Title

Safety, health and environmental risk culture: a manufacturing case study

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PREFACE

This mini-dissertation is the final deliverable in the Centre for Applied Risk Management (UARM)'s taught master's degree programme. The mini-dissertation was written in article format and consists of three sections: Research project overview, Article, and Reflection.

This mini-dissertation is the student's work. The student was responsible for the final concept, set-up, execution of the research project and writing of the mini-dissertation. The members of the supervisory team contributed in an advisory and technical support capacity on study conception and design, analysis and interpretation of data and critical revision of the manuscript by the student. The mini-dissertation was language edited before submission.

The main study supervisor gave the student permission to submit this mini-dissertation for examination.

ABSTRACT

Introduction: This study considered the role that safety, health and environmental (SHE) risk culture should play in the improvement of SHE risk management. The study focused on the perception of SHE risk culture at management and non-management levels in a manufacturing organisation in South Africa. SHE risk culture was viewed in terms of tone from the top and operational understanding of the risk management process.

Method: A SHE risk culture questionnaire was created based on information available in the academic literature. The aim of this exploratory questionnaire was to assess the status of the SHE risk culture within the targeted organisation and to recommend improvements. The questionnaire included items designed to assess five aspects of SHE risk culture: understanding of the SHE risk approach; understanding of SHE risks and controls; SHE risk involvement and buy-in; communication; and governance, leadership and accountability.

The target group for this study consisted of operations personnel and risk and SHE employees at different levels in the company. Survey data were obtained from 224 employees from a wide range of jobs in the company.

Results: The data from the Likert-scale items in the questionnaire showed a number of significant differences between the perceptions of managers and non-managers with respect to the status of the SHE risk culture in the organisation. These differences indicated that management felt more comfortable with their understanding of the SHE risk approach, of the actual SHE risks, and of risk management controls than the non-management group. Also, management showed greater support for, and buy-in to, the SHE risk approach than the non-management group.

In addition, participants shared their views of how the SHE risk culture in the organisation may be improved. The top five recommendations were: improve communication on SHE risk culture; standardise the SHE risk management approach; enhance SHE risk-related training to build capacity and understanding; emphasize the significance of leadership's approach to embedding the SHE risk culture; and acknowledge the importance of involving employees in the development and implementation of the desired SHE risk culture.

Conclusion: This study illustrated the importance of a number of factors required to improve the SHE risk culture in the organisation both in terms of tone from the top and operational understanding of SHE risks: they include well-structured communication; standardising and simplifying SHE risk management; SHE risk capacity building; and encouraging employee

participation when developing and improving the desired SHE risk culture. The central role played by leadership to set the tone from the top and lead by example when implementing the desired organisational SHE risk culture was also highlighted by the participants.

Practical application: This study provides evidence-based guidance for the manufacturing sector on how to evaluate and improve a desired SHE risk culture. The paper also shows how the concept of risk culture can be applied to SHE risk culture. The questionnaire used in this study can be used by management teams wishing to get an understanding of the prevailing SHE risk culture in their organisations. The results of the survey can be used to inform change interventions to improve the existing SHE risk culture in the organisation studied. The questionnaire should also be useful for further research on the concept of risk culture and in particular SHE risk culture.

Key words:

Safety, health, environmental risk culture

Safety, health and environmental leadership

Safety, health and environmental communication

Safety, health and environmental training

Safety, health and environmental risk management

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How does the study fit into the field of risk management?

In the manufacturing sector, all risks are managed and governed through the enterprise risk management framework. Safety, health and environmental (SHE) risks are generally given specific attention in this process owing to manufacturing operations' inherent potential to expose employees and neighbours to SHE risks by the nature of manufacturing activities. It is within this context that SHE risk management is treated as a core focus area within the overall risk management strategy in manufacturing organisations.

Why did the student decide to study this specific topic?

This study is of practical relevance to the organisation where the student is employed, and the results of the study are expected to have practical benefit to the organisation. More generally, this study is also expected to provide valuable guidance on why and how the SHE risk culture in manufacturing organisations should and can be improved. The study is also expected to add to the existing body of academic knowledge by applying the concept of risk culture to improve the effectiveness of SHE risk management in the manufacturing sector.

Why was the specific journal selected?

For the purposes of this study, the *Journal of Safety Research* was selected for the following reasons:

- A detailed journal evaluation exercise was undertaken with due consideration of past articles published. As a result of this evaluation, it was our conclusion that the topic of this study was closely aligned to similar work previously published by this journal;
- this is a cross-disciplinary journal that allows for the exchange of evidence-based research in the field of health and safety. This article will contribute to the journal in the less published field by adding environment as part of SHE in this study; and
- four articles referenced in our paper have been published in this journal, indicating an interest in the topic of this study. This should ultimately provide support for the publication of our article.

ARTICLE

1 Abstract

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of SHE risk management; SHE risk capacity building; and employee participation when developing and improving the desired SHE risk culture. The central role played by leadership to set the tone from the top and lead by example when implementing the desired organisational SHE risk culture was also highlighted by the participants.

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2 Introduction

Manufacturing companies have the inherent potential to expose their employees, surrounding communities and the environment to safety, health and environmental (SHE) risks. All manufacturing organisations face major challenges when SHE risks materialise into actual loss-causing events despite the inclusion of SHE risk management as a core part of day-to-day business activities. Such events expose the company to economic, social and reputational harm when their employees suffer injuries, harm to health, loss of life or when the environment is damaged. Cooper (2000) contends that industries around the world are increasing their interest in safety culture as a mechanism to reduce major incidents associated with routine tasks. He further states that safety should be the dominating characteristic of the corporate culture in high-risk industries. Similarly, Glendon and Stanton (2000) maintain that safety culture has been identified in disaster queries as being fundamental to an entity's ability to manage safety-related aspects of its operations.

The importance and relevance of safety culture received particular attention during the investigation into the 1986 Chernobyl nuclear disaster, the worst nuclear disaster yet. The subsequent report from the International Nuclear Safety Advisory Group highlighted that an inadequate safety culture was a major contributor to the disaster (INSAG, 1992). This is further supported by the view articulated by Bunn and Heinonen (2011) that in light of the Fukushima nuclear disaster of 2011, the goal of organisations must be to change thinking and organisational priorities to focus on achieving the highest levels of safety and security. These

two incidents highlighted the importance of an organisation having an adequate safety culture to manage its risk exposure.

Pidgeon (1991) defines safety culture as the set of beliefs, norms, attitudes, roles, and social and technical practices that focus on minimising exposure of employees, managers, customers and members of the public to conditions considered dangerous and injurious. McDonald and Ryan (1992) found the concept of a safety culture to be a useful criterion for discrimination between organisations that perform well or poorly from a safety perspective. Similarly, embedding a SHE risk culture should assist the organisation to implement ‘best practices’ in SHE management. Safety culture has up to now been the primary research focus area in the academic literature but no academic articles have been found on SHE risk culture. Guldenmund (2000) argued that organisational culture expresses itself through organisational climate. He emphasised that specific beliefs or convictions form the core that is associated with the organisational culture. He added that safety climate denotes the attitudes to safety within the organisation, while safety culture establishes the strong convictions that form the basis for attitude to safety.

In this study, we investigated how the organisational SHE risk culture can be understood in terms of employees' experience of the SHE-related climate in a large South African manufacturing company. A SHE risk questionnaire was developed and administered to employees at all levels in the organisation. For purposes of this study, we focused on differences in perception of SHE risk culture between employees at management and non-management levels.

The aims of this research report are to:

- Describe the results of a study that assessed the status of SHE risk culture in a large manufacturing company in South Africa;
- highlight the need for greater understanding of the role that SHE risk culture should play to improve SHE risk management within manufacturing organisations;
- identify potential challenges in embedding a SHE risk culture in a manufacturing organisation and link these to challenges reported in the academic literature; and
- make recommendations on how to improve the SHE risk culture in a manufacturing organisation.

