

**Change risk culture: Insights from  
employees at a South African chemical  
manufacturer**

**RS Nair**

 **orcid.org 0000-0001-7071-5536**

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Supervisor: JF Goede

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## **PREFACE**

This mini-dissertation is the final deliverable for the Master of Commerce (MCom) in Applied Risk Management. The mini-dissertation was written in article format and consists of three sections: Research project overview; Article; and Reflection.

This study provided the researcher with an opportunity to learn how to conduct an applied research project and to demonstrate mastery of research at master's degree level within a research team context. This mini-dissertation is the student's work. The student was responsible for the final concept, set up, execution of the research project at the company studied and writing of the mini-dissertation. The members of the supervisory team contributed in an advisory and technical support capacity to study conception and design, analysis and interpretation of data and critical revision of the manuscript. The university appointed statistician performed the statistical analyses required to interpret the study findings to be able to answer the reported study's research questions. The mini-dissertation was language edited before submission. However, the student is responsible for effecting the edits, and for the grammatical correctness of the document before hand-in.

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

## ABSTRACT

Improving risk culture has been acknowledged by academics and practitioners as a means to effectively manage uncertainty and risk, thereby achieving a company's strategic objectives. Organisations adopt change initiatives as strategies for business improvement and sustainability. A conducive company culture is commonly cited in the academic literature as a prerequisite for a successful change initiative. Such change introduces uncertainty and risks too, that need to be handled appropriately. The South African chemical manufacturer in this study recently adopted lean manufacturing as an improvement strategy. Past failure with a similar change initiative highlighted the need to determine if the risk culture is amenable to changes in the organisation. The objectives of this study were to ascertain the perceptions of change risk culture as well as perceived level of comfort with change risk roles among the management and front-line employee groups. To this end, an online-based survey was administered to 653 employees, generating a response rate of 34% (n = 220). Tests for significance between the management and front-line groups were performed, with the risk culture perceptions of management indicating more optimism to welcome change than the front-line employees. Management were found to be more comfortable with their own change risk roles than the front-line employees. Recommendations to improve the change risk culture were also made by the participants, with the understanding of change risk, communication, risk role, leadership, accountability and reward constituting 80% of suggestions. A plan to improve the change risk culture at the company using change management principles was proposed. Despite the study's limitations, this research provides a baseline for other academics and practitioners to build onto the body of knowledge on the scarcely researched topic of change risk culture.

**Keywords:** change management, change risk culture, chemical manufacturer, lean manufacturing, organisational change, questionnaire survey

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# RESEARCH PROJECT OVERVIEW

## Project summary

The chemical manufacturer chosen for this study has established risk management frameworks, structures and governance policies at group level, which are cascaded down to the various operational facilities. The company regularly makes changes to its systems and processes to ensure continuous improvement in safety, quality and productivity. More recently, lean manufacturing was adopted as a strategy for business improvement. Previous attempts to introduce change initiatives proved to be unsustainable. Despite the academic literature indicating that such initiatives require a conducive culture to succeed, the risk culture associated with such change has not been assessed in the literature nor at the chemical manufacturer. The objectives of the study reported here were first to identify if there are differences in the perceptions of change risk culture as well as comfort with change risk roles between management and front-line employees; second, if so, the areas where the company can focus on to improve the risk culture associated with change initiatives. The primary research question was postulated as follows: “How do the perceptions of change risk culture compare between management and the front-line employee groups?”. A literature review provided insight on the concept of risk culture and organisational change such as lean manufacturing, thereby shedding light on the similarities between the concepts. To achieve the research objectives, a quantitative study was undertaken under the North-West University’s Centre for Applied Risk Management (UARM) Risk Culture Scale (UARM RCS) project within the Optentia Enhancing Risk Culture research programme. Further details pertaining to the use of the scale are furnished in Appendix B. A change-risk focused version of the UARM RCS was distributed to the target population. Following the data collection period, the responses were statistically analysed, allowing for inferences and conclusions to be drawn. Recommendations to improve the change risk culture as well as for future research were presented.

## Expected contribution of this study

This study is the first to assess the change risk culture at a manufacturing organisation in the chemical sector in South Africa. The results also provide more details to supplement the literature on culture associated with change initiatives such as lean manufacturing.

## Target audiences

The outcomes of this research project are expected to be valuable to executives, senior and middle management at the chemical manufacturer who are keen to understand risk culture associated with organisational change. The results may also be beneficial for academics as well as to practitioners of lean and continuous improvement who may be interested in attaining insight into culture that supports business improvement initiatives.

## Journal selection

Due to the expanse of knowledge available on change initiatives such as lean manufacturing, a platform which provides an international audience the opportunity to peruse similar topics would be apt for publication. The *Journal of Manufacturing Technology Management* (ISSN: 1741-038X) was selected as the journal of choice. Published by the Emerald Group, online access to 135 issues of the journal are available since 2014. As per the aims and scope of the journal, articles that merge theoretical concepts with practical application are preferred. Topics such as, but not limited to lean manufacturing and applying surveys as employed in this research are sought after. In 2019, the journal had a Scopus CiteScore of 6.1, whereas the 2020 year-to-date CiteScore is 7.2, indicative of the large extent to which researchers cite articles from this journal. The 2019 Impact Factor was 3.4. This article is believed to be the first to examine the risk culture associated with change initiatives such as lean manufacturing at a manufacturing company in the chemical sector, thus providing academics and practitioners a basis to amass knowledge on this research topic. The guidelines for publishing articles in this journal can be viewed by accessing the following link:

[https://www.emeraldgrouppublishing.com/journal/jmtm?distinct\\_id=174246a3080527-0b4af149ed1d26-3323766-1aeaa0-174246a3081332&\\_ga=2.45159916.995450566.1601211629-34342490.1598338775#author-guidelines](https://www.emeraldgrouppublishing.com/journal/jmtm?distinct_id=174246a3080527-0b4af149ed1d26-3323766-1aeaa0-174246a3081332&_ga=2.45159916.995450566.1601211629-34342490.1598338775#author-guidelines)

Due to the journal's prerequisite for a high level of quality work, the suitability of this article to be published will be determined post-examination, after taking the examiners' feedback into account.

## ARTICLE

### **Change risk culture: Insights from employees at a South African chemical manufacturer**

#### **Abstract**

Improving risk culture has been acknowledged by academics and practitioners as a means to effectively manage uncertainty and risk, thereby achieving a company's strategic objectives. Organisations adopt change initiatives as strategies for business improvement and sustainability. A conducive company culture is commonly cited in the academic literature as a prerequisite for a successful change initiative. Such change introduces uncertainty and risks too, that need to be handled appropriately. The South African chemical manufacturer in this study recently adopted lean manufacturing as an improvement strategy. Past failure with a similar change initiative highlighted the need to determine if the risk culture is amenable to changes in the organisation. The objectives of this study were to ascertain the perceptions of change risk culture as well as perceived level of comfort with change risk roles among the management and front-line employee groups. To this end, an online-based survey was administered to 653 employees, generating a response rate of 34% (n = 220). Tests for significance between the management and front-line groups were performed, with the risk culture perceptions of management indicating more optimism to welcome change than the front-line employees. Management were found to be more comfortable with their own change risk roles than the front-line employees. Recommendations to improve the change risk culture were also made by the participants, with the understanding of change risk, communication, risk role, leadership, accountability and reward constituting 80% of suggestions. A plan to improve the change risk culture at the company using change management principles was proposed. Despite the study's limitations, this research provides a baseline for other academics and practitioners to build onto the body of knowledge on the scarcely researched topic of change risk culture.

**Keywords:** change management, change risk culture, chemical manufacturer, lean manufacturing, organisational change, questionnaire survey

## Introduction

Organisations face numerous challenges ranging from losing market share to competitors, rising commodity prices, stricter health, safety and environmental regulations, to an increasing reliance on automation and the use of technology. Consequently, these entities seek to innovate through continuous improvement, thus placing an emphasis on change. A suitable culture is essential to achieve a successful and sustainable change initiative (Alves & Alves, 2015). One such initiative is lean manufacturing, an operational strategy adopted by organisations for business improvement, which requires a conducive culture to succeed (Alhuraish et al., 2017; Iranmanesh et al., 2019; Zhang et al., 2017). The chemical manufacturer considered in this study continuously pursues innovation by implementing changes to processes and systems. To this end, the company embarked on a lean manufacturing programme at the end of 2017 with the aim of achieving sustainable performance whilst empowering management and front-line employees. Previously in 2009, the Toyota Production Management (TPM) system, which is a similar continuous improvement change initiative, was launched by the same chemical manufacturer. However, despite four years of attempted implementation, TPM failed to be applied consistently, for reasons unknown and not investigated.

Waddell and Sohal (1998) indicated that organisational change initiatives are typically evaluated based on their “consequences”, which of course are not guaranteed to be known until the initiative is completed and adequate time has passed. This suggests that, inevitably, uncertainty is involved, implying that the management of risk associated with change initiatives is vital. Risk management is a key process that allows organisations to achieve their strategic objectives by improving the decision-making involved in the handling of risks (Aven, 2016; Clarke & Varma, 1999).

Significant efforts are made by organisations to quantify a variety of risks with intricate models, although cultural and behavioural aspects are still intangible (Roeschmann, 2014). Following the 2008 financial crises, regulatory bodies and financial institutions started to ascertain that risks that were handled poorly had more to do with culture and behaviour as opposed to limitations in formal risk management systems. This led to the acknowledgement of the value of a sound risk culture in organisations. Elements of a sound risk culture, especially in the financial sector, have been widely discussed (FSB, 2014; Palermo et al., 2017; Ring et al., 2016).

Despite the increasing awareness of risk culture and the plethora of literature indicating that a sound culture is critical to ensure a successful change initiative such as lean manufacturing, there is sparse academic and practitioner knowledge on the risk culture associated with change initiatives. The chemical manufacturer considered in this study places huge emphasis on change initiatives and yet has experienced inconsistencies in their adoption by the organisation in the past.

Although highly beneficial, lean manufacturing at organisations has a low success rate of 10% (Bhasin, 2012; Dorval et al., 2019; Paro & Gerolamo, 2017; Zhang et al., 2017). For these reasons, understanding the change risk culture at the chemical manufacturer in this research was considered to be crucial.

The research questions addressed in this study therefore were:

- How do the perceptions of change risk culture compare between the management and front-line employee groups?
- How do the management and front-line employee groups compare with respect to comfort with their own change risk roles?
- What are the improvement areas in the change risk culture that the chemical manufacturer could consider to implement change more successfully?

The primary objective of this study was therefore to identify if there were differences in perceptions of change risk culture as well as comfort with their change risk roles between management and front-line personnel. Second, the study sought to recognise the areas where the company could focus to improve the risk culture associated with change initiatives. Similar to the top-down implementation approach of the TPM system, this study postulates that the change risk culture perceptions, as well as comfort with own change risk roles of management, indicate more optimism to introduce and accommodate change than experienced by the front-line personnel (Loyd et al., 2020). To achieve these research goals, a survey was conducted by a questionnaire distributed to the management and front-line groups to evaluate the status of risk culture at the chemical manufacturer.

## **Background**

### **Organisational culture, risk management and risk culture**

Studies of organisational culture date back many decades. Pettigrew (1979) discussed aspects that need to be considered in the creation of organisational culture. Among them are factors such as commitment and purpose that are created through feelings and actions of individuals. Culture is defined as the “*collective programming of the mind that distinguishes the members of one group or category of people from others*” (Hofstede, 2011). He also explained that organisational cultures are visible through actions and practices, which provides a sense of what is going on in the workplace. Prajogo and McDermott (2005) specified organisational culture as the shared beliefs and values amongst individuals which lead to the behaviours and practices that are observable. The performance of a company is critically influenced by organisational culture (Paro & Gerolamo, 2017).

Organisations that perform better than others are said to align their culture with their strategy (Pakdil & Leonard, 2015). Numerous studies have been conducted to understand the role that culture plays in organisations, some of which focus on the dimensions and nature of organisational culture (Bortolotti et al., 2015). However, the understanding of culture in organisations cannot be improved if scholars, who may bring more understanding, do not spend more time in the field (Schein, 1996). To this end, according to Paro and Gerolamo (2017), explorative qualitative approaches such as interviews or quantitative methods such as questionnaire surveys of the kind reported in this study can be used to collect data on employee perceptions to evaluate and better appreciate organisational culture.

Risk management as a discipline has a history of some 40 years, with most academic studies discussing the fundamentals on how to assess and manage risk (Aven, 2016). Companies have to face a raft of interrelated risks relating to their operations, and supply chain, as well as environmental, financial and political issues (Boulton & Dominus, 2014). These authors highlighted the need for organisations to equip each employee to recognise and respond to risk, thereby establishing a culture that is more risk aware. According to Roeschmann (2014), significant effort goes into the quantitative modelling of risks and establishing risk management frameworks, yet the cultural and behavioural aspects are the least understood. The financial crises of 2007–2009 proved to be a trigger for banks and regulatory bodies to investigate the root causes of scandals and non-compliance incidents (Ring et al., 2016; Walter & Narring, 2020). This led to the introduction of the risk culture concept in the banking sector and the requirement for financial organisations to improve their risk culture (Palermo et al., 2017). For an organisation to enhance its risk culture, there needs to be a common understanding by academics and practitioners of the concept and what it entails. Suddaby (2010) indicated that definitions are key to capturing the characteristics of a concept. The definitions of risk culture, as stated in various articles and consulting documents, are listed in Table 1. The definition coined by the Centre for Applied Risk Management (UARM) of North-West University (NWU) at the top of the list in the table will be used in this study (Zaaiman et al., In progress).

