
	No	36	35.0
OHSAS 18001 Safety certificate	Yes	35	34.0
	No	68	66.0

Table 2. Measurement scales of study variables

Safety leadership	
Inspirational appeals	
Leader1	Managers show great integrity and ethical behaviour with regards safety
Leader2	Managers show concern for working conditions
Leader3	Managers encourage employees to achieve safety goals and objectives
Leader4	Managers motivate employees to work safely
Leader5	Managers motivate employees to learn new safety procedures
Leader6	Managers motivate employees to improve job skills
Leader7	Managers consider employees' opinions when developing projects and proposals for improvement
Leader8	Supervisors talk to employees frequently about problems and possible improvements with regards safety
Leader9	Supervisors help employees to work more safely
Leader10	Supervisors create a good atmosphere to improve relationships among employees
Participative management	
Leader11	Managers provide the resources necessary to avoid appearance of safety-related incidents
Leader12	Managers participate in safety inspections and audits
Leader13	Managers continually evaluate effectiveness of safety systems
Leader14	Managers participate in safety training and information activities for employees
Leader15	Managers tend to visit workplace to check conditions and communicate with employees
Leader16	Managers are committed to identify dangers and plan preventive activities
Leader17	Managers prioritise safety problems over other possible problems
Leader18	Managers act quickly when informed about an incident
Working conditions	
Work pressure	
Pressure1	Employees are often pressurised to finish tasks quickly
Pressure2	Work overload sometimes makes it necessary to ignore safety rules
Pressure3	Safety rules and instructions make it more difficult to achieve production objectives
Pressure4	Employees sometimes receive requests simultaneously that are mutually incompatible
Environmental conditions and occupational hazards	
Hazard1	Lighting in work areas is adequate
Hazard2	Working space is adequate
Hazard3	Noise level is appropriate
Hazard4	Operators have right tools and equipment to do their work
Hazard5	Equipment has safety mechanisms
Hazard6	Cleanliness and tidiness is kept at very high level
Hazard7	In general, it is a safe place to work
Safety incentives	
Incentiv1	Supervisors/managers praise employees who pay particular attention to safety
Incentiv2	Firm makes it easier for employees with good safety behaviour to get promoted
Incentiv3	Firm rewards employees who inform about dangers in their workplace
Incentiv4	Safety behaviour is relevant when assessing performance and deciding on remuneration and/or promotion
Incentiv5	Firm imposes significant sanctions for non-compliance with in safety rules and procedures
Co-worker support	
Co-worker1	Employees try to ensure that their workmates comply with safety procedures
Co-worker2	Employees encourage their workmates to participate in safety activities
Co-worker3	Employees inform their superiors when workmates fail to comply with safety rules and procedures
Co-worker4	Employees tend to talk about the dangers in their workplace and how to control them
Co-worker5	There is good communication between employees in firm
Safety performance	
Safety compliance	
Complian1	Employees always comply with safety rules and procedures
Complian2	Employees always wear right personal protective equipment
Complian3	Employees keep workspaces clean and tidy
Complian4	Employees use safety equipment properly
Safety participation	
Particip1	Employees participate in developing projects to innovate and improve health and safety
Particip2	Employees go beyond requirements to help firm to improve its health and safety
Particip3	Employees show enthusiasm and interest in safety programmes
Particip4	Employees make suggestions to improve safety in firm
Particip5	Employees participate actively in safety training activities
Particip6	Employees participate actively in drawing up task instructions and safety procedures
Particip7	Employees participate in carrying out risk evaluations and safety audits
Particip8	Employees participate in accident investigations
Particip9	Employees often attend safety meetings in firm voluntarily and participate actively

Table 3. Means, standard deviations, reliabilities and correlations

	Mean	S.D.	Cronbach α	IA	PM	SL	WP	EH	SI	CS	SC	SP
IA	3.76	0.81	0.939	-								
PM	3.73	0.92	0.917	0.838**	-							
SL	3.75	0.83	-	-	-	-						
WP	1.98	0.83	0.783	-.548**	-.574**	-.586**	-					
EH	4.19	0.62	0.866	0.563**	0.484**	0.543**	-.413**	-				
SI	2.65	0.94	0.816	0.557**	0.449**	0.521**	-206*	0.213*	-			
CS	3.09	0.77	0.831	0.502**	0.358**	0.444**	-.265**	0.437**	0.350**	-		
SC	3.87	0.77	0.887	0.591**	0.536**	0.586**	-.464**	0.628**	0.301**	0.620**	-	
SP	3.05	0.79	0.888	0.410**	0.313**	0.374**	-.192	0.409**	0.469**	0.668**	0.460**	-

** Correlation is significant at 0.01 level; * Correlation is significant at 0.05 level.

Abbreviations: Inspirational appeals (IA); Participative management (PM); Safety leadership (SL); Work pressure (WP); Environmental conditions and occupational hazards (EH); Safety incentives (SI); Co-worker support (CS); Safety compliance (SC); Safety participation (SP).