3 Background

Globally, a poor safety culture is one of the leading causes of occupation-related accidents (Pearson, 2009). In addition, an understanding of the many SHE risks facing an organisation is essential to mitigate SHE risk. Internal and external stakeholders expect that comprehensive SHE risk assessments will be conducted and appropriate controls implemented in companies that are highly exposed to SHE risks such as manufacturing. The status of SHE-related compliance is one criterion to demonstrate exposure to SHE risks. In South Africa, reliable sources of information with respect to SHE compliance risk status are available through regulatory compliance reports. For example, the National Environmental Compliance and Enforcement Report (South African Department of Environmental Affairs, 2013) serves as a good reference to understanding the environmental compliance challenges faced by industries generally. This report highlighted 1539 environmental non-compliances detected in 2849 facilities inspected by the Environmental Management Inspectorate over the period 2012/2013. In terms of occupational health and safety, the South African Compensation Fund Annual Report registered 129 405 health and safety compensation claims for 2012/2013. This report highlight the extent of the health and safety risk to which employees could be potentially exposed (South Africa Department of Labour, 2013). The manufacturing sector is a significant contributor to these statistics (South African Department of Environmental Affairs, 2013; South African Department of Labour, 2013). SHE risks are therefore a reality in the manufacturing sector in South Africa.

Embedding a risk-based SHE culture can assist an organisation to manage its SHE risks. Safety culture has up to now been the primary research focus area in the academic literature. Safety culture relates to how individuals and groups of employees take personal responsibility with respect to safety at work. Ideally, this responsibility includes communicating safety concerns while striving to learn and adapt individual and organisational behaviour based on lessons learnt (Zhang, Wiegmann, von Thaden, Sharma, & Mitchell, 2002). Appropriate SHE risk behavioural rules that apply to leadership as well as to other employees are required to be able to embed a strong SHE risk culture within an organisation. Within such a SHE risk-aware culture appropriate behaviours are encouraged, communicated, rewarded and supported by processes designed to reinforce the desired behaviour.

In the next paragraphs, we focus on the need for a strong SHE risk culture, understanding the role of leadership in setting the appropriate tone from the top, how to conduct a SHE risk culture assessment, and on the characteristics of an appropriate SHE risk culture.

3.1 Contextualising the need for a SHE risk culture

In manufacturing industries where significant SHE risks arise on a regular basis, there has been a shift away from exclusively focusing on historical lagging data on fatalities, lost-time accident rates and incidents towards proactive leading indicators. These leading indicators include safety climate and safety culture (Flin, Mearns, O'Connor, & Bryden, 2000). Proactive interventions allow organisations to improve their predictive capability to manage exposure to SHE risks. Therefore, challenges associated with people in the process of embedding the desired SHE risk culture must be appropriately managed.

Accordingly, it has been recognised that people-related barriers need to be addressed by an organisation in order to embed a risk culture (Fenech & Media, 2011). The decision-making process in an organisation is highly influenced by the prevailing risk culture. For example, according to the Financial Stability Board (2014), culture plays a vital role in the way decisions are made and the manner in which the organisation interacts with stakeholders. Van Vuuren (2000) analysed cultural influences on risk-related incidents and risk management and found that the prevalent safety culture does not only affect behaviour on a shop floor but also impacts on priorities of management and their perception of human error. Consequently, the role of leadership and cultural tone set from the top has a downstream effect on the shop floor.

3.2 Tone from the top

The attitudes of individuals to SHE risks in an organisation are influenced by the working environment. Several studies (INSAG, 1991; Flin & Yule, 2004; Fernández-Muñiz, Montes-Peón & Vázquez-Ordás, 2007) highlighted the importance of creating appropriate conditions that support and foster the desired culture and importance of the role of leadership in this process. This was further endorsed by Cui, Fan, Fu and Zhu (2013), who found that the connection between a perceived hazardous environment and employees' internal beliefs in establishing a safety climate is influenced by the organisation's leadership approach.

Other studies emphasise the importance of the role played by leadership to establish an appropriate risk culture that allows for challenges without fear (Lewis, 2013; Gandz, 2013; Walker, Shenkir & Barton, 2014). Trust is strengthened amongst all stakeholders when risk-related matters are discussed in an open and transparent manner.

The tone from the top in the context of this study is the direction that is set by senior management to establish the desired SHE risk culture. This is generally described in and

communicated via the company's SHE policy. The SHE policy will direct the organisation's approach to SHE risk management. The tone from the top must be unambiguously clear to drive a risk-based culture and secure buy-in from all stakeholders involved. In setting the tone from the top, leadership should assume accountability to establish, communicate and act in a consistent manner that is aligned to the desired risk culture. Leadership commitment is central to ensuring that a risk-based culture is entrenched in the company. Senior leadership plays a central role in the key decisions that promote a specific risk culture. Gandz (2013) and Komori (2013) emphasise this point through their descriptions of how leadership strategies improved risk culture and consequently turned around struggling organisations ranging from banking to manufacturing.

In the context of the role leadership plays, an understanding of the prevailing SHE risk culture is required through the application of a diagnostic process in order to act decisively.

3.3 Conducting a SHE risk culture assessment

Asselin-Miller, Davidson, Mackenzie and Wilkinson (2012) argue that companies can only implement real cultural change if they are aware of their current risk culture and how well it is aligned to their risk profile and objectives. They further suggest that risk culture can be diagnosed using a variety of mechanisms, including interviews with senior stakeholders as well as wider focus groups. However, they suggest the best way to understand the risk culture throughout the company is to engage directly with employees whose daily job is to identify, take and manage risks, in order to solicit honest views. According to Atkinson (2013) and Anderson and Richardson (2012), an appropriate risk culture diagnostic assessment must be undertaken to determine the as-is culture and highlight gaps to implement appropriate initiatives.

Cox and Cheyne (2000) suggest that the benefits of using an appropriate toolkit to conduct a risk culture assessment will serve to direct the health and safety focus and allow for active monitoring and support regarding health and safety matters. The outcome of such a diagnostic assessment will not only reveal gaps that exist but should also guide management to align their communication and change management strategy.

3.4 Communication as a means to drive the SHE risk culture embedding process

Effective communication is vital for setting the appropriate tone from the top. A number of studies (Farrel & Hoon, 2009; Cui, Fan, Fu & Zhu, 2013; Dejoy, Schaffer, Wilson, Vandenberg &

Butts, 2004) concluded that commitment from management is required to ensure responsive employees, active participation in safety initiatives and open and effective communication as key features of a positive safety climate. The success of effective communication to support SHE risk mitigation relies on responsive leadership, where concerns regarding SHE risks raised by employees lead to appropriate risk mitigation actions. Such leadership should reinforce the desired SHE risk tone, secure employee commitment and ultimately drive the SHE risk mitigation strategy.

In order to support embedding an appropriate SHE risk culture, there is a need to clearly articulate and reinforce a single and consistent risk message that is well understood by the recipients. Komori (2013) advocates that organisations reconsider their approach to managing people when attempting to improve risk culture.

The Institute for Risk Management of South Africa (2013) declared that appropriate risk communication will support the embedding of a risk culture. In addition to communication, an appropriate and structured approach towards SHE risk training must be implemented to drive the embedding of appropriate SHE risk management in an organisation.

3.5 Training as a mechanism to support the embedding of a SHE risk culture

With the implementation of any strategic intervention within an organisation, success or failure is largely determined by the associated training that supports such interventions. According to Whiles (as cited in Robotham, 2001), the difference between effective and ineffective occupational health and safety training can result in death, injury, pain, suffering and lost profits. Baret & Barrett (2013) advocate that a risk intelligent culture is established when there is an appropriate understanding by employees of risk, which guides their risk attitudes to make well-informed decisions.

In this paper, we argue that SHE risk-related training should allow employees to deal with SHE risks and understand the implementation of mitigation measures. A SHE-related reward and sanction mechanism should be in place to complement the training interventions in embedding the desired SHE risk culture.