**Table 1: Risk culture definitions**

| Source                       | Risk culture definitions                                                                                                                                                                                                                                                                                                                                       |
|------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Zaaiman et al. (In progress) | "The risk culture of an organisational group is manifested by the importance given to considering risk when the group makes decisions. The level of explicit inclusion of risk in decision-making represents the implicit, subjective value afforded to risk by the group"                                                                                     |
| Domanska-Szaruga (2020)      | "Values, convictions, knowledge of and approaches to risk shared by a group of people with a common intended purpose, in particular the employees of an organisation"                                                                                                                                                                                          |
| Walter & Narring (2020)      | "Risk culture influences the decisions of the management and employees during the day-to-day activities and has an impact on the risks they assume"                                                                                                                                                                                                            |
| KPMG (2018)                  | "An organisation's risk culture reflects the collective norms, values, attitudes, and behaviours of members of the organisation"                                                                                                                                                                                                                               |
| Palermo et al. (2017)        | "How organisational actors navigate complexities at the level of both ends and means and how they perceive and construct their repertoire of responses"                                                                                                                                                                                                        |
| APRA (2016)                  | "The norms and traditions of behaviour of individuals and of groups within an organisation that determine the way in which they identify, understand, discuss, and act on the risks the organisation confronts and the risks it takes"                                                                                                                         |
| Ring et al. (2016)           | "Values, beliefs, knowledge and understanding about risk shared by a group of people with a common purpose"                                                                                                                                                                                                                                                    |
| CRO (2015)                   | "Risk culture is a shared philosophy of managing uncertainty that is embedded within an entity"                                                                                                                                                                                                                                                                |
| Roeschmann (2014)            | "It defines which rules and norms members of the group have learned over time to be rational and important, which hence are used and implemented with more or less understanding, conviction, or motivation. It guides how risk-relevant information is provided, understood and used, and how global rules are enacted within the context of local realities" |
| Deloitte (2012)              | "Risk culture encompasses the general awareness, attitudes, and behaviours of an organisation's employees toward risk and how risk is managed within the organisation"                                                                                                                                                                                         |
| Levy et al. (2010)           | "The norms of behaviour for individuals and groups within an organisation that determine the collective ability to identify and understand, openly discuss and act on the organisation's current and future risks"                                                                                                                                             |

Interest has been shown by regulatory bodies such as the Financial Stability Board to improve the risk culture of banks, thereby creating value through more effective risk management (Carretta et al., 2017). Indicators of a sound risk culture – such as “tone from the top”, “accountability”, “effective communication and challenge” and “incentives” – have been proposed for institutions to consider when reviewing risk culture (FSB, 2014). Domańska-Szaruga (2020) alluded to the use of continuous improvement models to develop or improve risk culture. The evaluation of the baseline risk culture status of an organisation was specified as an initial step in this improvement process (Bennett et al., 2020). According to Sheedy et al. (2017), little is revealed in the academic literature on the attitudes or perceptions of employees toward risk-related matters. Practitioners, on the other hand, devise methods of obtaining information pertaining to the “risk climate” or “risk environment” with surveys (APRA, 2016; CRO, 2015; Deloitte, 2012; KPMG, 2018; Levy et al., 2010). Both academics and practitioners use the terms “climate” and “culture” interchangeably (Casey et al., 2017). The term “culture” is used for the purposes of this study. For support, organisations should engage with consulting, audit and research-related institutions with a vested interest in these matters as this would minimise subjective evaluations from self-assessments (Domańska-Szaruga, 2020).

Despite risk culture gaining prominence since the 2008 financial crisis, the concept is certainly not new. According to Ashby et al. (2012), it can be traced back to the 1980-s and to Piper Alpha, an

oil platform in the North Sea that exploded with extensive loss of life and was one of the worst industrial disasters the world had then witnessed. Moreover, safety culture has been discussed in the literature for decades (Carroll, 1998; Nordlöf et al., 2017; Strauch, 2015; Vierendeels et al., 2018). More recently, with organisations experiencing cyber-related attacks, the culture associated with how information and data are handled is gaining attention (Munteanu & Fotache, 2015; Nasir et al., 2019; Tang et al., 2016). With global uncertainty, organisations are obliged to make changes to their strategic operating models for purposes of sustainability. How culture supports organisational change now needs to be discussed.

### **Lean manufacturing and organisational change**

An operational strategy adopted by organisations to improve business that requires a conducive culture, is lean manufacturing (LM) (Alefari et al., 2017; Alhuraish et al., 2017; Iranmanesh et al., 2019; Sreedharan et al., 2018; Zhang et al., 2017; Zuliyanti et al., 2017). The roots of LM stem from the operating philosophy of the Toyota Motor Corporation in Japan (Alves & Alves, 2015). According to Scherrer-Rathje et al. (2009), the abundance of academic literature on LM as well as its industry-wide adoption indicates the value-add of this improvement strategy. LM focuses on adding value to the final product by minimising waste and delivering quality product on time, through the involvement and empowerment of employees (Mor et al., 2018). Waste is generally known as anything that exceeds the minimum required amounts (Bonavia & Marin Juan, 2006), examples of which include overproduction, excess raw material stock, exceeding standard production time, equipment-related breakdowns, quality defects and needless activities to complete a task (Randhawa & Ahuja, 2017).

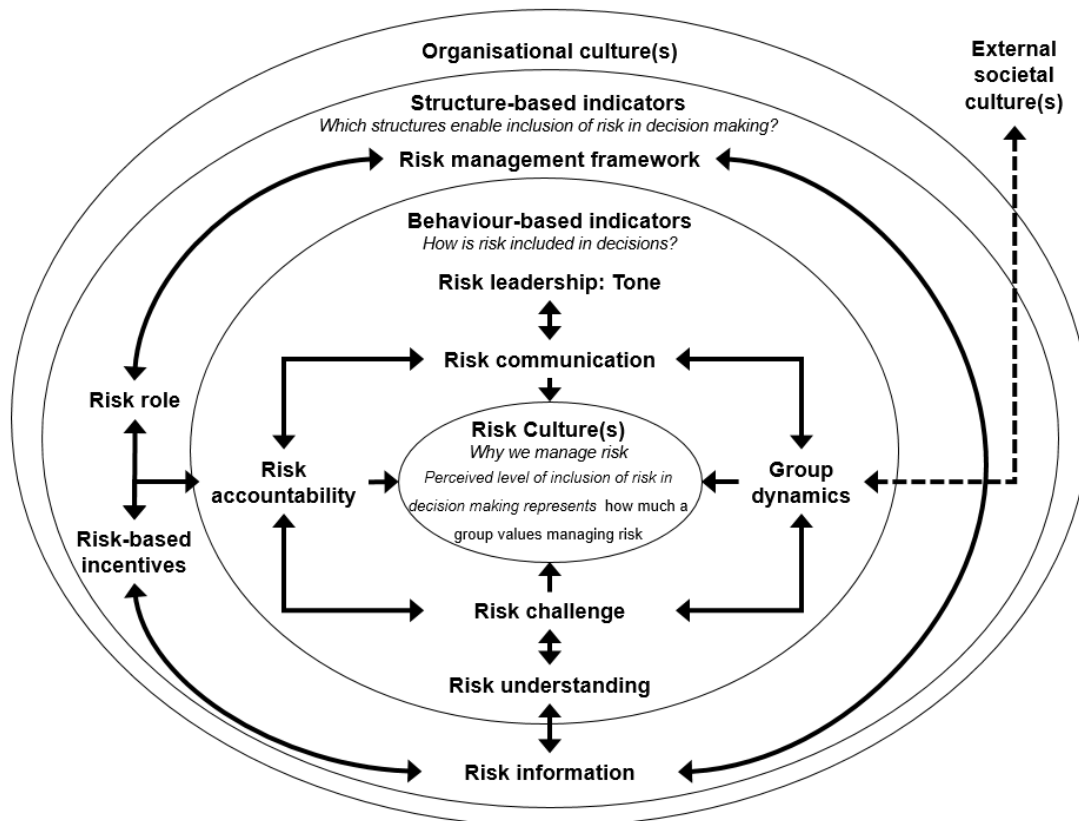
There are numerous practices and tools related to LM that aim to improve operational performance by identifying and reducing waste (Belekoukias et al., 2014; Panwar et al., 2015). Best practices such as 5S (a five-step process to identify and remove waste) and autonomous maintenance are adopted to achieve a clean and orderly work environment with equipment functioning optimally with minimum breakdowns (Panwar et al., 2015). Standardised work is a practice that allows operators to follow a specific set of instructions when making a product. Such procedures can minimise process variation across all employees in different shifts and also serve as training material for new recruits (Mor et al., 2018). Visual management is a practice that enables teams to monitor their performance metrics and drive problem-solving through collaboration if targets are not met (Eaidgah et al., 2016). A widely used root-cause analysis tool within LM, 5-Why, is employed to identify the root causes of problems by asking “why” five times (Gangidi, 2019). All the above-mentioned practices and tools are implemented at the chemical manufacturer considered in this study.

Despite its potential benefits, the adoption of LM faces many challenges, with a success rate of only 10% (Dorval et al., 2019). There is a common misconception of equating LM to the tools that can be used for process and efficiency improvement. According to Mann (2009), only 20% of LM implementation is based on the tools, whereas the remaining 80% focuses on behaviours and practices, that is, the way things are done. This is reciprocated in terms of Toyota's success with TPM, through the fostering of a sound culture on all organisational levels (Lloyd et al., 2020). The authors indicated that management at Toyota viewed front-line employees as highly knowledgeable and crucial to the process of continuous improvement. Management was said to be more inclusive by engaging with the workforce. This level of engagement between management and front-line employees and "sound culture" is perhaps a critical aspect that other companies including the chemical manufacturer in this study may have failed to consider. Nordin and Deros (2017) reported that LM requires a change in an organisation's structure, processes and individual behaviours. Such change is not a once-off occurrence but rather a continuous effort (Nordin et al., 2012). AlManei et al. (2018) considered LM as an evolutionary change, that is, involving a significant change over time, which requires a change culture. Resistance to change initiatives was discussed by Waddell and Sohal (1998) as critical in understanding why organisations are not always successful when introducing change. Individuals are not necessarily opposed to change, however, but rather to the uncertainty and potential outcomes that may come from change. "*The effect of uncertainty on objectives*" is defined as risk (ISO, 2009). In the study reported here, LM is considered as an example of change that introduces risk and uncertainty, which in turn needs to be managed accordingly. Only one study was found to discuss the effect of change risks on decision-making (Apostolopoulos et al., 2016). The authors focused on methods to facilitate the management of change risks in the project management field, considering that change brings risk, which in turn can lead to the detriment of a project's life cycle. Culture was found to be a key factor for change risk; however, there was no evidence of this culture being investigated.

### **Similarities between risk culture and lean manufacturing**

The increasing awareness of risk culture in financial organisations as well as change initiatives including continuous improvement in other industries can be attributed to problems such as sub-standard practices, rising competition and major incidents (Ashby et al., 2012). Numerous studies have discussed the critical success factors pertaining to LM implementation (Alhuraish et al., 2017; Sreedharan et al., 2018; Zhang et al., 2017; Zuliyanti et al., 2017). A review of the LM literature allowed for the mapping of success factors to the risk culture indicators in the risk-informed decision culture (RiDC) model shown in Figure 1. The RiDC model was developed to form the basis on which both quantitative and qualitative research can be performed in an applied manner across organisational sectors (Zaaiman et al., In progress). Appendix A shows that all the LM critical success factors identified are related to the risk culture indicators. The Risk Culture Scale,

elaborated in the Method section of this paper, was established based on the RiDC model and was adopted to assess the change risk culture which has not yet been established in the literature nor at the chemical manufacturer in this study. The most frequently cited critical success factor was found to be “management commitment and support”. It is possible that management personnel at the chemical company studied perceive the risk culture and their change risk roles to be adequate for introducing new initiatives, whereas the front-line employees may have other views.



**Figure 1: The risk-informed decision culture (RiDC) model (Zaaiman et al., In progress).**

### The chemical manufacturer

This research study was performed at the primary production facility of a South African chemicals company listed on the JSE Ltd. The core business is the manufacturing and delivering of a diverse range of granular and liquid chemical products for the agriculture, mining and chemical sectors in South Africa as well as foreign markets. The production facility comprises several interconnected unit operations in the value chain, some of which produce feedstock to reduce costs and dependency on raw material suppliers. Risk management is an established function within the entity, with relevant reporting structures and regular risk assessments taking place at a site level because safety, health and environmental risks materialise more frequently. The firm continuously seeks to improve its systems, processes and after-sales customer support. More recently, organic product and data technology-based businesses were acquired to diversify the company's portfolio.

The chemical manufacturer is not immune to factors that threaten its sustainability. External variables such as growing competition and rising commodity prices as well as internal issues such as safety, quality incidents and inconsistent production forced the leaders in the organisation to alter the manufacturer's operational strategy, with LM being adopted for business improvement. As discussed earlier, the Toyota Production Management system was attempted previously, albeit with no success. This study has proved to be crucial in understanding the change risk culture at the company to potentially ensure that both current and future change initiatives are sustainable and successful.

## **Method**

This section explains the approach used in the study to achieve the research objectives.

### **Study type**

This questionnaire survey-based quantitative study aimed to establish the perceptions of change risk culture at the organisation under consideration. A survey proved to be practical considering the time limitations, ease of administration and the ability to reach a relatively large study population (Ha & Zhang, 2019).