Table 4. 1st-order CFA for Safety leadership

Dimension Variables	**Composite Reliability Index**	**Standardised Lambda Parameters**	**t- values**	**Dimension-Dimension**	**Correlation**	**Confidence Interval**
F1: Inspirational appeals	0.942					
Leader1		0.846	10.406	F1-F2	0.917	(0.871 – 0.963)
Leader2		0.853	10.879			
Leader3		0.688	10.262			
Leader4		0.846	9.756			
Leader5		0.794	10.766			
Leader6		0.762	8.542			
Leader7		0.750	8.499			
Leader8		0.787	10.947			
Leader9		0.816	11.171			
Leader10		0.700	7.071			
F2: Participative management	0.918					
Leader11		0.756	7.146			
Leader12		0.669	8.921			
Leader13		0.674	7.848			
Leader14		0.780	12.441			
Leader15		0.795	10.235			
Leader16		0.866	11.367			
Leader17		0.758	10.583			
Leader18		0.803	9.249			
Results of Model Fit:		**S-Bχ^2 (134) = 191.000 $p < 0.01$**		**RMSEA= 0.065 BBNNFI = 0.936**	**IFI= 0.945 GFI= 0.797**	**CFI= 0.944**

Note: t-values above 1.96 indicate significant at 95% confidence level.

Table 5. 2nd-order CFA for Safety leadership

Dimension Variables	**Standardised Lambda Parameters**	**t- values**
F1: Inspirational appeals	**0.961**	**9.919**
Leader1	0.846	-----
Leader2	0.853	11.479
Leader3	0.689	9.771
Leader4	0.846	13.007
Leader5	0.794	10.753
Leader6	0.762	10.888
Leader7	0.750	9.291
Leader8	0.787	11.581
Leader9	0.816	11.077
Leader10	0.700	7.922
F2: Participative management		
Leader11	**0.954**	**6.809**
Leader12	0.756	-----
Leader13	0.670	6.271
Leader14	0.674	5.669
Leader15	0.781	6.909
Leader16	0.794	8.044
Leader17	0.866	7.923
Leader18	0.757	7.307
	0.803	8.163

Results of Model Fit: **S-Bχ^2 (134) = 190.974 $p < 0.01$** **RMSEA= 0.065** **IFI= 0.945** **CFI= 0.944** **BBNNFI = 0.936** **GFI= 0.797**

Note: t-values above 1.96 indicate significant at 95% confidence level.

Table 6. 1st-order CFA for Working conditions

Dimension Variables	**Composite Reliability Index**	**Standardised Lambda Parameters**	**t-values**	**Dimension-Dimension**	**Correlation**	**Confidence Interval**
F1: Work pressure	0.794					
Pressure1		0.530	5.443	F1-F2	-0.491	(-0.675 - -0.307)
Pressure2		0.820	7.501	F1-F3	-0.272	(-0.454 - -0.090)
Pressure3		0.597	5.336	F1-F4	-0.301	(-0.485 - -0.117)
Pressure4		0.831	7.528	F2-F3	0.251	(0.073 – 0.429)
F2: Environmental conditions and occupational hazards	0.872			F2-F4	0.444	(0.222 – 0.666)
				F3-F4	0.464	(0.250 – 0.678)
Hazard1		0.769	6.316			
Hazard2		0.799	7.246			
Hazard3		0.759	11.461			
Hazard4		0.641	4.118			
Hazard5		0.582	3.018			
Hazard6		0.619	7.766			
Hazard7		0.736	8.913			
F3: Safety incentives	0.822					
Incentiv1		0.713	8.252			
Incentiv2		0.796	10.653			
Incentiv3		0.620	5.604			
Incentiv4		0.780	11.340			
Incentiv5		0.540	5.696			
F4: Co-worker support	0.841					
Co-worker1		0.865	11.302			
Co-worker2		0.881	11.909			
Co-worker3		0.625	6.635			
Co-worker4		0.584	6.480			
Co-worker5		0.595	6.333			
Results of Model Fit:		**S-Bχ^2 (183) = 237.781 p = 0.004**		**RMSEA= 0.054 BBNNFI = 0.916**	**IFI= 0.929 GFI= 0.813**	**CFI= 0.927**

Note: t-values above 1.96 indicate significant at 95% confidence level.

Table 7. 1st-order CFA for Safety performance

Dimension Variables	**Composite Reliability Index**	**Standardised Lambda Parameters**	**t-values**	**Dimension-Dimension**	**Correlation**	**Confidence Interval**
F1: Safety compliance	0.893			F1-F2	0.478	(0.312 – 0.644)
Complian1		0.784	10.198			
Complian2		0.869	13.074			
Complian3		0.746	9.863			
Complian4		0.884	11.071			
F2: Safety participation	0.889					
Particip1		0.663	8.699			
Particip2		0.809	10.596			
Particip3		0.831	10.917			
Particip4		0.578	5.693			
Particip5		0.669	6.669			
Particip6		0.703	8.639			
Particip7		0.638	8.672			
Particip8		0.563	6.720			
Particip9		0.698	9.489			
Results of Model Fit:		**S-Bχ^2 (64) = 98.956 p = 0.003**		**RMSEA= 0.073 BBNNFI = 0.934**	**IFI= 0.947 GFI= 0.852**	**CFI= 0.946**

Note: t-values above 1.96 indicate significant at 95% confidence level.