3.6 Rewarding appropriate SHE risk-taking behaviour and addressing poor SHE risk-taking behaviour

According to Gandz (2013), reward schemes should support the strengthening of SHE risk culture in companies. However, in order to reinforce the desired SHE risk culture, there should be opportunities available for constructive dissent without repercussions. Aligning incentive schemes to support the SHE risk approach is expected to support the organisation to embed a SHE risk culture. Milne (2007) states that many organisations believe that reward or recognition programmes will help bring about the desired cultural change.

In order to build and entrench an appropriate SHE risk culture coupled with incentivising acts, there needs to be appropriate sanctions applied when there is a deviation from the desired culture. This will support the company to drive the desired SHE risk culture as part of the day-to-day business activities and is not seen as a specific initiative. It should be felt and experienced as ‘the way things are done' in the organisation concerned.

3.7 Elements of a SHE risk culture

Elements of good safety culture are defined in terms of the norms and rules on attitude to safety and how risks are dealt with (Pidgeon, 1991). Safety culture has two key components. The first is the formal safety framework within an organisation. Establishing, communicating and enforcing this framework is the responsibility of management in the organisation. The second is the attitude of staff at all levels in responding to, and benefiting from, the framework (INSAG, 1991).

Komori (2013) identifies important components towards building an effective and sustainable risk culture. This includes agreeing on the need for an appropriate SHE risk culture; identifying behaviours and processes that support it; defining leadership accountable for change; and understanding the near and long-term implications of the risk culture change intervention. Mannan, Mentzer and Zhang (2013) highlight key principles and guidelines that can be used to improve safety culture in organisations. For example, Kimbrough and Componation (2009) argue that an engineering manager responsible for implementing enterprise risk management must clearly understand his or her role and act in a manner that reflects a committed and collaborative risk management culture. Bozeman and Kingsley (1998) recommended that in

order to promote a risk-orientated culture and calculated risk-taking, managers need to trust employees.

Lee (1998) suggests that low-accident plants in the manufacturing sector have the following key characteristics: a high level of communication regarding risks within the organisation; focused, committed and visible leadership; and good organisational learning and quality training. These characteristics remain relevant to any manufacturing plant as they support the mitigation of SHE exposure risk. In many organisations, health and safety committees could be the natural breeding grounds for safety culture change (Nielsen, 2014). Experiences in the financial services and other industries, where a strong risk culture has been achieved, can be applied to a manufacturing organisation in order to improve SHE risk management.

With consideration to the above, it was decided to view SHE risk culture in terms of the tone from the top and operational understanding of the risk management process in this study. Based on a literature study, a SHE risk questionnaire was designed to assess the understanding of the participants regarding following five aspects of SHE risk culture:

- understanding of the SHE risk approach;
- understanding of SHE risks and controls;
- involvement and buy-in;
- communication; and
- governance, leadership and accountability.

In terms of the cited literature, we believe these aspects capture the essence of a SHE risk culture.

4 Method

4.1 Introduction

This study consisted of a literature review and a questionnaire-based survey intended to evaluate the status of SHE risk culture in a large manufacturing organisation in South Africa. The target group for this study consisted of operations personnel and risk and SHE employees at different levels in the company.

4.2 Development of a risk culture questionnaire

A structured self-administered online questionnaire was developed for use in this study. In the development of the survey, the guidance provided by Guldenmund (2007), to develop a questionnaire that yields just enough relevant and valid information, was taken into account. He further suggested that results of previous research can be combined to construct a new questionnaire. This was the approach adopted when developing the questionnaire for this study.

As discussed above, the tone from the top and operational experience of SHE risk culture were assessed in this study. The questionnaire was designed to assess the understanding of the participants of the five aspects of SHE risk culture identified in section 3.7. The questionnaire comprised three sections. The first section asked for demographic information and included: age, gender, ethnic group, nationality, highest level of education and level of current job role.

The second part of the questionnaire consisted of 15 SHE risk culture-specific items, phrased to assess the tone from the top and operational experience of SHE risk culture. The responses obtained were used to evaluate the status of the SHE risk culture within the company as experienced by employees at different levels. The items are listed in the left-hand column of each table.

Based on their experience and knowledge, the participants ranked each of the 15 items according to a 5-point Likert-type scale, from ‘not at all’, ‘not well’, ‘reasonably well’, ‘well’ and ‘perfectly’. Participants were also provided with an additional option to indicate difficulty with understanding the item.

Lastly, an open-ended, free-text question, ‘How can the SHE risk culture in the organisation be improved?', was asked.

4.3 Survey approach and sample

The focus of this study was to determine how SHE risk culture is experienced by management as well as non-management employees in a South African multinational organisation. A combination of convenience and snowball sampling was used. The convenience sampling involved a selected target audience within the organisation's operations, and from the risk and SHE corporate office. Snowball sampling followed when the target audience was requested to forward the study instrument to fellow employees who fitted the study requirements. This sampling method was cost effective and could be conducted within a limited time frame.

The survey was administered using an online tool that allowed for anonymous capturing of the data. Operations personnel and SHE employees at different levels in the organisation were requested via email to complete the survey on a voluntary and confidential basis. The survey was open for a period of one and a half months with regular tracking and follow-ups with participants to encourage optimum response. This approach paid off when a sample of 224 SHE risk stakeholders from different areas within the company completed the questionnaire.

4.5 Analysis

The analysis of the item data was done for the total group as well as for the management and non-management subgroups to allow for comparison between these groups.

The items were categorised into two major subsections, namely, tone from the top and operational experience. The internal reliability of the questionnaire was estimated using Cronbach alpha to evaluate the data set related to tone from the top and operational experience.

In addition, a non-parametric Kruskal-Wallis test and a median one-way analysis were used to assess whether the management and non-management responses differed significantly at the 95% confidence level. This was done for each item in the questionnaire. The SAS® non-parametric procedure was used to perform the analysis. The Wilcoxon and median score types were used to test for differences in location. The Wilcoxon scores are the ranked sums of the data, whereas the median scores are the number of points above the median.

The null hypothesis of the Kruskal-Wallis test confirms that the mean ranks of the groups are the same. Under the null hypothesis of no difference among class levels, the H test statistic of the Kruskal-Wallis test has an asymptotic chi-squared distribution with r – 1 degrees of freedom, where r is the number of class levels. The benefit of using the Kruskal-Wallis test rather than the exact ANOVA is that it can be applied to situations where the observations are not normally distributed. The Kruskall-Wallis test does, however, assume homoscedasticity, which means that it assumes the same distribution for the different groups. The Kruskall-Wallis test will however show the differences between the standard deviations of the two groups' distributions.

This limitation of the test led to a chi-squared test of the frequency distribution. The frequencies, or percentages, of the answers per question show the distribution of each question for the management and non-management group. The frequencies for the options "Not at all" and "Not well" were, however, too low to perform a chi-squared test. The cumulative percentages were

calculated for the options “Not at all”, “Not well” and “Reasonably well”, and “Well” and “Perfectly”, respectively. The cumulative percentages were then tested using the chi-squared test.

Lastly, the open-ended question was analysed separately. Recommendations from individual participants on how to improve the SHE risk culture were summarised using key words and phrases used in the responses.

5 Results and Discussion

The results from the study are presented in the following sections, focusing on:

- demographic information for the sample group;
- descriptive statistics on the responses per item; and
- an analyses of significant differences between management and non-management responses to the 15 items.

5.1 Demographic summary of the sample group

In total of 224 staff members completed the questionnaire. In terms of age, 12% fell in the 20-29-year group; 34% in the 30-39-year group; 34% in the 40-49-year group; 19% were aged 50-59 years, and just 1% were 60 years and older. Male and female participants were fairly equally distributed with 58% male participants and 42% female participants. Given that this is a South African study, the majority of the participants were South African. The group of non-South Africans, who made up 8% of the participants, can be attributed to the international presence of the company. The ethnic composition of the study sample was 56% whites, 23% blacks, 17% Indians, 4% coloureds, one Chinese and one participant listed as ‘other’.

Eighty-two percent of participants indicated that they had a post high school qualification, made up of 10% of the total sample with a college qualification, 35% with a university bachelor’s degree and 37% with a university post-graduate degree. This indicates that the participants in this study were from a well-qualified group. With respect to seniority, 54% of the participants were employed at management level (executive management 3%, senior management 16%

and middle management 35% of the sample), while the balance of 46% were non-management participants.