### **Survey instrument**

As part of the larger UARM risk culture research programme, the Risk Culture Scale (UARM RCS-2019) (Zaaiman et al., In progress) was used to collect the data. Appendix B provides the generic RCS, which was slightly customised for the purposes of this study, as follows. The word "risk" in the items were replaced with the words "change risk" to focus the participants' attention on that specific type of risk. The scale comprises two sections, the first containing two items related to demography and the second featuring 42 items related to change risk culture.

The first demographic question, "How well do you understand English?", with response options: 1 = "Very poorly", 2 = "Poorly", 3 = "Reasonably well", 4 = "Well", 5 = "Extremely well", was posed to ascertain the participants' grasp of the English language, thereby allowing for potential improvement in future research to accommodate those with lower levels of understanding. The second demographic question, "What is your current function in the organisation?", with response options: "Director", "Senior Manager", "Plant Manager", "Engineering Manager", "Engineer", "Technician", "Superintendent", "Foreman", "Process Leader", "Shift Supervisor", "Operator", "Artisan", "Fitter", "Electrician", "Mechanic", allowed the researcher to cluster the responses into the relevant study groups for analysis purposes. The functions from "Director" to "Foreman" form

part of the management group, whereas the remaining functions represent the front-line employees.

Two ranges of response options were provided for the other 42 items in the form of a five-point Likert scale, depending on the type of item:

- 1 = “Never”, 2 = “Infrequently”, 3 = “Sometimes”, 4 = “Usually”, 5 = “Always”.
- 1 = “Not at all”, 2 = “Not well”, 3 = “Moderately well”, 4 = “Well”, 5 = “Perfectly”.

A sixth option, “I do not know” or “I do not understand the statement”, was also provided for each item to cater for participants who had limited knowledge or opinion on an item. This would potentially reduce response bias, that is, having to select either side of the response spectrum (Croasmun & Ostrom, 2011). The UARM RCS-2019 has been refined and piloted over 4 years (2016–2019). The 2019 version of the scale showed a high Cronbach  $\alpha$  reliability coefficient of 0.97 (internal consistency). The scale measures two risk-culture-related factors:

- Factor 1: Risk culture as defined in UARM – Perceived level of integration of risk in decision-making processes (24 items)
- Factor 2: Diagnostic factor – Comfort with own risk management role (18 items).

Furthermore, the following diagnostic items were also included:

- “All identified change risks are reviewed regularly to ensure that the risks are addressed effectively” with response options: 0 = “I do not know”, 1 = “Never”, 2 = “Infrequently”, 3 = “Sometimes”, 4 = “Usually”, 5 = “Always”.
- “The organisation allows sufficient time to embed change initiatives such as lean manufacturing” with response options: 0 = “I do not know”, 1 = “Strongly disagree”, 2 = “Disagree”, 3 = “Agree”, 4 = “Strongly agree”.
- “To improve the inclusion of risk in decision-making in the organisation, I believe that we must start with improving...”.

### **Target study population and sample**

This study was conducted at the primary production facility of a South African chemical manufacturer with a global footprint. The facility was selected over its sister sites due to its higher production volumes. The facility comprises 893 full-time employees. Kothari (1990, p. 19) advocated that purposive sampling is a technique in which the researcher deliberately selects a portion of the population to constitute the sample. I used this method to select management and the front-line employees in the production, supply chain and engineering departments as they are

involved in risk-related activities and participate in change initiatives. Departments such as Human Resources, Information Technology, Finance, Security and Administration were not included in the scope of this study as they are not the main target of change initiatives. The target population, consisting of 55 management and 598 front-line personnel, were issued with the questionnaire.

Baruch and Holtom (2008) suggested that an acceptable survey response rate in studies of organisations is around 36%, albeit primarily based on United States data. An acceptable response rate of 13% was identified from organisational surveys in India (Krishnan & Poullose, 2016). These authors also discussed the potential influence that national culture has on response rates. A greater power distance (felt between management and other employees) was said to result in lower response rates. In a South African context, the power distance index is around 50, placing it between the United States with 40 and India with around 75 (Hofstede et al., 2010, p. 103). Considering this relationship, an acceptable response rate in this study would be anywhere between 13% and 36%. This study yielded a response rate of 34%, which is deemed to be adequate. The response rates per study group are elaborated in more detail in the results and discussion section of this article.

### **Data collection and analysis**

The online scale was delivered via Research.net (SurveyMonkey's professional plan). Data gathering was conducted by UARM and the data sets were housed and analysed by UARM. After NWU ethics clearance for the study and formal permission was obtained from the company to apply the scale, the measure was customised by the researcher for the study. A weblink to the scale was distributed via e-mail and text message by a Human Resources Business Partner. Dewaele (2018, p. 281) advised performing pilot tests whereby a small group of participants can provide critical feedback in respect of questionnaire layout, intelligibility and logic. A pilot study was therefore conducted for improvement suggestions. In addition, no technical glitches were reported having been faced by the pilot group when accessing the link. Thereafter as part of the official research project, the link to the questionnaire was distributed and left open for a period of four weeks (9 July – 29 July 2020) and was closed after a maximum of two reminders were issued to intended participants to complete the survey. The survey was conducted during uncertain times in the organisation, due to the global Covid-19 pandemic and company turnaround with restructuring. The restructuring process spanned three months, ending on 16 August 2020, with a phased recruitment approach starting with senior management and ending with the operators in the front-line teams.

Statistical analyses of the UARM RCS-2019 survey responses was performed by the UARM appointed statistician using SAS®. Descriptive statistics such as frequencies and percentages were

recorded on the demographic-related responses to determine the response rates of the study groups. The study's "Very poorly" and "Poorly" responses to the "How well do you understand English?" demography question were analysed to identify the portion of the respondent sample that may have found some concepts in the questionnaire challenging to understand. This information allowed the researcher to suggest alternative data collection methods for future studies. Factor analysis was incorporated in the development of the instrument scale. Tests for data normality were applied as part of the test selection process. Normality of the score distributions could not be assumed and statistically significant differences were identified using non-parametric tests. Significant differences between groups were tested at the 95% significance level, using the non-parametric Mann–Whitney U test when comparing two groups. The results from this analysis were interpreted by the researcher allowing for deductions to be made on the study objectives. The study's "I do not know" and "I do not understand the statement" answers were analysed separately, thereby providing valuable information on the levels of uncertainty about risk-culture-related aspects in the study sample that could be indicative of possible risk-related knowledge or its lack in the study population.

### **Ethical considerations**

The study was conducted after approval was provided by the NWU Faculty of Economics and Management Sciences ethics committee (ethics approval number NWU-00708-20-A4). Permission to conduct the study at the chemical manufacturer was granted by the facility's operational Director. The scale was set up for anonymous data capturing, meaning that the study participants could not be identified from the demographic information requested. In addition to confidentiality and with the aim of ensuring voluntary participation, an introductory page to the questionnaire shown in Appendix C, briefed participants on their right to withdraw from the survey at their own discretion, whilst also requesting their consent. Employee contact numbers were sourced from line management to distribute the questionnaire. This information was obtained without issue as employees are required to provide contact information to the company in the case of emergency, work and communication matters. The researcher could not influence the participants and their responses owing to the online nature of the questionnaire. The data were stored safely with the UARM department, thereby preventing potential breaches by third parties. The researcher took efforts to ensure that the identity of the chemical manufacturer was kept anonymous.

### **Learning through reflection**

The academic literature is rich with discussions on the role that reflective journals play in establishing transparency in qualitative research (Noble & Smith, 2015; Nowell et al., 2017; Ortlipp, 2008). Reliability and validity in quantitative research has been discussed albeit with a focus on the

research instrument's ability to produce replicable results and whether it correctly measures the construct under examination. Rolfe (2006) avers that generating best practices for the quality assessment of research studies is pointless. This is because each study is unique and so a research report is recommended to be read together with the researcher's reflective diary to ascertain the quality of work done. It is for this reason that I have incorporated a reflective journal in this study that can be viewed in Appendix D.

### **Limitations with the research approach**

Despite the advantages of quantitative research based on a questionnaire survey, there are limitations that cannot be ignored. According to Dewaele (2018, p. 275), questionnaires may seem to impose on those who have little participatory experience. Having multiple-choice options in the form of Likert scales may also unearth bad memories from taking tests at school. Most respondents were found not to be English-first-language speakers with some indicating low levels of understanding of English. Potential to translate survey items for future research needs to be investigated. Furthermore, it is the company's strict policy to limit e-mail access to management and only some front-line personnel. This necessitated the sourcing of contact numbers to which the survey link was distributed. Upon distribution of the survey via e-mail and text message, 22 messages including "failed to send" or "delivery failure notification" were received, indicating either that the potential participants had incorrect e-mail addresses or contact numbers. Considering that the front-line employees constitute a large portion of the study population, alternative data collection methods may be sought if higher response rates are to be achieved should such an exercise be repeated, some of which are recommended in the concluding chapter of this report.

### **Results and discussion**

The results of this study are discussed in the following order: respondent demographics, change risk culture factor refinement, questionnaire reliability, change risk culture factor scores, the "I do not know" and "I do not understand" responses, diagnostic item analysis, and the change risk culture improvement suggestions as provided by the participants.

#### **Demographic information**

A total of 653 management and front-line employees were requested to partake in the survey, with 220 completing the questionnaire, resulting in an overall response rate of 34%. This is deemed as acceptable in a South African organisational context, with an overall response rate of between 13% and 36% being targeted for this study. Out of the production facility's small population of 55 management personnel, 46 responses (84%) were obtained. The very high response rate of

management could indicate their significant level of interest in the study. Of the 598 front-line personnel, 174 completed the survey, resulting in a response rate of 29%. The lower response rate from the front-line employees may be attributed to the Covid-19 outbreak at the site and the impending threat of retrenchment by the employer. The response rates per study group are shown in Table 2 and indicate an adequate representation of the overall population.

**Table 2: Study groups' response rates**

|                     | <b>Total (n)</b> | <b>Management</b> | <b>Front-line</b> |
|---------------------|------------------|-------------------|-------------------|
| <b>Invited</b>      | 653              | 55                | 598               |
|                     | %                | 8                 | 92                |
| <b>Participated</b> | 220              | 46                | 174               |
|                     | %                | 84                | 29                |

A breakdown of the respondent groups per job function is provided in Table 3.

**Table 3: Distribution of responses per job function**

| <b>Study group</b> | <b>Job function</b> | <b>Frequency</b> | <b>Percentage of respondent sample (%)</b> |
|--------------------|---------------------|------------------|--------------------------------------------|
| Management         | Director            | 3                | 1.4                                        |
|                    | Senior manager      | 4                | 1.8                                        |
|                    | Plant manager       | 3                | 1.4                                        |
|                    | Engineering manager | 2                | 0.9                                        |
|                    | Engineer            | 8                | 3.6                                        |
|                    | Technician          | 8                | 3.6                                        |
|                    | Superintendent      | 8                | 3.6                                        |
|                    | Foreman             | 10               | 4.6                                        |
| Front-line         | Process leader      | 21               | 9.6                                        |
|                    | Shift supervisor    | 3                | 1.4                                        |
|                    | Operator            | 108              | 49.1                                       |
|                    | Artisan             | 24               | 10.9                                       |
|                    | Fitter              | 6                | 2.7                                        |
|                    | Electrician         | 7                | 3.2                                        |
|                    | Mechanician         | 5                | 2.3                                        |
| Total              |                     | 220              | 100                                        |

Only five respondents (2.3%), all from the front-line group revealed in Table 4, indicated that they had relatively low levels of understanding of English. Although the 2.3% is not significant to warrant

an intervention, there exists the possibility that certain terms used in the scale may not have been understood by some respondents. Risk literacy across the organisation could be focused on in future research. Despite 11 official languages in South Africa, the business language at the company is English, with procedural documents and meetings written and conducted in the language. English was therefore acceptable for the purposes of a survey.

**Table 4: Distribution of the levels of understanding of English**

| <b>How well do you understand English?</b> | <b>Management</b> | <b>Front-line</b> | <b>Total</b> | <b>Percentage (%)</b> |
|--------------------------------------------|-------------------|-------------------|--------------|-----------------------|
| Very poorly                                | 0                 | 2                 | 2            | 0.9                   |
| Poorly                                     | 0                 | 3                 | 3            | 1.4                   |
| Reasonably well                            | 2                 | 31                | 33           | 15.0                  |
| Well                                       | 24                | 98                | 122          | 55.5                  |
| Extremely well                             | 20                | 40                | 60           | 27.3                  |
| Total                                      | 46                | 174               | 220          | 100                   |

### **Change risk culture factor refinement**

The UARM RCS-2019 and associated factor measures, discussed in the Method section as well as in Appendix B, are based on the larger risk culture research programme of North-West University. Factor analysis performed on this study's sample data reduced the total number of useful survey items from 42 to 29. Two factors were generated: Factor 1 measured the perception of change risk culture and Factor 2 measured the comfort with own change risk role; 13 items were derived for Factor 1, whereas 16 items were obtained for Factor 2. The "I do not know" answers were not included in the scale's factor analysis, and only participants with fewer than 30% of the "I do not know" answers (per factor) were included in the calculation of the factor scores. This means that the participant had to answer at least 9 of the items in Factor 1 and 11 items in Factor 2 to be included in the calculation of the factor score.

### **Questionnaire reliability**

The PROC CORR procedure in SAS® was used to test for reliability. A Cronbach alpha of 0.98 indicated the high reliability of the scale for the sample studied.