The discussion of results will now focus on the differences between the perceptions of management vs non-management participants with respect to SHE risk culture.

5.2. Management vs non-management perception of the organisational SHE risk culture

Table 1 shows the descriptive statistics for each questionnaire item. An analysis of the answers to all 15 statements resulted in a high Cronbach alpha coefficient value of 0.92. The Cronbach alpha value related to tone from the top was 0.84. The value for the statements related to operational experience was 0.89. The Cronbach alpha for the full scale is slightly higher than the values for the subsections. The items in the two subsections of the questionnaire also produced Cronbach alpha values higher than 0.80. These findings allowed us to conclude that the scale as a whole, as well as the two subsections, have high internal reliability when used for a large sample of respondents. In addition, only one of the respondents selected the 'I do not understand this statement' option for question 5, leading us to believe that the content of the questionnaire had adequate face validity for our target group.

To analyse the results, the items were allocated to the five SHE culture aspects identified from the literature study, namely, understanding the SHE risk approach, understanding SHE risks and controls, SHE risk involvement and buy-in, communication, and governance, leadership and accountability as illustrated in the tables.

Table 1 contains the minimum and maximum values for each item for the total sample and separated into the management and non-management subgroups. Table 2 shows the median and mode values for every item. Table 3 contains the percentages of the answers per question for the management and non-management groups. The median and mode values for the three groups fell in the 4 (‘well’) and 5 (‘perfectly’) categories (Table 2). These results indicate a generally positive SHE risk culture in the organisation. The descriptive statistics, other than the minimum, do not indicate that the management and the non-management groups answered differently. However, when one observes the percentages as answered by each group, we suspect that statistically significant differences did occur.

The results of the non-parametric Kruskal-Wallis tests and the median one-way analyses are presented in Table 4. These results were used to compare the responses of the management and non-management groups for each item. Some of the items showed a 95% statistically

significant difference between management and non-management responses. The Kruskal-Wallis and the median one-way analyses significance tests had the same outcome for the differences between the responses from management and non-management groups for each item (Table 4). These differences may, however, show only the differences in the standard deviations of the distributions. The results of the chi-squared test of the cumulative percentages for the management and non-management groups are shown in Table 5. The chi-squared test observed an additional statistically significant difference for item 4, “My organisation communicates clearly, effectively and with a common message on SHE risk management to staff”. These results will now be discussed.

Table 1 Minimum and maximum management and non-management responses to the 15 SHE risk culture items

	Minimum value			Maximum value		
	Total n=224	**Man.* n=120**	**Non-man.* n=104**	**Total n=224**	**Man.* n=120**	**Non-man.* n=104**
ITEMS RELATED TO OPERATIONAL EXPERIENCE:						
Understanding of the SHE risk approach						
1. I understand my organisation's approach to SHE risk management	2	2	2	5	5	5
2. I understand how my organisation's strategic objectives link to its SHE risk management process	2	2	2	5	5	5
3. I understand my role in the SHE risk management process	1	2	1	5	5	5
Understanding of SHE risks and controls						
6. I understand what my entity/function's high SHE risks are	1	3	1	5	5	5
7. I understand the controls in place to mitigate my entity/function's high SHE risks	1	1	1	5	5	5
Involvement and buy-in						
8. I implement the specified controls to mitigate the high SHE risks connected to my role	1	2	1	5	5	5
13. My knowledge and understanding of SHE risk allows me to make informed decisions about SHE risk in my daily work-related activities	1	3	1	5	5	5
15. I support the risk-based approach to SHE as implemented in my organisation	1	2	1	5	5	5
ITEMS RELATED TO TONE FROM THE TOP:						
Communication						
4. My organisation communicates clearly, effectively and with a common message on SHE risk management to staff	1	2	1	5	5	5
5. I understand the SHE risk messages sent by senior leadership in my organisation (e.g.: Senior Vice President Risk and SHE, Entity/Function Senior Vice President and Entity Vice President SHE)	1	1	1	5	5	5
Governance, leadership and accountability						
9. I understand the consequences associated with failure to apply controls to mitigate the high SHE risks connected to my role	1	3	1	5	5	5
10. My organisation acknowledges good SHE risk mitigating behaviour	1	1	1	5	5	5
11. The rules of risk behaviour apply equally to employees at all levels in the organisation regardless of seniority	1	1	1	5	5	5
12. I am aware that SHE risks are discussed in various SHE governance structures of the organisation	2	2	2	5	5	5
14. My entity/function takes decisions with due consideration to SHE risks	1	2	1	5	5	5

*Man.= management; non-man. = non-management.

Table 2 Measures of central tendency for management and non-management responses to the 15 SHE risk culture items

	Median*			Mode*		
	Total n=224	**Man. n=120**	**Non-man. n=104**	**Total n=224**	**Man. n=120**	**Non-man. n=104**
ITEMS RELATED TO OPERATIONAL EXPERIENCE:						
Understanding of the SHE risk approach						
1. I understand my organisation's approach to SHE risk management	4	4	4	4	4	4
2. I understand how my organisation's strategic objectives link to its SHE risk management process	4	4	4	4	4	4
3. I understand my role in the SHE risk management process	4	5	4	5	5	4
Understanding of SHE risks and controls						
6. I understand what my entity/function's high SHE risks are	4	5	4	5	5	4
7. I understand the controls in place to mitigate my entity/function's high SHE risks	4	4	4	4	4	4
Involvement and buy-in						
8. I implement the specified controls to mitigate the high SHE risks connected to my role	4	4	4	4	4	4
13. My knowledge and understanding of SHE risk allows me to make informed decisions about SHE risk in my daily work-related activities	4	4	4	4	4	4
15. I support the risk-based approach to SHE as implemented in my organisation	5	5	4	5	5	5
ITEMS RELATED TO TONE FROM THE TOP:						
Communication						
4. My organisation communicates clearly, effectively and with a common message on SHE risk management to staff	4	4	4	4	4	4
5. I understand the SHE risk messages sent by senior leadership in my organisation (e.g.: Senior Vice President Risk and SHE, Entity/Function Senior Vice President and Entity Vice President SHE)	4	4	4	5	5	4
Governance, leadership and accountability						
9. I understand the consequences associated with failure to apply controls to mitigate the high SHE risks connected to my role	5	5	4	5	5	5
10. My organisation acknowledges good SHE risk mitigating behaviour	4	4	4	4	4	4
11. The rules of risk behaviour apply equally to employees at all levels in the organisation regardless of seniority	4	4	4	5	5	4
12. I am aware that SHE risks are discussed in various SHE governance structures of the organisation	4	4	4	4	4	4
14. My entity/function takes decisions with due consideration to SHE risks	4	4	4	4	4	4

*Mean values are not provided, as item-specific values are not valid for Likert-type data.
**Man. = management; non-man. = non-management.

Table 3 Percentage responses to the 15 SHE risk culture items

	Non-management					Management				
	Not at all	Not well	Reasonably well	Well	Perfectly	Not at all	Not well	Reasonably well	Well	Perfectly
ITEMS RELATED TO OPERATIONAL EXPERIENCE:										
Understanding of the SHE risk approach										
1. I understand my organisation's approach to SHE risk management	0	3	24	39	34	0	1	9	46	44
2. I understand how my organisation's strategic objectives link to its SHE risk management process	0	11	23	39	27	0	3	12	51	34
3. I understand my role in the SHE risk management process	1	8	12	41	38	0	1	8	40	51
Understanding of the high SHE risks and controls										
6. I understand what my entity/function's high SHE risks are	1	3	15	47	34	0	0	6	35	59
7. I understand the controls in place to mitigate my entity/function's high SHE risks	1	4	20	46	29	1	1	10	45	43
Involvement and buy-in										
8. I implement the specified controls to mitigate the high SHE risks connected to my role	1	0	19	56	24	0	2	13	53	33
13. My knowledge and understanding of SHE risk allows me to make informed decisions about SHE risk in my daily work-related activities	1	0	13	52	35	0	0	8	47	45
15. I support the risk-based approach to SHE as implemented in my organisation	2	1	12	38	48	0	1	3	29	68
ITEMS RELATED TO TONE FROM THE TOP:										
Communication										
4. My organisation communicates clearly, effectively and with a common message on SHE risk management to staff	1	12	31	32	25	0	8	21	48	23
5. I understand the SHE risk messages sent by senior leadership in my organisation (e.g.: Senior Vice President Risk and SHE, Entity/Function Senior Vice President and Entity Vice President SHE)	0	1	3	32	34	1	0	3	8	43
Governance, leadership and accountability										
9. I understand the consequences associated with failure to apply controls to mitigate the high SHE risks connected to my role	1	1	12	39	47	0	0	3	35	62
10. My organisation acknowledges good SHE risk mitigating behaviour	1	1	9	19	43	0	3	4	26	42
11. The rules of risk behaviour apply equally to employees at all levels in the organisation regardless of seniority	3	13	23	31	30	2	11	18	32	38
12. I am aware that SHE risks are discussed in various SHE governance structures of the organisation	0	6	23	43	28	0	5	9	47	39
14. My entity/function takes decisions with due consideration to SHE risks	1	5	26	45	23	0	2	17	47	35

Table 4 Kruskal-Wallis and median one-way analyses of the 15 SHE risk culture item responses

	Mean rank of Wilcoxon scores		Kruskal-Wallis test		Mean of median scores		Median one-way analysis		Significant difference at the α = 0.05 level for both tests
	Non-man.*	Man.*	Chi-squared **	p value	Non-man.*	Man.*	Chi-squared value	p value	
ITEMS RELATED TO OPERATIONAL EXPERIENCE:									
Understanding of the SHE risk approach									
1. I understand my organisation's approach to SHE risk management	101	122	7.0	0.01	0.4	0.6	4.8	0.03	Yes
2. I understand how my organisation's strategic objectives link to its SHE risk management process	101	122	6.8	0.01	0.4	0.6	5.8	0.02	Yes
3. I understand my role in the SHE risk management process	102	121	5.9	0.02	0.4	0.6	4.0	0.04	Yes
Understanding of SHE risks and controls									
6. I understand what my entity/function's high SHE risks are	95	128	17.8	0.00	0.4	0.6	15.1	0.00	Yes
7. I understand the controls in place to mitigate my entity/function's high SHE risks	100	123	8.2	0.00	0.4	0.6	7.1	0.01	Yes
Involvement and buy-in									
8. I implement the specified controls to mitigate the high SHE risks connected to my role	106	118	2.3	0.13	0.5	0.5	2.4	0.12	No
13. My knowledge and understanding of SHE risk allows me to make informed decisions about SHE risk in my daily work-related activities	105	119	3.1	0.08	0.5	0.5	2.8	0.09	No
15. I support the risk-based approach to SHE as implemented in my organisation	99	124	10.9	0.00	0.4	0.6	8.6	0.00	Yes
ITEMS RELATED TO TONE FROM THE TOP:									
Communication									
4. My organisation communicates clearly. effectively and with a common message on SHE risk management to staff	107	117	1.6	0.21	0.5	0.5	2.4	0.12	No
5. I understand the SHE risk messages sent by senior leadership in my organisation	97	126	12.3	0.00	0.4	0.6	10.1	0.00	Yes
Governance, leadership and accountability									
9. I understand the consequences associated with failure to apply controls to mitigate the high SHE risks connected to my role	102	122	6.9	0.01	0.4	0.6	4.7	0.03	Yes
10. My organisation acknowledges good SHE risk mitigating behaviour	113	112	0.0	0.85	0.5	0.5	0.2	0.70	No
11. The rules of risk behaviour apply equally to employees at all levels in the organisation regardless of seniority	106	118	2.1	0.14	0.5	0.5	2.1	0.14	No
12. I am aware that SHE risks are discussed in various SHE governance structures of the organisation	102	122	6.2	0.01	0.4	0.6	5.9	0.02	Yes
14. My entity/function takes decisions with due consideration to SHE risks	101	122	6.9	0.01	0.4	0.6	6.4	0.01	Yes

*Man. = management; non-man. = non-management.
**H test statistic.

Table 5 Chi-squared analyses of the cumulative percentages of the 15 SHE risk culture item responses

	Cumulative percentage				Chi-squared test		Significant difference at the α = 0,05 level
	Option 1, 2, 3		Option 4, 5				
	Non-man.	Man.	Non-man.	Man.	Chi squared	p value	
ITEMS RELATED TO OPERATIONAL EXPERIENCE:							
Understanding of the SHE risk approach							
1. I understand my organisation's approach to SHE risk management	27%	10%	73%	90%	10.88	0.00	Yes
2. I understand how my organisation's strategic objectives link to its SHE risk management process	34%	15%	66%	85%	10.73	0.00	Yes
3. I understand my role in the SHE risk management process	20%	9%	80%	91%	5.53	0.02	Yes
Understanding of the high SHE risks and controls							
6. I understand what my entity/function's high SHE risks are	19%	6%	81%	94%	9.43	0.00	Yes
7. I understand the controls in place to mitigate my entity/function's high SHE risks	25%	12%	75%	88%	6.75	0.01	Yes
Involvement and buy-in							
8. I implement the specified controls to mitigate the high SHE risks connected to my role	20%	15%	80%	85%	1.04	0.31	No
13. My knowledge and understanding of SHE risk allows me to make informed decisions about SHE risk in my daily work-related activities	13%	8%	87%	92%	1.53	0.22	No
15. I support the risk-based approach to SHE as implemented in my organisation	14%	3%	86%	97%	8.83	0.00	Yes
ITEMS RELATED TO TONE FROM THE TOP:							
Communication							
4. My organisation communicates clearly, effectively and with a common message on SHE risk management to staff	43%	29%	57%	71%	4.83	0.03	Yes
5. I understand the SHE risk messages sent by senior leadership in my organisation (e.g. Senior Vice President Risk and SHE, Entity/Function Senior Vice President and Entity Vice President SHE)	4%	3%	65%	51%	19.39	0.00	Yes
Governance, leadership and accountability							
9. I understand the consequences associated with failure to apply controls to mitigate the high SHE risks connected to my role	13%	3%	87%	97%	7.73	0.01	Yes
10. My organisation acknowledges good SHE risk mitigating behaviour	11%	7%	63%	68%	0.30	0.59	No
11. The rules of risk behaviour apply equally to employees at all levels in the organisation regardless of seniority	39%	31%	61%	69%	1.81	0.18	No
12. I am aware that SHE risks are discussed in various SHE governance structures of the organisation	29%	14%	71%	86%	7.24	0.01	Yes
14. My entity/function takes decisions with due consideration to SHE risks	43%	29%	68%	82%	5.40	0.02	Yes

5.2.1 Understanding of SHE risk approach

Items 1, 2 and 3 of the survey assessed the operational understanding of the SHE risk management approach. The median and mode values of both management and non-management groups indicated that they believe that they understand the approach from 'well' to 'perfectly' (Table 2).

However, statistically significant differences between the management and non-management groups were found. The mean rank of Wilcoxon scores (Table 4) and the mean of the median scores for the management group were higher than those of the non-management group for all three of the items, indicating that the SHE risk approach is better understood by management than non-management. Table 5 confirms the same finding applying the chi-squared analysis to items 1, 2 and 3.

The difference between management and non-management understanding of the SHE risk approach indicates an opportunity for further investigation of the possible causes regarding these differences and corresponding actions to improve this understanding in the organisation.

5.2.2 Understanding SHE risks and controls

Items 6 and 7 of the survey assessed the operational understanding of high SHE risks and associated controls. Both management and non-management indicated that they understood high risks and controls either well or perfectly. However, statistically significant differences between the two groups indicated that the management group felt more confident of their understanding than the non-management group (Tables 4 and 5).