### **Change risk culture factor scores**

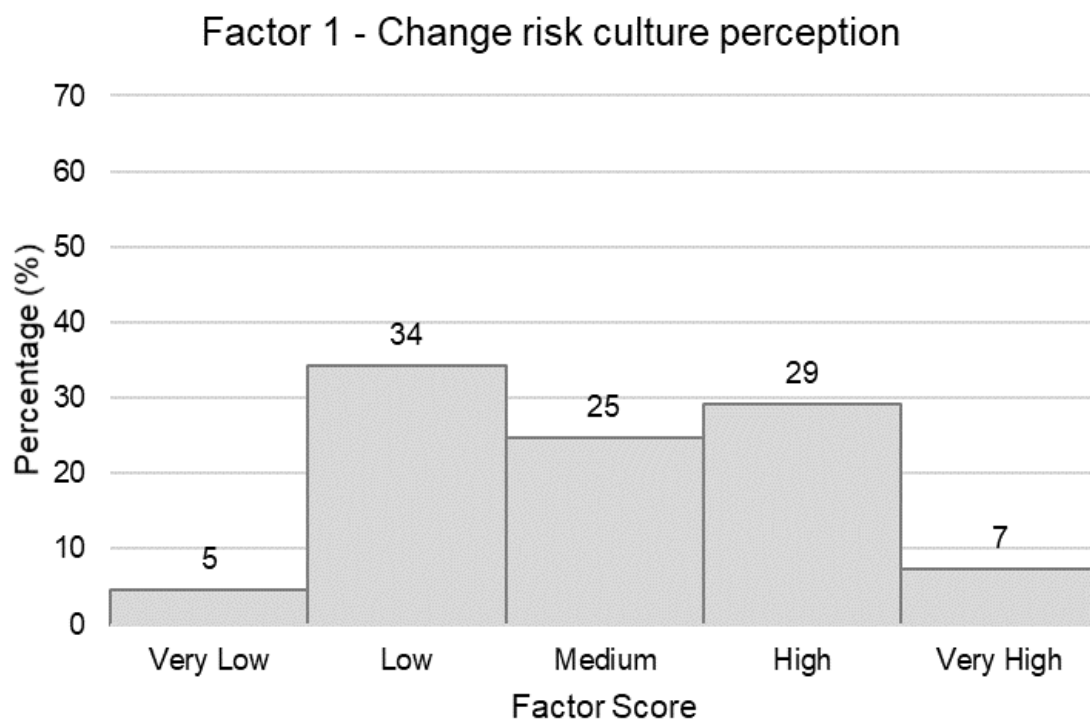
The change risk culture factor scores were obtained by calculating the average of the responses over the items making up each factor. Factor 1, serving as the measure for the perception of change

risk culture, was 3 for all participants whereas that for Factor 2, measuring the comfort with own change risk role, was 3.2. The factor scores per respondent group are shown in Table 5. Based on the scale developed by Zaiman et al. (In progress) in Appendix B, both management and front-line groups indicated a medium level of integration of risk in decision-making (risk culture) with scores of 3.4 and 2.9, respectively. Management had a high level of comfort with their change risk roles (3.8) when compared to the medium level of comfort (3.1) shown by the front-line employees. The difference in comfort with own change risk roles could be attributed to the lack of clarity in responsibilities among the front-line employees.

**Table 5: Factor scores for the respondent groups**

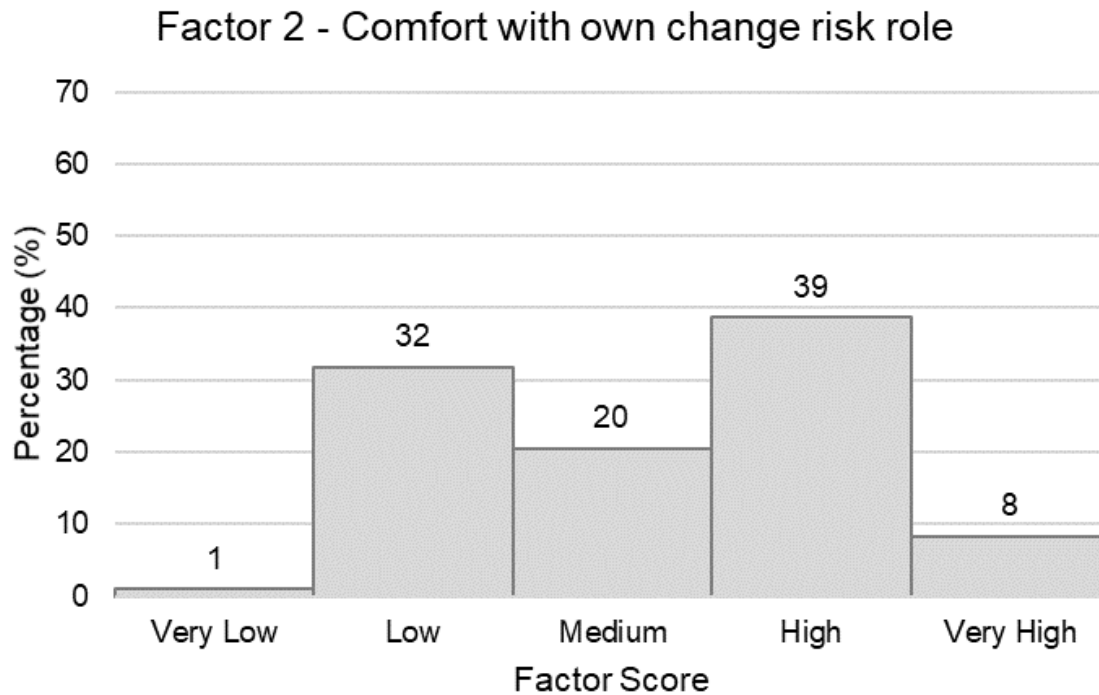
| Study group | Factor scores |          |
|-------------|---------------|----------|
|             | Factor 1      | Factor 2 |
| Management  | 3.4           | 3.8      |
| Front-line  | 2.9           | 3.1      |

Tests for data normality using the PROC UNIVARIATE procedure in SAS® were also performed to gauge how the factor scores were distributed for the two groups. Figure 2 illustrates a positively skewed distribution of the Factor 1 scores, with scores indicating a slight tendency towards the left of the scale.



**Figure 2: Distribution of the study sample's change risk culture perception responses.**

The Factor 2 scores were also distributed unevenly and are shown in Figure 3.



**Figure 3: Distribution of the study sample's comfort with own change risk role responses.**

Since the parametric assumption of normality did not hold true, the use of a non-parametric test was required to test for significant differences between the two study groups' distributions. The Mann–Whitney U test was performed using the PROC NPAR1WAY procedure in SAS®. The following hypotheses were tested:

*H1,0:* There are no differences in the risk culture perceptions between management and front-line groups.

*H1,A:* The risk culture perceptions of management indicate more optimism to introduce and accommodate change than experienced by the front-line personnel.

*H2,0:* There are no differences in comfort with own change risk roles between management and front-line groups.

*H2,A:* Management are more comfortable with their own change risk roles than the front-line personnel.

The foundation behind the alternative hypotheses (*H1,A* and *H2,A*) is that management personnel generate and drive strategies for change such as the TPM system, although it is the front-line personnel who are affected by the change (Lloyd et al., 2020). Having limited exposure to change initiatives such as lean manufacturing and its proposed benefits, a lack of clarity with respect to their roles and responsibilities and limited communication and training may hinder the front-line from

easily adopting the change. Table 6 depicts the results of the tests on the differences between the management and front-line groups. A p-value of 0.003 was generated from the significance test for Factor 1. As this value is less than the significance level of 0.05,  $H1,0$  is rejected for Factor 1. The risk culture perceptions of management indicate more optimism to introduce and accommodate change than the front-line personnel, therefore answering the first research question.

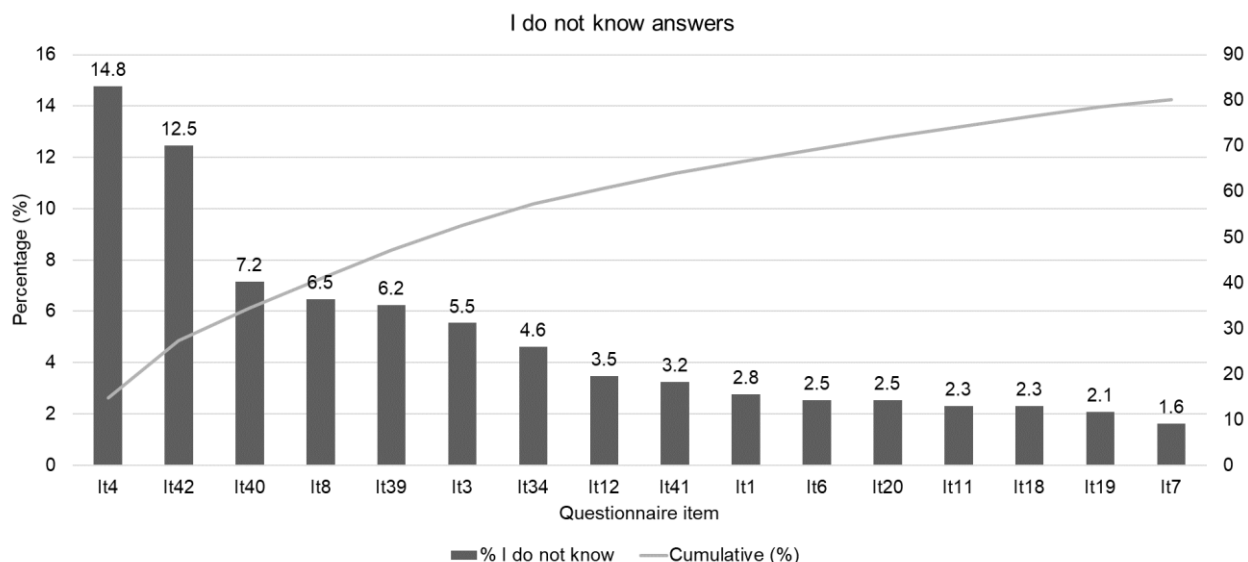
**Table 6: Tests for differences between management and front-line groups**

| Level of role                                    | n   | Wilcoxon mean score | Chi-square test statistic | p-value | Significant difference at $\alpha = 0.05$ |
|--------------------------------------------------|-----|---------------------|---------------------------|---------|-------------------------------------------|
| Factor 1: Change risk culture perception measure |     |                     |                           |         |                                           |
| Management                                       | 45  | 135                 | 8.59                      | 0.003   | Yes                                       |
| Front-line                                       | 174 | 104                 |                           |         |                                           |
| Factor 2: Comfort with own change risk role      |     |                     |                           |         |                                           |
| Management                                       | 46  | 146                 | 17.73                     | <0.0001 | Yes                                       |
| Front-line                                       | 174 | 101                 |                           |         |                                           |

The significance test for Factor 2 yielded a p-value smaller than 0.0001. Being much lower than the significance level of 0.05, the null hypothesis ( $H2,0$ ) is rejected for this factor. As expected, the management group is more comfortable with their own change risk roles than the front-line employees, thereby answering the second research question.

### Examining the “I do not know” responses

The “I do not know” and “I do not understand the statement” responses provide valuable information on the levels of uncertainty about risk-culture-related aspects in the study sample that could be indicative of possible risk-related knowledge, or of its lack, in the study population. The Pareto principle, typically used to identify the 20% of causes that results in 80% of the problems, was applied to highlight the questionnaire items out of the initial 42 that constitute 80% of the “I do not know” responses (Fadeyi et al., 2016; Nallusamy & Majumdar, 2017). Eighty percent of the respondents’ “I do not know” responses are shown in Figure 4.



**Figure 4: Frequency distribution of “I do not know” responses.**

As observed in the graph, several items in the top 80% have similar and low frequencies. For the purposes of prioritisation, items with more than 3% frequency are listed in Table 7 for discussion. Items 39, 40 and 42 all refer to performance management and subsequent incentives that employees receive. The uncertainty from employees at the facility on these aspects corroborates with the fact that there is no performance management system to assess employee performance. In relation to this, there is no standard practice to reward the workforce for meeting objectives. This gap serves to indicate an improvement opportunity that senior management can consider. Items 3 and 4 specify whether the organisation considers threats and opportunities when defining objectives while also defining the boundaries within which risks can be tolerated. It can be argued that these decisions are taken at a more strategic and senior management level, although the very same objectives are cascaded down to the various teams in the organisation. It could prove worthwhile to articulate the business objectives together with the consequences for the company if objectives are not met, to employees at other levels. This may serve to improve understanding of change and associated risks among the workforce. Item 8 alludes to recognising the work performed by risk management teams. Uncertainty about this item may result from the assumption that risk is inherently managed by all employees on site, as opposed to having a dedicated team. Item 34 proved to be interesting because the sample respondents were unsure as to whether training adds value. This uncertainty may relate to the content of the training and whether it links directly to managing risks associated with change.

**Table 7: List of prioritised “I do not know” responses**

| Item | “I do not know responses” (%) | Description                                                                                                        |
|------|-------------------------------|--------------------------------------------------------------------------------------------------------------------|
| 4    | 14.8                          | The organisation manages its change risks within its risk appetite limits.                                         |
| 42   | 12.5                          | Managers use change risk management as criterion when evaluating the performance of staff members.                 |
| 40   | 7.2                           | The organisation punishes staff members who take irresponsible change risks.                                       |
| 8    | 6.5                           | The work of the formal change risk management functions is appreciated by the other functions in the organisation. |
| 39   | 6.2                           | The organisation rewards staff members who take responsible change risks.                                          |
| 3    | 5.5                           | The organisation clearly links change risks and opportunities when defining its objectives.                        |
| 34   | 4.6                           | The organisation's change risk training initiatives have prepared me to manage the risks connected to my role.     |

Contrary to the items with the most “I do not know” responses, three items garnered no uncertainty from the respondents and are shown in Table 8. The responses are valuable in the sense that they indicate a broad understanding of the items that does not require further explanation or training to the participants. The study sample were clear with their responses regarding their trust, or lack of it, in the messages from management on change risk-related issues and are shown in Figure 5. Some 52% of management indicated that they trust the messages from their managers, whereas 38% of the front-line specified otherwise.

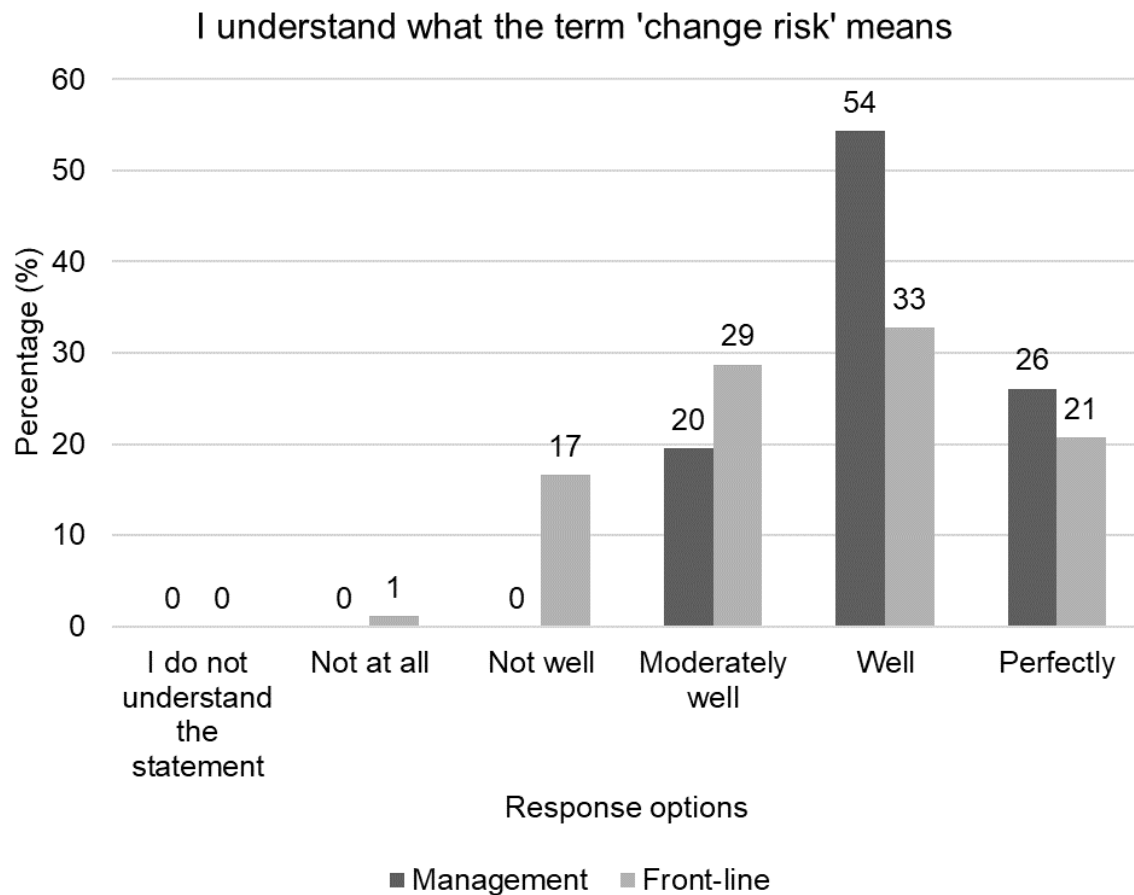
**Table 8: Survey items with zero “I do not know” responses**

| Item | Description                                                                   |
|------|-------------------------------------------------------------------------------|
| 5    | I trust the messages from management on change risk-related issues.           |
| 24   | I understand what the term ‘change risk’ means.                               |
| 25   | I understand the link between the organisation’s change risks and objectives. |



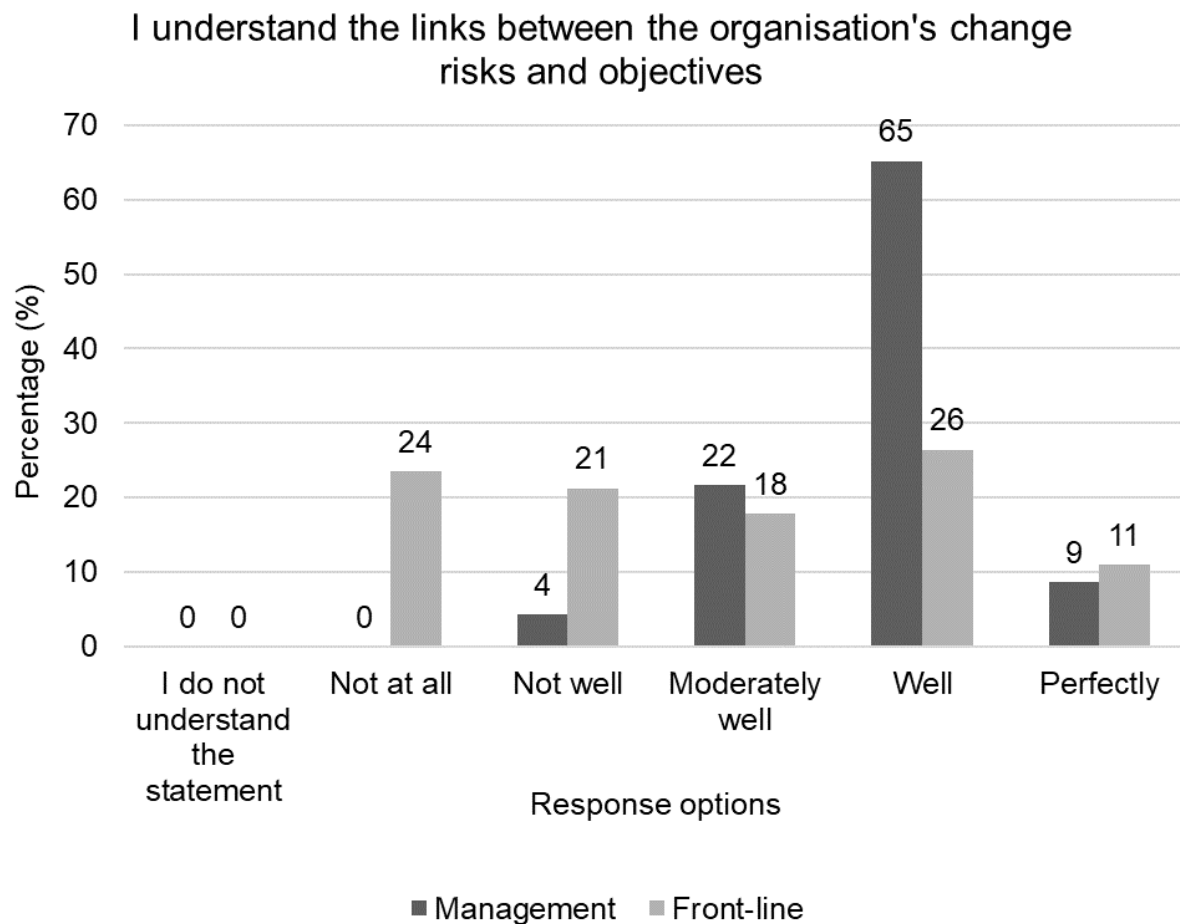
**Figure 5: Distribution of responses to “I trust the messages from management on change risk-related issues”.**

From Figure 6, 80% of management and 54% of the front-line employees specified that they understood the concept of change risk, which proves to be encouraging in terms of understanding the risk type and is crucial for this survey. Few front-line employees (18%) said that they did not understand the concept well and none replied “I do not know”. This lack of awareness can be improved through training and communication.



**Figure 6: Distribution of responses to “I understand what the term ‘change risk’ means”.**

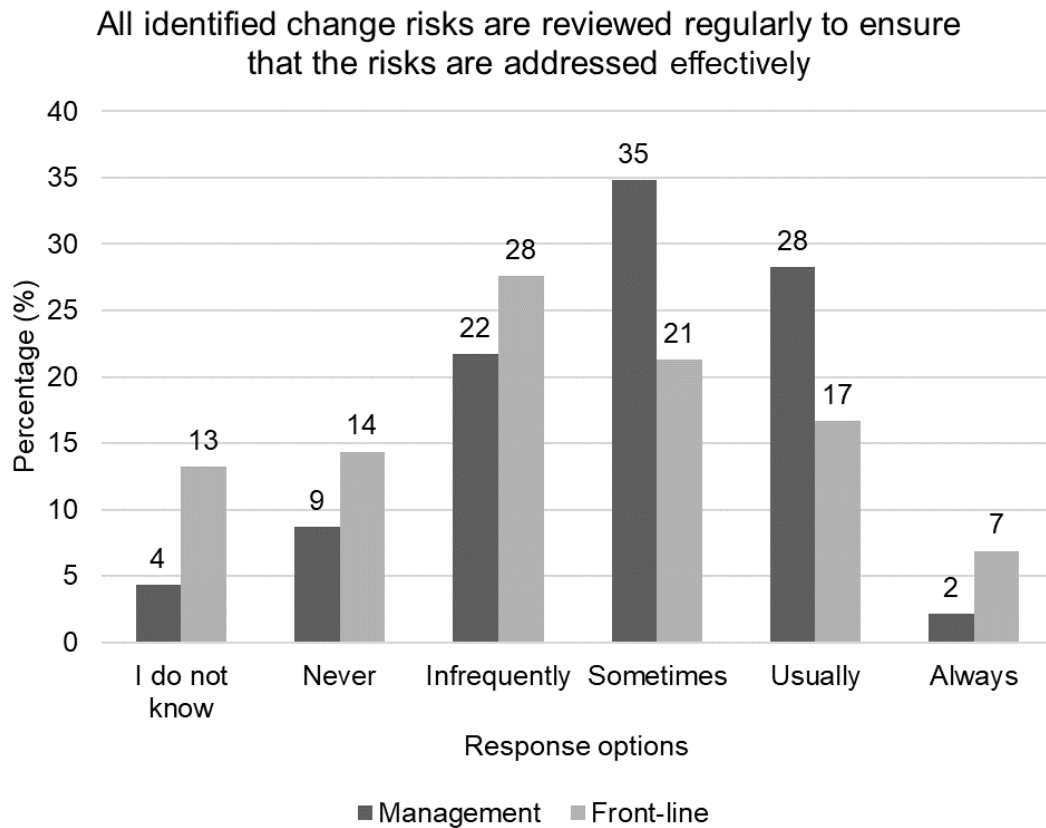
Most of the management team (74%) indicated that they understood the link between the organisation’s change risks and objectives. The front-line workers displayed varying levels of understanding with 45% specifying a lack of understanding. The distribution in responses between the two study groups is displayed in Figure 7. Articulating the change risks and their link to the company objectives through training and communication may improve the understanding among the front-line workers. The management team with sound knowledge can perform a crucial role in empowering the front-line employees.



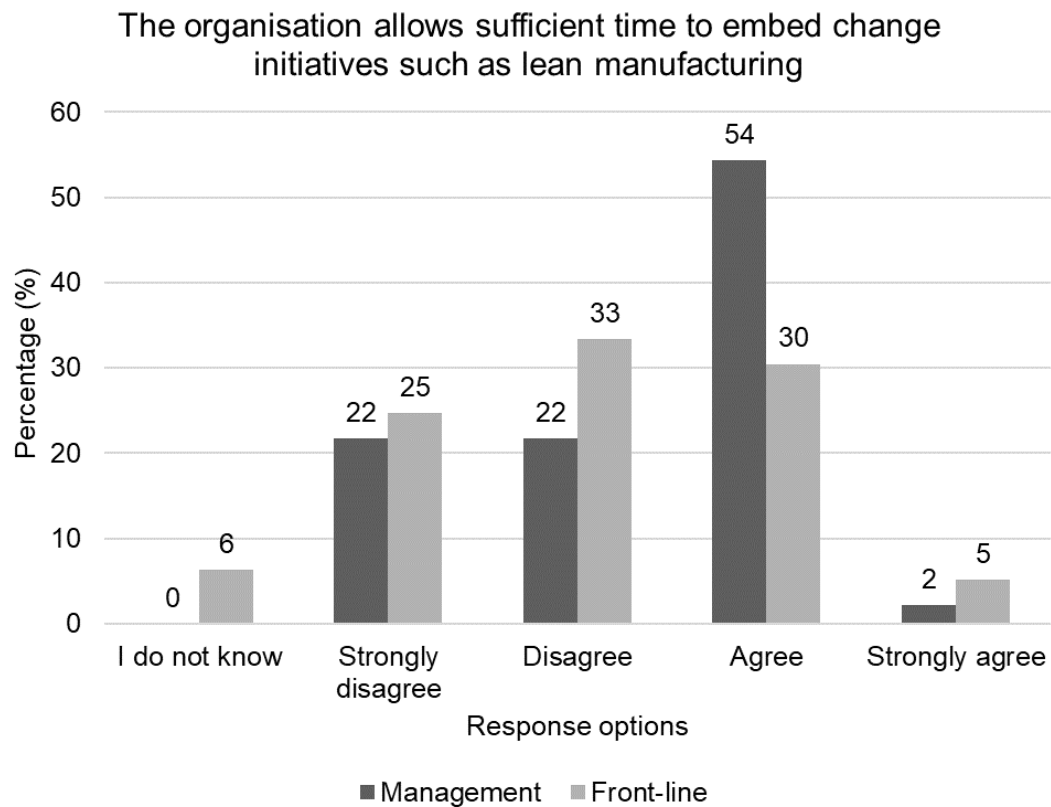
**Figure 7: Distribution of responses to “I understand the links between the organisation’s change risks and objectives”.**

### Diagnostic items

The analysis of the two additional items, not included in the original scale, is provided below. The distribution of the study groups’ responses to the items “All identified change risks are reviewed...” and “The organisation allows sufficient time to embed change...” is shown in Figures 8 and 9, respectively.