5.2.3 Involvement and buy-in

Items 8, 13 and 15 of the survey assessed the operational experience of involvement and buy-in of both groups in managing SHE risks. On items 8 and 13, both management and non-management provided similar responses, indicating similar levels of comfort when executing SHE risk management actions (Tables 4 and 5).

On item 15 both management and non-management indicated that they support the risk-based approach to SHE, either well or perfectly. However, management indicated a statistically significant higher level of support of the risk-based approach to SHE risk in the organisation. This finding indicates that management should give attention to buy-in into the SHE risk process at the non-management levels of the organisation.

5.2.4 Communication

Items 4 and 5 of the survey assessed the tone from the top in terms of how the SHE risk messages are received and understood at management and non-management levels of the organisation. Based on the answers to item 4, management and non-management employees felt that the organisation communicates clearly, effectively and with a common message on SHE risk management to staff members, using the mean rank of Wilcoxon scores. However, applying the chi-squared analysis of accumulative percentages a significant difference was observed between management and non-management regarding SHE risk messaging (Table 5). The Kruskall-Wallis test did not show that there is a difference in the distribution of the standard deviations for the management and non-management groups. The median for the two groups is the same. However, when one observes the cumulative percentages, 71% of the observations for the management group were either 'well' or 'perfectly', whereas only 57% of the non-managers chose 'well' or 'perfectly'. We therefore conclude that the frequency distributions for the two groups differ and not the shape of the distribution.

For item 5, the mean rank of the Wilcoxon scores for non-management was lower than that of management, indicating that the non-management group felt less comfortable in their understanding of the SHE risk messages sent by senior leadership in the organisation (Table 4). The chi-squared analysis confirmed a significant difference between management and non-management understanding of the risk messaging (Table 5).

These findings should be evaluated according to Farrel and Hoon's (2009) view that setting the appropriate tone from the top must be supported by good communication. Despite initiatives being in place to communicate with employees, how the recipient understands the message and its practical implications is the measure of communication success. In order to appropriately embed the desired SHE risk culture, the organisation will need to review its SHE risk communication strategy, training and approach.

The role of leadership in the communication process should not be underestimated. But more than just communication, visible leadership on the factory floor communicating with non-management should assist in building a solid foundation to embed the appropriate SHE risk culture.

5.2.5 Governance, leadership and accountability

Items 9, 10, 11, 12 and 14 of the survey assessed the tone from the top regarding SHE risk governance, leadership and accountability (Tables 4 and 5). These include governing SHE risks through appropriate structures, rewards and sanctions in response to specific behaviours, and appropriate decision-making with due consideration to SHE risks. Similar responses were obtained from both management and non-management with respect to items 10 and 11 regarding rewards and the application of the rules to employees at all levels.

However, the responses to item 9 showed a statistically significant difference with respect to management and non-management experience regarding sanctions related to non-compliance with SHE risk mitigation measures. Management level employees indicated a greater understanding of the consequences associated with failure to apply controls to mitigate the high SHE risks connected to their role. This finding is mitigated by the high level of understanding indicated by both groups as can be seen from Table 2. However, the apparent difference in extent of understanding is an area that the organisation should give attention to.

Items 12 and 14 both indicated that management were well aware of SHE risk governance and the approach to SHE risk decision making. However, non-management were significantly less confident about their awareness of how these processes work (even though their answers corresponded to the 'well' option of the Likert-scale as shown in Table 2). This finding again indicates that management level employees are probably more comfortable with SHE risk practices in the organisation.

In summary, the data from the Likert-scale items in the questionnaire showed a number of significant differences between the perceptions of managers and non-managers regarding the status of the SHE risk in the organisation. These differences indicated that management felt more comfortable with their understanding of the SHE risk approach, the actual SHE risks and risk management controls than the non-management group. Also, management showed greater support for, and buy-in to, the SHE risk approach than the non-management group. Although, the responses were generally positive, the differences between the experiences and perceptions of the management and non-management groups can be expected to influence the SHE risk culture of the organisation.

The findings for the five categories are reflected in the recommendations discussed in section 5.3.

5.3 Recommendations to improve SHE risk culture

The following open-ended question was posed to the target population: 'How can the SHE risk culture in the organisation be improved?' A wide range of responses relating to how SHE risk culture in the organisation can be improved was received. These responses are indicative of the challenges that should be addressed to facilitate embedding the desired SHE risk culture. For the purposes of this study, detailed consideration will be given to the top 5 response categories. These categories were created by analysing the words or phrases mentioned by the participants and cover 68% of the free-text responses received.

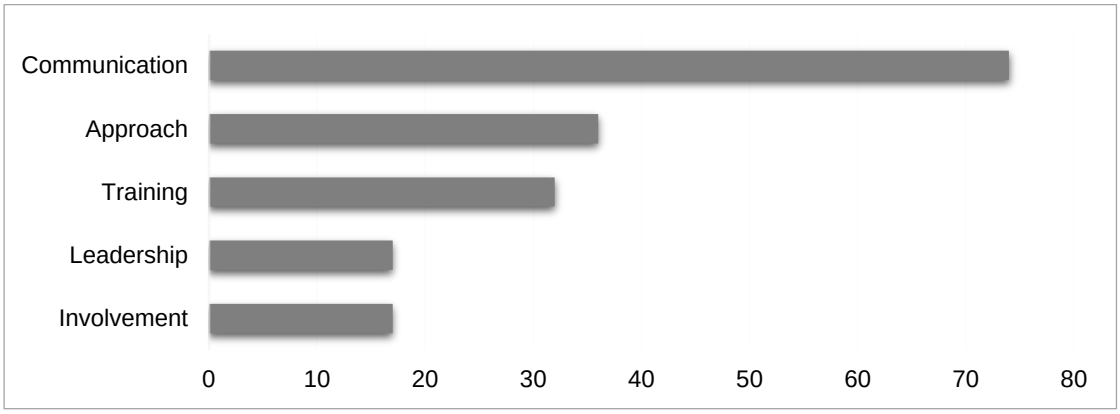

Fig 1: Top five recommendations (in terms of numerical responses) arising from management and non-management responses to the open-ended question.

The participants' responses to the open-ended question highlighted recommended SHE risk improvement areas, including communication, understanding the approach to SHE risk management and the associated culture, training, leadership, and involvement. These results are similar to the five aspects of SHE risk culture identified from the literature in section 3.7 and the findings from the questionnaire. Communication, the approach to SHE risk management and SHE risk-related training were the top three recommendations from the open-ended question. Although it seems from the Likert-type items that the tone is adequately set from the top regarding the implementation and embedding of the SHE risk culture, the open-ended question provided overwhelming requests for improved communication of SHE risks and approach to managing SHE risk. Two of the top three recommendations from the responses to the open-ended question correspond to the findings by Lee (1998) that, within the manufacturing sector, operations that have a low incident rate have the following traits: a high level of communication within the organisation, good organisational learning, and quality training.

5.3.1 SHE risk communication:

In total, 74 responses identified communication-related barriers that needed to be addressed to improve the prevailing SHE risk culture.

The following were some of the main recommendations:

- A clear and standardised SHE risk communication strategy should strengthen and entrench the SHE risk culture throughout the organisation and prevent mixed messages; and

- increased frequency of communication is expected to build and strengthen the desired risk culture message. This process can serve to reinforce and constantly highlight the relevance and importance of the desired SHE risk culture.

As suggested by Dejoy, Schaffer, Wilson, Vandenberg and Butts (2004), with respect to safety, open and effective communication is a key feature to a positive safety climate within the organisation. This can similarly be applied to SHE within the work environment.

Though the tone may be set from the top, engaged leadership with non-management should assist with entrenching a specific SHE risk culture. Appropriate communication is coupled closely to culture change. The clarity and standardisation of communication is therefore essential to embed an appropriate SHE risk culture. Based on this recommendation and the communication-related findings in the Likert-type items, we propose that a communication gap analysis be undertaken, with the aim to clarify the requirements for greater understanding of the SHE risk messages at especially the non-management level in the company.