**Figure 8: Distribution of responses to “All identified change risks are reviewed regularly to ensure that the risks are addressed effectively”.**



**Figure 9: Distribution of responses to “The organisation allows sufficient time to embed change initiatives such as lean manufacturing”.**

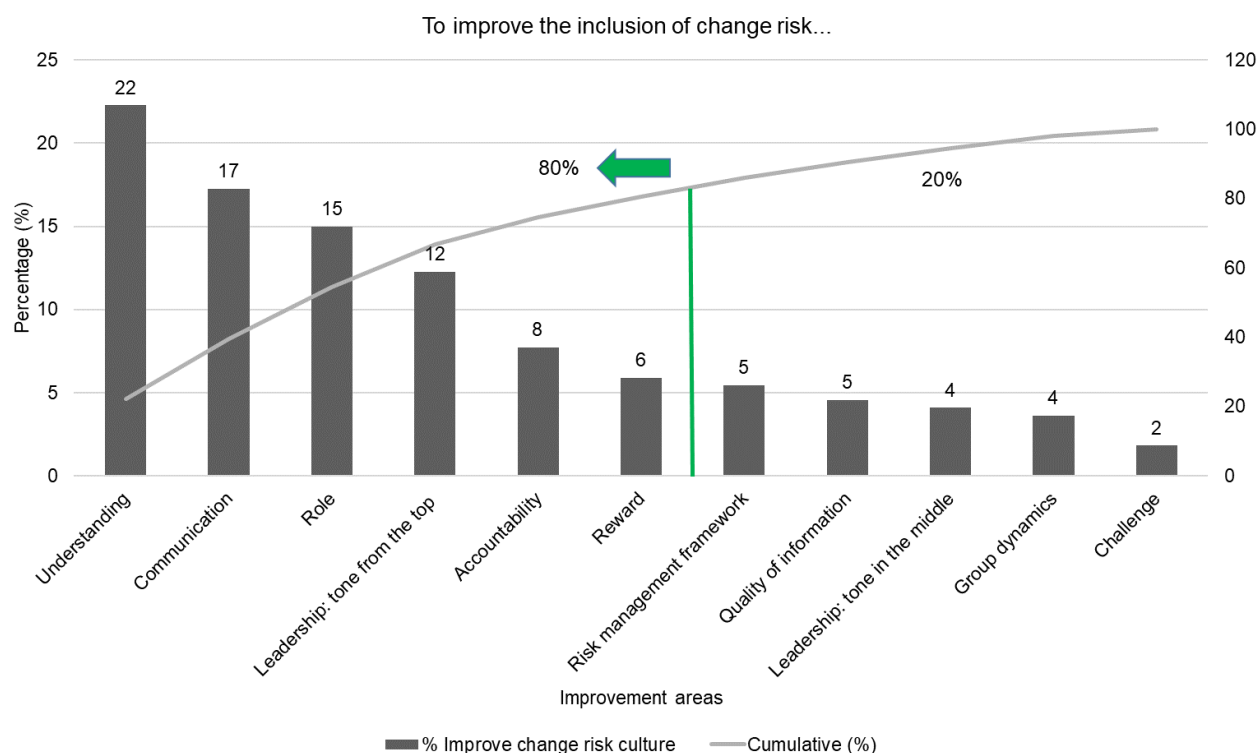
The descriptive statistics associated with both items are listed in Table 9. The responses to “All identified change risks are reviewed...” indicate that most of the respondents believed that change risks are reviewed occasionally. This could potentially indicate a lack of effective risk management to ensure that identified change risks are mitigated over time. With the majority of the front-line (42%) answering “Never” and “Infrequently” on this item, it could also imply a lack of communication from management with respect to the progress of change risk management. The responses to “The organisation allows sufficient time to embed change...” indicate that 58% of front-line employees believed that they were not given adequate time to fulfil the desired results of an evolutionary change such as lean manufacturing. This is contrary to the 56% of management who specified that they agreed. This inconsistency could pose a risk in terms of the understanding of LM practices and ensuring their effective implementation. Whereas management expects more agile delivery of results, the front-line may require more time to adapt to the change through learning and practice.

**Table 9: Descriptive statistics for the diagnostic items**

|                                                                                                              | Minimum | Median | Maximum | Mean | Std Dev. | Mode |
|--------------------------------------------------------------------------------------------------------------|---------|--------|---------|------|----------|------|
| <b>All identified change risks are reviewed regularly to ensure that the risks are addressed effectively</b> |         |        |         |      |          |      |
| Management                                                                                                   | 1       | 3      | 5       | 2.9  | 1.0      | 3    |
| Front-line                                                                                                   | 1       | 3      | 5       | 2.7  | 1.2      | 2    |
| <b>The organisation allows sufficient time to embed change initiatives such as lean manufacturing</b>        |         |        |         |      |          |      |
| Management                                                                                                   | 1       | 3      | 4       | 2.4  | 0.9      | 3    |
| Front-line                                                                                                   | 1       | 2      | 4       | 2.2  | 0.9      | 2    |

### Improvement suggestions

The diagnostic item “To improve the inclusion of change risk...” was posed to participants to garner possible improvement areas in the change risk culture. Applying the Pareto principle once again, the distribution of the responses to the various focus areas is depicted in Figure 10. How change risk was understood by staff was selected by 49 (22%) of respondents, followed by how managers communicate (17%), requirement to clarify roles (15%), setting the tone from the top by leadership (12%), accountability (8%) and incentives (6%). These aspects constitute the primary areas for improvement thereby answering the third research question. The improvement suggestions as proposed per study group are provided in Appendix E.



**Figure 10: Change risk culture improvement opportunities.**

Reflecting on the risk-informed decision culture model in Figure 11, four items (understanding, communication, leadership, and accountability) out of the top six areas for improvement are linked to the behaviour-based indicators, whereas the remaining two (role and reward) constitute the structure-based indicators highlighted in Figure 11. The study sample's preference for a focus on behavioural aspects correlates with discussions in the literature on ensuring sustainable lean manufacturing (LM) initiatives. According to Alhuraish et al. (2017), LM requires a change in behaviour which, although it can be taught, is more challenging to achieve. Employees tend to be frustrated if they do not understand the reasons for change. To alleviate these concerns, strong management support is required by communicating the need for change whilst also providing the resources for employees to participate in the change (Worley & Doolen, 2006; Zhang et al., 2017). A key resource to sustain LM efforts is to create capability among the employees through training and coaching (Boyer, 1996; Zhang et al., 2017). Irrespective of other business challenges, management should find the time to focus on creating an environment where employees can be engaged and encouraged. AlManei et al. (2018) proposed a change management-based framework to assist organisations pursuing change initiatives such as LM. The framework is based on Kotter's eight-step model for the leading and managing of change. This process is widely recognised by organisational leaders as the "solution" to the problems faced when implementing change (Pollack & Pollack, 2015). The framework as suggested by AlManei et al. (2018) was adopted to highlight the links to the improvement areas identified from this research in the encircled themes. Further details on how the change risk culture can be improved using the framework can be viewed in Appendix F.

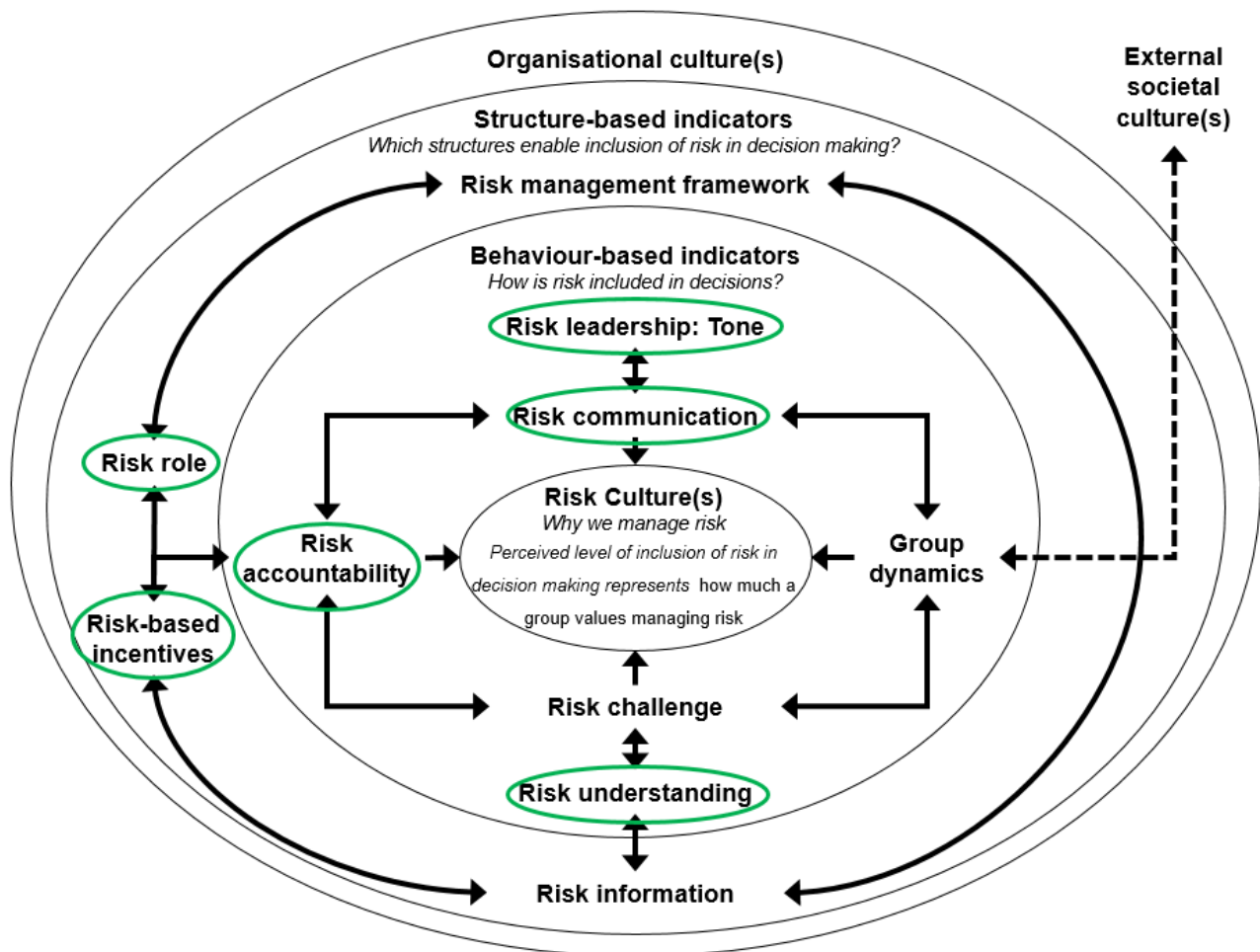


Figure 11: RiDC model with identified improvement areas encircled.

## Conclusions

This quantitative study, facilitated through the administering of a survey focused on change risk, served to examine the perceptions of change risk culture as well as comfort with change risk roles among the management and front-line employees at a South African chemical manufacturer. Statistical analyses of the data collected provided unique insight into the concept of change risk culture at the firm. Significant differences between the study groups' levels of comfort with change risk roles were identified, with management being more comfortable with their roles than the front-line employees. With respect to their perceptions of change risk culture, significant differences were also observed, with management indicating more optimism to introduce and accommodate change than the front-line employees. The understanding of change risk through training and coaching, communication, risk role, leadership, accountability and incentives were identified by respondents as the chief aspects to improve the change risk culture. As discovered in the academic literature and summarised in Appendix A, strong management commitment and support is required to improve the likelihood of success when implementing change initiatives such as lean manufacturing (Alefare et al., 2017; Alhuraish et al., 2017; Taherimashhadi & Ribas, 2018; Zhang et al., 2017). To support the

management team at the chemical manufacturer, it is advised that the change management approach proposed in Appendix F be undertaken. For every lean manufacturing practice and tool that is to be implemented and utilised by the front-line employees, it is imperative for management to clearly communicate the link between the practice and the company objectives while providing the resources such as training to build knowledge and awareness. Engaging the front-line employees to drive continuous improvement by creating wins can potentially enhance commitment and develop the sound culture as denoted in the well-described Toyota Production Management system (Loyd et al., 2020). This study is a pioneer in providing insight into the risk culture associated with change initiatives and the first of its kind at the chemical manufacturer. It is envisaged that the firm's management team will acknowledge the findings and provide impetus to the lean manufacturing programme by adopting new behaviours.