Acting on the outcome of this, the desired tone in the organisation will be reinforced, employee commitment will be facilitated to the embedding of the SHE risk culture, and ultimately contribute towards driving the SHE risk mitigation strategy.

An existing communication barrier will ultimately impact negatively on the process to embed the SHE risk culture and therefore must be addressed. This is aligned to the view expressed by the Institute for Risk Management of South Africa (2013), in which they suggest that the appropriate risk communication will support the embedding of a risk culture. In order to successfully embed the desired SHE risk culture, the messaging must be understandable and implementable in the day-to-day activities of the target audience to be meaningful.

5.3.2 SHE risk approach

Barriers to improving the prevailing SHE risk culture related to the approach to SHE risk management were identified by 36 of the participants. The following were raised as recommendations to improve SHE risk culture:

- Standardisation and simplification of the SHE risk approach across all business entities should assist with the embedding of the SHE risk culture. Such an approach is likely to result in employees understanding the approach with relative ease and facilitating buy-in into the process;

- the desired SHE risk culture should be supported by the creation of an appropriate climate with operations or line management taking accountability for SHE and for not seeing the delivery of SHE support via the SHE function. Participants highlighted that ownership of SHE risk does not reside with the SHE function, but with operations. Involving operations in the entire process will enable the embedding of the desired SHE risk culture within the organisation as a whole but specifically within operations;

- the benefits associated with implementing an effective SHE culture as well as the appropriate management of SHE risks should be reinforced;

- senior level commitment and alignment should be clearly articulated in messages and actioned by leadership. An important component of this process is to have engaged leadership, where senior leadership in the organisation clearly acts in accordance with the desired culture; and

- the approach ought to be enabled through the implementation of relevant systems to support the desired SHE risk culture. These tools should be standardised and fully aligned to give effect to the SHE risk culture.

These recommendations link to the findings from the Likert-type items.

As suggested by Komori (2013), important factors to achieve an effective and sustainable risk culture are agreement on the risk culture that is suitable for the organisation, behaviours and processes that support it, and leadership taking clear accountability for change. These components should be coupled with simplification, standardisation, and understanding that SHE accountability resides with line management or operations. The successful implementation and embedding of the desired SHE risk culture can be attained through such an approach to SHE risk.

5.3.3 SHE risk training

Training was identified by 32 of the responses as a key component to improve the SHE risk culture in the organisation. The following recommendations were suggested to improve SHE risk culture from a training perspective:

- Improved training and awareness relating to the desired SHE risk culture and the implementation of the risk-based approach to SHE. Skilled and competent employees tend not to act outside the scope of the approach to SHE risk management due to ignorance. Greater knowledge, skill and awareness can serve to reinforce the desired culture; and

- focused SHE risk training that addresses relevant SHE risk-related issues with targeted audiences. This approach should create meaningful outcomes for those receiving the training and equip them with the necessary skills to act in accordance with the organisation's SHE risk culture.

Baret and Barrett (2013) recommended that creating a risk intelligent culture can be established only if there is an appropriate understanding by employees of SHE risks, which guides their risk attitudes to make well informed decisions. Training therefore needs to be able to deliver on these outcomes. This endorses the position that Lee (1988) articulates when he suggested that one of the characteristics of a low-accident plant is where good organisational learning and quality training exists. A well informed and trained workforce will act with more care and diligence as this creates capacitated and empowered accountability.

5.3.4 SHE risk leadership

The role leadership plays was identified by 17 participants, warranting consideration in order to improve the SHE risk culture. The following specific recommendations were noted:

- The importance of visible felt leadership, with management leading by example, was highlighted. The role played by leaders in building the SHE risk culture through their actions and interactions with employees is an important mechanism that can be used to drive the SHE risk culture change; and

- the desired culture should be rolled out to senior leadership first and then to lower levels within the organisation. Leadership buy-in and support is critical for sustained long-term success of any initiative and embedding a SHE risk culture is no different. Having senior leadership supporting the approach to embed the desired SHE risk culture will endorse the tone being set from the top.

Being able to set the tone from the top is only one component of the multi-faceted role that leadership plays. Rather than engaging in ongoing fault finding efforts, leaders should focus on driving the process of embedding the desired risk culture through creating an open, transparent and collaborative environment. Clear and well-directed communication by leadership will support the effort to embed the desired SHE risk culture. Leadership must take every opportunity to celebrate and share the application of the SHE risk culture practice. The process of incentivising the right risk behaviour is crucial whilst applying appropriate sanctions when non-compliances are experienced. The sanctions should be appropriate and not create an environment of fear but rather instil collaboration and buy-in.

5.3.5 SHE risk involvement

Seventeen of the responses identified involvement of employees in the implementation of SHE risk culture as important. The following key recommendations were advanced:

- Involvement of both management and non-management stakeholders in the implementation of the desired SHE risk culture will serve to secure commitment and buy-in to the SHE risk culture for both groups. SHE risk culture formulation and implementation should involve employees from all levels in the organisation. When employees are included in the process, ownership can be established and employees can be expected to start to act in accordance with the desired SHE risk culture; and
- use the shared knowledge and experience of both leadership and employees to enhance and build on the SHE risk culture. Involvement of employees in this context will support buy-in throughout the organisation as a sense of ownership is created.

The involvement of a representative sample of stakeholders in the development and rollout of the SHE risk culture can assist in securing buy-in, which will ultimately achieve success in the mitigation of SHE risk. The collective knowledge and wisdom of operational staff as well as subject matter experts will support the approach and measures to embed a SHE risk culture that is sustainable.

Some of the challenges highlighted above, including those associated with communication, training and leadership, can be identified and addressed appropriately through the involvement of non-management and management early in the SHE risk culture improvement process.

In summary, the recommendations of the survey participants to improve the SHE risk culture both added and linked to the information gained through the Likert-type items.

6 Conclusion

The survey indicated a disconnect between management and non-management experience regarding the establishment of the desired SHE risk culture as identified in the manufacturing company studied. The recommendations from the open-ended questions provide good direction as to what is required to be addressed to embed the desired SHE risk culture. The main areas that require attention and improvement were the following:

- Improvement in communication between management and non-management on SHE risk culture and SHE risk-related matters;
- implementing a simplified and standardised approach to SHE risk management;
- improving training and awareness relating to SHE risk culture and management of SHE risks amongst employees;
- leadership to remain committed and to support the rollout of the desired SHE risk culture. Governance and accountability requirements to be clearly articulated and understood by both management and non-management. Additionally, leadership must remain engaged with employees and act within the confines of the organisation-specific SHE risk culture. Leadership plays a central role to set the tone from the top and lead by example when implementing the desired organisational SHE risk culture; and
- the involvement of both management and non-management stakeholders in the implementation of the SHE risk culture can strengthen commitment and buy-in.

It is our view that the above have been identified as key components towards building and entrenching the desired SHE risk culture in the organisation studied. A well-structured and implemented SHE governance framework (key structures for SHE meetings) in place in all tiers within an organisation will lay the foundation to promote SHE risk culture change as this can be mobilised as a culture change vehicle. Change and communication champions can be identified through these structures to support the SHE culture embedding processes. This framework should assist in demonstrating how issues relevant to SHE risk culture are dealt with from the board level to the shop floor.

This study did not distinguish the perceptions of employees in the SHE risk role versus employees in operational roles as we did not specifically ask this question in the survey. This constitutes a limitation of this study and should be considered as an aspect for future study.

This study provides evidence-based guidance for the manufacturing sector on how to evaluate and improve a desired SHE risk culture. The paper also showed how the concept of risk culture can be applied to SHE risk culture. The questionnaire used in this study can be used by management teams wishing to understand the prevailing SHE risk culture in their organisations. The results of the survey can be used to inform change interventions to improve the existing SHE risk culture in the organisation studied here. The questionnaire should also be useful for further research on the concept of risk culture and in particular SHE risk culture.

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REFLECTION

While reflecting on the article completed in partial fulfilment of my master's studies, there have been some valuable lessons learnt as highlighted below:

What worked well?