**Number of words:**

Abstract: 281 (max: 300 words)

Article: 7912 (max 8,000, excluding abstract and references)

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## REFLECTION

Furthering my studies dominated my thought process over the past few years. Confusion kicked in with a plethora of options being available, with the MBA being one of the more sought-after courses. After deliberation with colleagues and friends, I zoned in two options, finance and risk-related. What led me to select the Applied Risk Management programme was quite interesting. My line manager had an interest in pursuing the degree and had setup a meeting with the programme leader, Professor Hermien Zaaiman, and I had merely tagged along. Upon hearing their discussion on risk culture and behaviour, I was instantly sold on the similarities with my line of work, lean manufacturing. From being a spectator at a meeting for a discussion on a topic I had scant knowledge about, to applying and being selected on the course while my line manager opted out, proved to be quite the change.

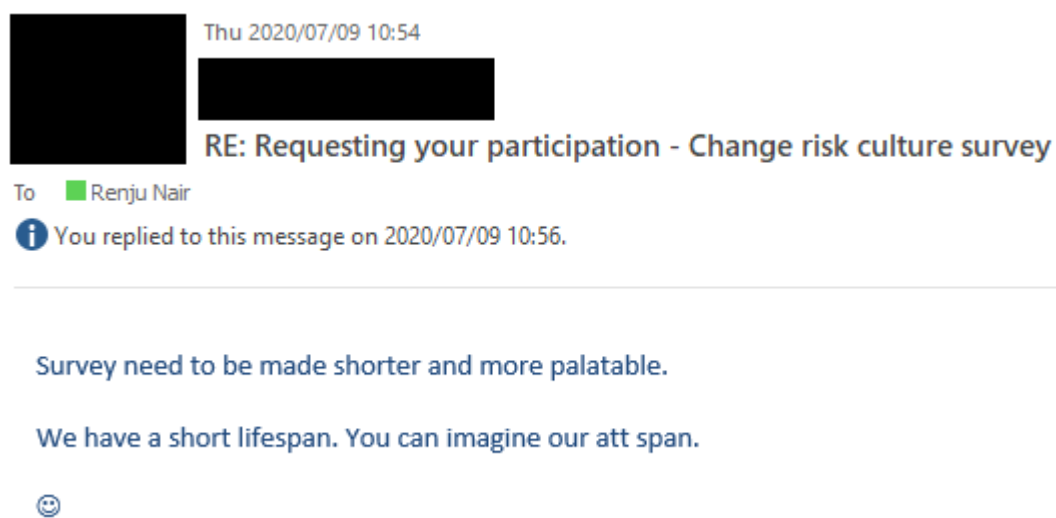
After eight years since the completion of my previous degree, I embarked on the two-year part-time programme. This certainly tested my rusty scholarly skills and juggling act to balance work and academics. This has been an exciting and fruitful journey from the very first module. I achieved distinctions in all my assignments, while learning from my sector-diverse colleagues. The high level of engagement with the experienced, knowledgeable and passionate educators proved to be the best part of this journey.

The second year of my studies proved to be more challenging. An unprecedented global pandemic, Covid-19, affected human lives and livelihoods. It changed what was once considered “normal” with the postponement of schedules thus congesting the key study deliverables. At the same time, the company I work for experienced a cyber-attack and shortly afterwards announced an alteration to its business model with restructuring and subsequent retrenchments. This took a toll on the workforce with individuals experiencing fear, anxiety and just uncertainty of the unknown. What all this taught me was that knowingly and unknowingly, we all manage risk in one form or another. Human beings are known to survive and thrive. We need to make a conscious effort to develop a culture of learning and teamwork, and this starts with the individual. If we all do our part, organisations will end up building the resilience they require to endure challenging times of uncertainty while managing risk to achieve objectives.

My study supervisor, Mr Fred Goede, with all his industrial experience and academic insight, served as a captivated listener and provided me with the support and challenge to keep learning and improving my work, for which I am forever grateful.

There are numerous suggestions in the literature on how to improve an organisation’s risk culture (Bennett et al., 2020; Boulton & Dominus, 2014; Domańska-Szaruga, 2020; Walter & Narring, 2020; Wood & Lewis, 2018). Each organisation is unique and perhaps a copy-and-paste method will simply not work. In the context of change risk culture, it is advised to share the learnings from this study with the stakeholders who participated. The researcher presented the results of the study on 15 September 2020 to site management and proposed a plan (Appendix F) for improvement. The management team agreed to improve the “tone at the top” by being more “visible” to the front-line employees through daily shop floor visits. This provides the opportunity for direct communication between management and the front-line workers. The researcher also engaged with the Human Resource General Manager regarding the requirement to improve communication on site. A communication project team was formed to assess the current means of communication and make improvements through newsletters and visual boards. A recognition standard has also been tabled for implementation.

The quality and quantity of the data received from the survey may also contribute to its robustness. The chemical manufacturer experienced several challenging moments which were out of the researcher's control, examples being the global Covid-19 pandemic, a cyber-attack and restructuring. Despite these factors, the study had to progress to comply with University timelines. In the future, it is advised to conduct similar studies when there is more stability in the organisation so that individuals are less likely to be mentally and physically occupied. As seen in this study, the overall response rate was 34%. The literature provides ideas on how response rates from surveys can be improved (Krishnan & Poulouse, 2016; Porter, 2004; Wiley et al., 2009). One of the recommendations to improve the response rate is to reduce the length of the questionnaire with around 20 questions being ideal (Porter, 2004; Wiley et al., 2009). This suggestion was echoed by one of the survey participants, as shown in Figure 12.

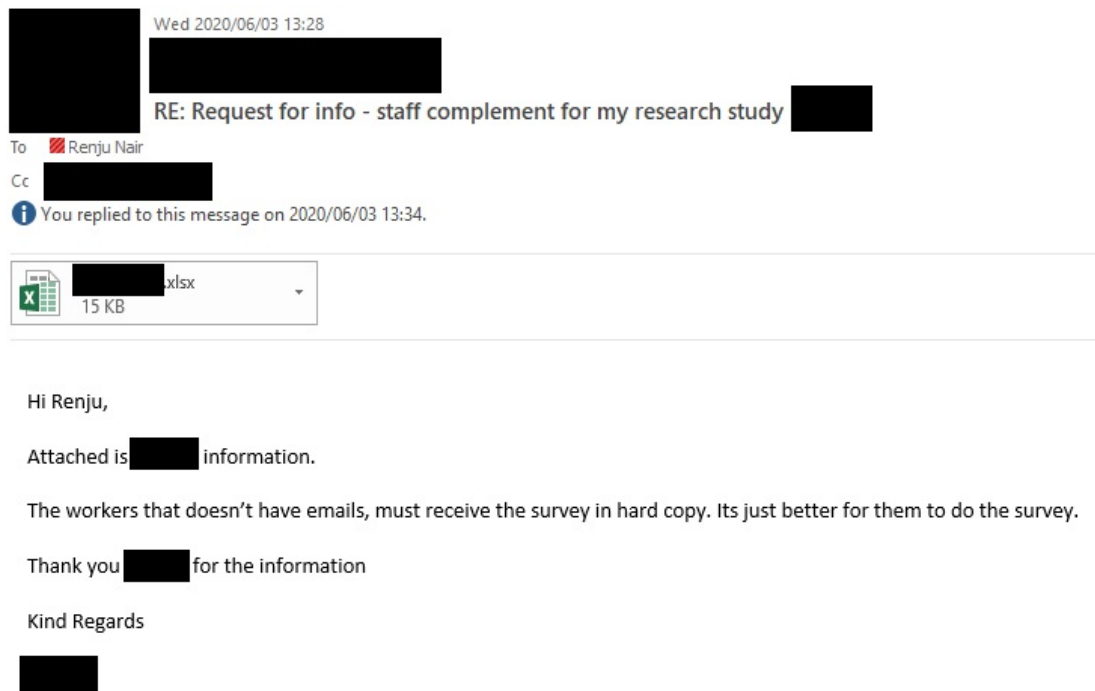


**Figure 12: Participant feedback reflecting on the length of the questionnaire.**

This can be accomplished by performing a critical literature review of the existing knowledge of the subject (Carnwell & Daly, 2001; Torraco, 2005). This process results in focusing on the most frequently cited contributors to the success of lean manufacturing, for example, management commitment and support. As this links to the “tone at the top” risk culture indicator, only the questions related to this factor can be issued in the survey, thus making the questionnaire more concise. Once this exercise is completed and improvement opportunities garnered, the researcher can move to the next factor. Survey fatigue must also be considered; rather ensure adequate time between research studies.

Another challenge that was faced was access to e-mail and data availability. Due to the company's strict policy, e-mail access is limited to management and some front-line personnel. In a bid to obtain respondent contact numbers, a few administrative personnel with whom contact was established, indicated that several front-line employees in their respective departments change

their contact numbers frequently with most struggling to have available data to access an online version of the survey. Figures 13 and 14 indicate some examples of feedback with paper-based surveys being proposed as the more suitable option.



**Figure 13: Feedback obtained for respondent contact information at Operation i.**



**Figure 14: Feedback obtained for respondent contact information at Operation ii.**

For the sake of maintaining research ethics, the data collection mechanism was standardised across site, thereby avoiding the use of hard copies. For a more efficient data collection process in the future, the use of Microsoft Forms as a survey tool is advised. This application, shown in Figure

15, allows for a link to be used as many times as possible while setting timelines for data collection. The weblink can easily be placed on a central computer within each department, thereby providing a fair chance for all to participate, irrespective of their access to personal electronic devices and data.

The screenshot displays the Microsoft Forms editor interface. The main area shows a survey titled "Change risk culture survey" with a "Questions" tab selected. The survey content includes a greeting "Dear Participant," and an invitation to participate in an academic research study conducted by the Centre for Applied Risk Management (UARM), North-West University. The settings panel on the right includes options for who can fill out the form (Anyone with the link can respond), response options (Accept responses, Start date, End date, Shuffle questions, Customize thank you message), and notifications (Send email receipt to respondents, Get email notification of each response).

**Figure 15: Microsoft Forms as an alternative survey tool.**

Beyond quantitative research lie methods that are qualitative in nature. The semi-structured interview is one such method that allows for interaction between the researcher and the sample under study. This approach is said to capture the behaviours associated with the perceptions of the interviewees (Fossey et al., 2002; Louise Barriball & While, 1994; Rabionet, 2011). It is recommended that the researcher explore the complexity of risk culture through the lens of qualitative research.

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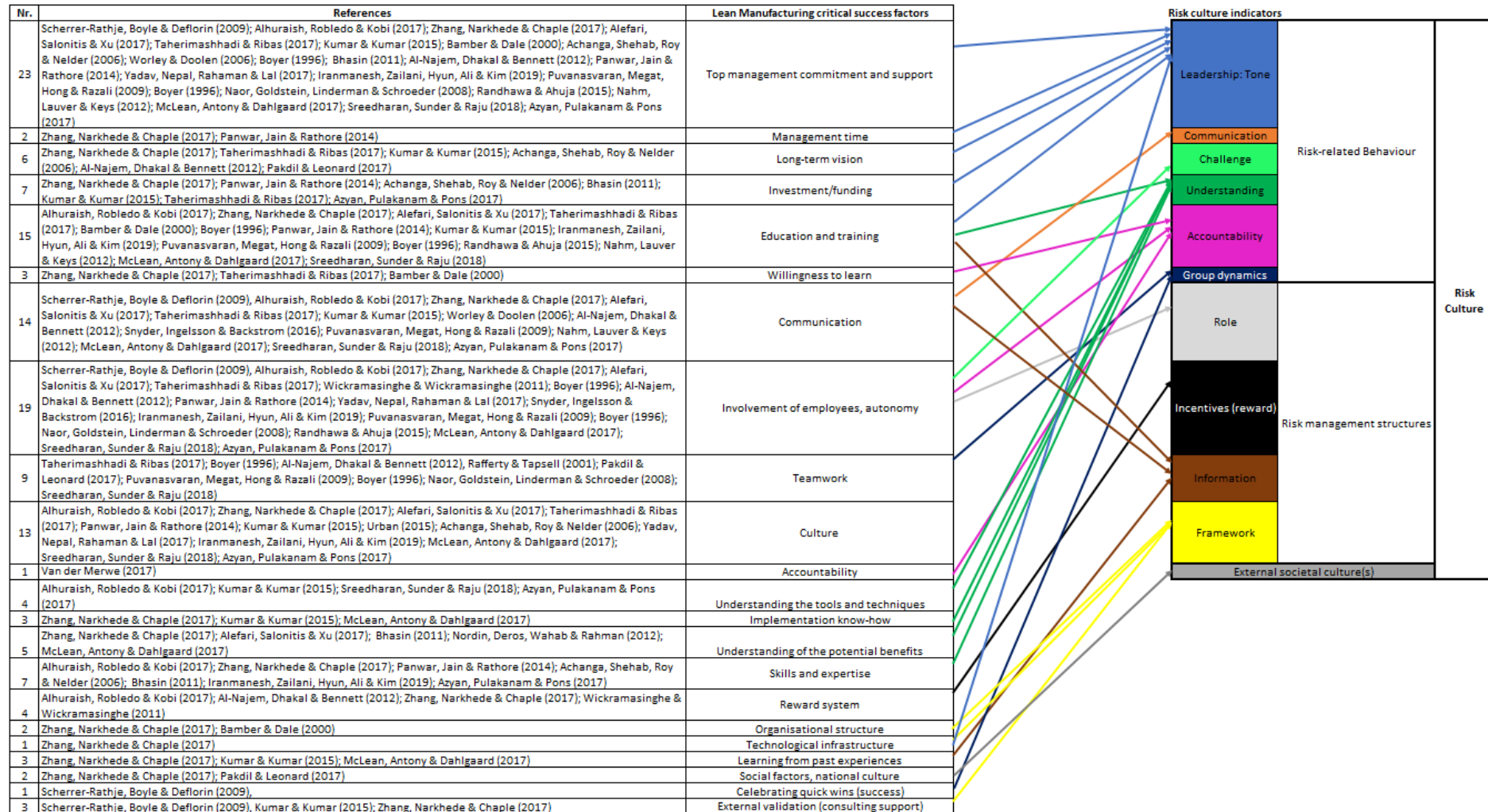
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# APPENDICES

## Appendix A: Mapping lean manufacturing critical success factors to the RiDC model risk culture indicators



## **Appendix B: UARM risk culture scale**

### **UARM Risk Culture Scale (UARM RCS-2019)**

#### **An Overview**

**Hermien Zaaïman and Hedré Pretorius**

#### **Aims**

This document provides a summary of the North-West University (NWU)'s Centre of Applied Risk Management (UARM) Risk Culture Scale (UARM RCS). Current approaches to risk culture tend to be qualitative, using a general view of what risk culture is. Where risk culture questionnaires are applied, it is important to ascertain the validity and reliability of the resulting information against the broad construct of risk culture. The UARM Risk Culture Scale (UARM RCS) was developed to meet the need for an academically validated instrument to measure the risk culture in organisations.