- The guidance provided in lectures on how to approach a dissertation coupled with the practical lessons learnt from the reports completed, provided a solid foundation to embark on the process to draft the article;
- the ongoing support and encouragement by the supervisory team instilled a positive drive to complete the mini-dissertation;
- having a structured approach and remaining accountable while securing buy-in from the supervisory team to meet the review commitments, assisted in getting the paper to the next stage in a timely manner;
- accepting criticism in a positive manner and addressing matters raised in a timely manner;
- keeping in constant contact with the supervisory team and advising them of any challenges or difficulties experienced;
- the workshops presented by the Kerlick team, together with the support on the concept outline and finally the guidance and review of our draft articles, were extremely valuable. The writer's retreat was indeed a value adding experience and an excellent mechanism get the article appropriately updated for final review by the supervisory team. The experience with the Kerlick team made a material contribution to the improvement of my article.

What I would do differently?

- I would allocate more time from a planning perspective to ensure that the writing is spread out over a longer period;
- three blocks of three-day sessions with the Kerlick team at different intervals in the drafting process would contribute significantly to the drafting;
- it would have also been valuable to co-opt a subject matter expert/critical reviewer earlier in the process to shape my thinking.

What would I do to apply my learnings in the workplace?

This study provides evidence-based guidance for my company regarding an approach to implementing a desired SHE risk culture. The results of this study will be communicated internally among the Risk and SHE Executive Committee and with the other members of both the Risk and SHE team. The company is in the process of reviewing its entire approach to risk management, inclusive of SHE risk management. The results of the study can be used to inform some of the thinking being applied and to test some of the work completed. The practical value derived from this study has come at an opportune moment as the organisation has merged the Risk and SHE functions. The learning from this study can therefore be easily shared on a single platform with key decision-makers in the risk and SHE corporate office structure for proactive inventions to be implemented. The recommendations made with respect to embedding a SHE risk culture will be given specific attention among relevant stakeholders. However, given the merger of Risk and SHE into a single function, the recommendations can be applied within the broader context of Risk as well.

APPENDICE

Appendix A: Journal writing/author guidelines

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Appendix B - Survey explanation and consent

APPLIED RISK MANAGEMENT

SHE Risk Culture Survey

Survey explanation and consent

Dear Participant

You are invited to participate in an academic research study conducted by the Centre for Applied Risk Management (UARM), North West University Vaal Triangle Campus. (http://www.nwu.ac.za/uarm/home)

The goal of the study is to obtain an understanding of the status of the SHE risk culture within [redacted]. Our ultimate aim is to use the findings of this study to create a diagnostic tool that can be used to evaluate and improve the risk culture of a manufacturing organisation such as [redacted].

Consent to conduct the research has been obtained from [redacted] subject to the following conditions:
1. This is an anonymous survey. The answers you give will be treated as strictly confidential.
2. [redacted] will not be identified in the research report.
The data will be reported as a case study in the manufacturing sector without identifying the organisation the study was done in.
3. The data will be analysed and only reported in aggregated format.
4. The general results of the study may be published in an academic journal.

Take note:
1. Please answer the questions as completely and honestly as possible.
2. The first part of the questionnaire asks for biographical information followed by questions on your experience of risk.
3. It should take you less than 15 minutes to complete the whole survey.
4. Please answer all the questions.
5. Only complete the survey once per application process.

1. I have read the information above and consent to participate in this study on a voluntary basis

- ◯ Yes
- ◯ No

APPLIED RISK MANAGEMENT

SHE Risk Culture Survey

Biographical information

This section asks for information about yourself. This information will be used in the analysis of the data and not to identify you.

Please select the option that best describes yourself.

1. Select the category that contains your current age

- ◯ younger than 20 years old
- ◯ 20-29
- ◯ 30-39
- ◯ 40-49
- ◯ 50-59
- ◯ 60 or older

2. Your gender

- ◯ Female
- ◯ Male

3. Your ethnic group

- ◯ Black
- ◯ Chinese
- ◯ Coloured
- ◯ Indian
- ◯ White
- ◯ Other

Other (please specify)

4. Your nationality

- ◯ South African
- ◯ Other

Other (please specify)

5. Highest level of formal education completed

- ◯ No formal education
- ◯ Primary school
- ◯ High school
- ◯ College
- ◯ University bachelor's degree
- ◯ University post-graduate degree
- ◯ Other

Other (please specify)

6. Level of your current role in your organisation

- ◯ Executive
- ◯ Senior Management
- ◯ Middle Management
- ◯ Non-management

7. Name the entity you work for

8. Name the functional area/department/section within the entity that you work for

APPLIED RISK MANAGEMENT

SHE Risk Culture Survey

SHE Risk Culture Survey

Please rate your own knowledge and experience of the risk processes in the organisation that you work for by selecting the most appropriate option for each item below.

Note: In this study 'my/the organisation/entity/function' refers to employment in [redacted]

1. I understand my organisation's approach to SHE risk management

Not at all	Not well	Reasonably well	Well	Perfectly	I do not understand this statement
○	○	○	○	○	○

2. I understand how my organisation's strategic objectives link to its SHE risk management process

Not at all	Not well	Reasonably well	Well	Perfectly	I do not understand this statement
○	○	○	○	○	○

3. I understand my role in the SHE risk management process

Not at all	Not well	Reasonably well	Well	Perfectly	I do not understand this statement
○	○	○	○	○	○

4. My organisation communicates clearly, effectively and with a common message on SHE risk management to staff

Not at all	Not well	Reasonably well	Well	Perfectly	I do not understand this statement
○	○	○	○	○	○

5. I understand the SHE risk messages sent by senior leadership in my organisation (e.g.: Senior Vice President Risk and SHE, Entity/Function Senior Vice President and Entity Vice President SHE)

Not at all	A little	Moderately	Very	Absolutely	I do not understand this statement
○	○	○	○	○	○

6. I understand what my entity/function's high SHE risks are

Not at all	Not well	Reasonably well	Well	Perfectly	I do not understand this statement
○	○	○	○	○	○

7. I understand the controls in place to mitigate my entity/function's high SHE risks

Not at all	Not well	Reasonably well	Well	Perfectly	I do not understand this statement
○	○	○	○	○	○

8. I implement the specified controls to mitigate the high SHE risks connected to my role

Not at all	Not well	Reasonably well	Well	Perfectly	I do not understand this statement
○	○	○	○	○	○

9. I understand the consequences associated with failure to apply controls to mitigate the high SHE risks connected to my role

Not at all	Not well	Reasonably well	Well	Perfectly	I do not understand this statement
○	○	○	○	○	○

10. My organisation acknowledges good SHE risk mitigating behaviour

Not at all	Not well	Reasonably well	Well	Perfectly	I do not understand this statement
○	○	○	○	○	○

11. The rules of risk behaviour apply equally to employees at all levels in the organisation regardless of seniority

Not at all	Not well	Reasonably well	Well	Perfectly	I do not understand this statement
○	○	○	○	○	○

12. I am aware that SHE risks are discussed in various SHE governance structures of the organisation

Not at all	Not well	Reasonably well	Well	Perfectly	I do not understand this statement
○	○	○	○	○	○

13. My knowledge and understanding of SHE risk allows me to make informed decisions about SHE risk in my daily work-related activities

Not at all	Not well	Reasonably well	Well	Perfectly	I do not understand this statement
○	○	○	○	○	○

14. My entity/function takes decisions with due consideration to SHE risks

Not at all	Not well	Reasonably well	Well	Perfectly	I do not understand this statement
○	○	○	○	○	○

15. I support the risk based approach to SHE as implemented in my organisation

Not at all	Not well	Reasonably well	Well	Perfectly	I do not understand this statement
○	○	○	○	○	○

16. How can the SHE risk culture in the organisation be improved?

APPLIED RISK MANAGEMENT

SHE Risk Culture Survey

Thank you!

Your participation in this survey is much appreciated.

Should you have any questions or comments regarding the study, please contact the UARM Manager:
Prof. Hermien Zaaiman, hermien.zaaiman@nwu.ac.za

OR

Chan Naidoo [redacted]