#### **Approach**

Multiple definitions of risk culture exist in regulatory papers and risk standards. One of the more comprehensive definitions is that of the Basel Committee on Banking Supervision (BCBS) defining risk culture as: "A bank's norms, attitudes and behaviours related to risk awareness, risk-taking and risk management, and controls that shape decisions on risks. Risk culture influences the decisions of management and employees during the day-to-day activities and has an impact on the risks they assume" (BCBS, 2015, p. 2).

However, applying such broad definitions to evaluate and improve the risk cultures of organisations is complex. This process requires the development of instruments to assess and measure specific aspects of risk culture. The UARM RCS was developed using our decision-focused view of risk culture as basis for the development and testing of its items:

*'The risk culture of an organisational group is manifested by the importance given to considering risk when the group makes decisions. The level of explicit inclusion of risk in decision-making represents the implicit, subjective value afforded to risk by the group.'*

The scale items were therefore developed to represent aspects of the integration of items in risk culture based on our Risk Culture Indicator (RCI) model, described by Zaaïman in the Appendix: 'Risk Culture Indicator Model – An Overview'.

## Status

The UARM RCS provides three sets of results that can be used to assess the:

### 1) Two risk-culture-related factors

The 42-item five-point Likert scale has been developed and piloted over 4 years (2016-2019). The scale is now mature and can be regarded as valid, as the scale items map to the RCI model and has been shown in 19 studies to work well across sectors, functions and management levels (content validity). The scale also shows a high Cronbach  $\alpha$  reliability coefficient of 0.97 (internal consistency). This mini-dissertation study forms part of further testing of the scale.

The scale measures two risk-culture-related factors:

- Perceived level of integration of risk in decision-making processes (24 items)  
*Note: Although the items cover the indicators in the RCI Model, only one factor is found in the answer data. This can be ascribed to the interlinked nature of the indicators and provides an indication of the validity of the scale for the study of this focused view of risk culture.*
- Comfort with own risk management role (18 items)

The factor scores are calculated as the average of the responses over the items making up the factor. This translates to the following scale for the decision-based view of risk culture used in this study.

|          |                                                                                                                       | UARM RCS-2019 (FS = Factor Score)                   |                                                     |                                                            |                                             |                                                      |
|----------|-----------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------|-----------------------------------------------------|------------------------------------------------------------|---------------------------------------------|------------------------------------------------------|
|          |                                                                                                                       | 1.0 $\leq$ FS < 1.5                                 | 1.5 $\leq$ FS < 2.5                                 | 2.5 $\leq$ FS < 3.5                                        | 3.5 $\leq$ FS < 4.5                         | 4.5 $\leq$ FS $\leq$ 5.0                             |
|          | <i>Item response options related to the level provide an indication of group perception associated with the level</i> | <i>Very low level:<br/>Never and<br/>Not at all</i> | <i>Low level:<br/>Infrequently and<br/>Not well</i> | <i>Medium level:<br/>Sometimes and<br/>Moderately well</i> | <i>High level:<br/>Well and<br/>Usually</i> | <i>Very high level:<br/>Always and<br/>Perfectly</i> |
| Factor 1 | Perceived level of integration of risk in decision-making processes                                                   | Very low level of perceived integration             | Low level of perceived integration                  | Medium level of perceived integration                      | High level of perceived integration         | Very high level of perceived integration             |
| Factor 2 | Comfort with own risk management role                                                                                 | Very low level of comfort                           | Low level of comfort                                | Medium level of comfort                                    | High level of comfort                       | Very high level of comfort                           |

### 2) The I-do-not-know/I-do-not-understand-the-statement answer option

Item response options include an 'I do not know' or "I do not understand the statement" option to mitigate possible spurious effects of respondents who truly do not know the answer to an item. The I-do-not-know answers were not included in the scale's factor analysis, and only participants with fewer than 30% of I-do-not-know answers (per factor) are included in the calculation of the factor

scores. This means that the participant has to have answered at least 16 of the items in factor 1 and 12 items in factor 2 to be included in the calculation of the factor score.

In addition, the full set of the study's I-do-not-know answers is analysed separately, thereby providing possibly valuable information on the levels of uncertainty about risk-culture-related aspects in the study sample(s) that could be indicative of possible risk-related knowledge in the study population(s).

### **3) Two further diagnostic questions**

The scale also contains two further RCI model-based diagnostic questions:

*'Which organisational characteristic assists you most to include risk when you make decisions?'*

*'To improve the inclusion of risk in decision-making in the organisation, I believe that we must start with improving....'*

The options to these responses correspond to the risk culture indicators in the UARM risk culture indicator model. These options are presented in alphabetical order. Evaluating the responses to these questions allow for suggestions on the way forward on improving the risk culture of the organisation.

## **Scale application**

This is an online scale housed on Research.net (SurveyMonkey's professional (Premier) plan). Data gathering is done by UARM and the data sets are housed and analysed by us. Each instance of the scale is set up for anonymous data capturing, meaning that the respondents cannot be identified. After formal permission to apply the scale has been obtained from the organisation and NWU ethics clearance for the study, a suitable project sponsor in the studied organisation sends out the weblink to the scale (not the student doing the study). The scale is closed after a maximum of two reminders to complete the survey. Study-relevant data results are provided to the student (and organisational project sponsor, if requested) in analysed, aggregated format.

## **Interpretation of results**

Scale results have to be interpreted in the context of the study for which the results were obtained. To keep in mind when analysing and interpreting the scale results:

- 1) In a scale like this, only the group response makes sense and the individual's factor score cannot be used as an indication of the individual's 'risk culture' as culture is always a group concept.
- 2) Levels of the measured factor could be inflated by response biases (e.g. positive response bias and social desirability influence).
- 3) The results of the scale are valid at factor level. A scale-based factor is based on the coherence for the group of items that make up the factor. These items were designed based on the measurement aims of the scale but do not contain every possible item that could have been used. Other items that refer to the construct may have shown the same result, implying that focusing on differences at item level could divert the user's attention to inadequately tested aspects of the underlying construct, while not considering the validated construct. The scale may be used to provide indications of where risk culture-related issues lie in the organisation, but was not designed to identify micro-level issues. Other scales and research methods are required to do detailed follow-up investigations.

For more information on the UARM RCS, please contact: Hermien Zaaiman at

[hermien.zaaiman@nwu.ac.za](mailto:hermien.zaaiman@nwu.ac.za)

<http://commerce.nwu.ac.za/uarm>

## References

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## Appendix C: Survey informed consent

### Risk Culture Survey (UARM RCS-2020)

#### 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. (<http://commerce.nwu.ac.za/uarm/>)

The objectives of this study are to identify if there are differences in perceptions of change risk culture as well as comfort with change risk roles between management and front-line personnel and if so, the areas where the company can focus on to improve the risk culture associated with change initiatives.

Note: The term 'the organisation' in this questionnaire refers to the [REDACTED] facility. Please answer all the questions with reference to the [REDACTED] facility except where specified otherwise in the questionnaire.

Consent to conduct the research has been obtained from Omnia subject to the following conditions:

1. This is an anonymous survey, which means that you cannot be identified as participant in this survey.
2. Your participation is voluntary and you may exit the survey at any stage should you no longer wish to continue completing the survey.
3. The data will only be reported in aggregated format, meaning that individual responses will not be reported.
4. The organisation will not be identified in the research report.
5. Anonymised general results of the study may be published in an academic journal subject to permission from the organisation.

**Note:**

1. The survey consists of 3 demographic items followed by 46 risk-related items.
2. It should take you less than 15 minutes to complete the survey.
3. We would like to know what your experience of risk management in the organisation is. Please answer all the items as honestly as possible.
4. You must be at least 18 years old to participate in this survey.
5. Only complete the questionnaire once per application of the survey.

Questions about this survey can be directed to:

Renju Nair at [REDACTED] or 0845839627

or the study supervisor, Mr. Fred Goede at [Fred.Goede@nwu.ac.za](mailto:Fred.Goede@nwu.ac.za) or 0829097981

*Note: The North-West University, South Africa, owns the intellectual property to the contents of this survey.*

**\* 1. I have read the information above and consent to anonymously participate in this study on a voluntary basis. I also understand that I may exit this survey at any stage.**

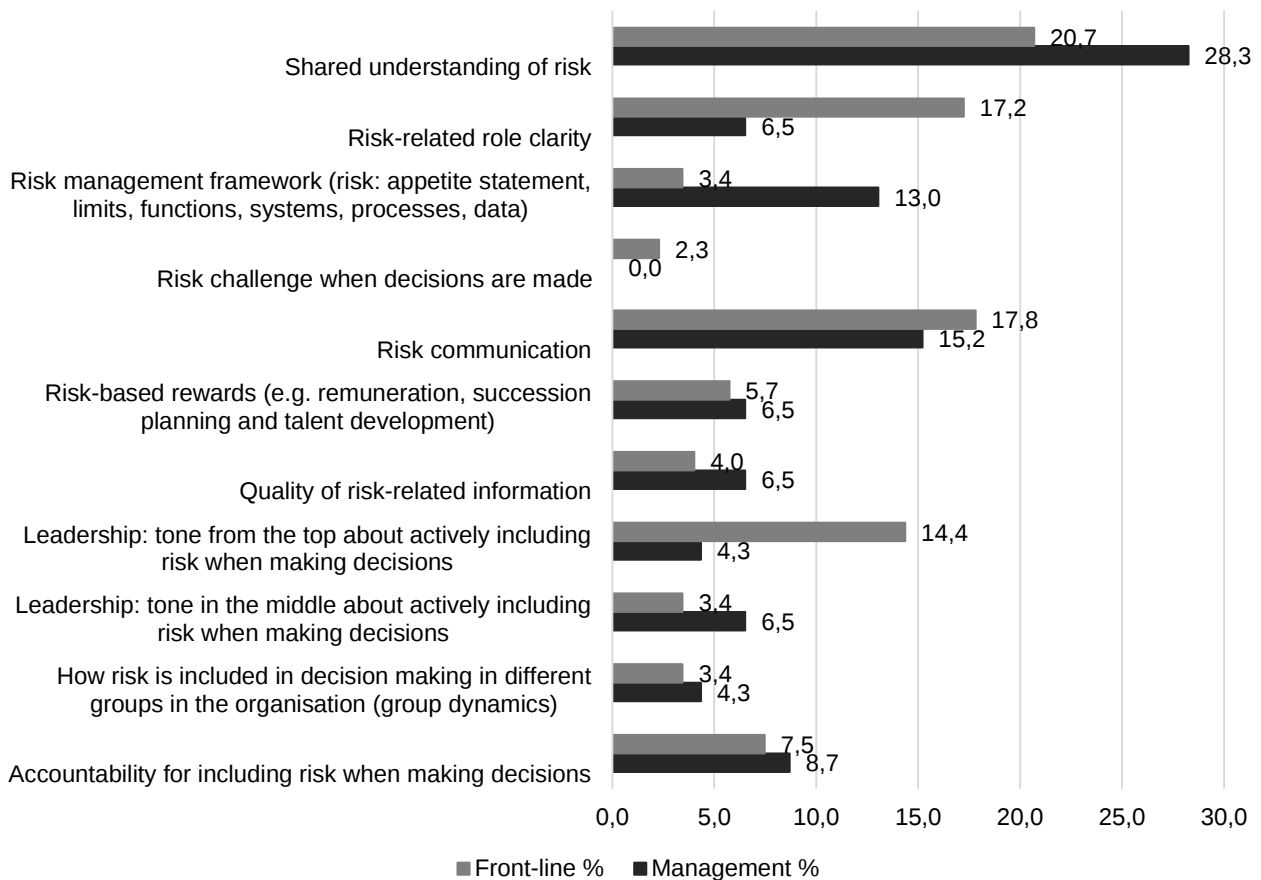
- ☐ Yes
- ☐ No

## Appendix D: Reflective journal

| Date       | Action                                                                                                                                                     | Result                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Change of approach required (Yes/No)                    |
|------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------|
| 2020/02/29 | I presented my proposed study 'Lean manufacturing and risk culture insights from management and frontline staff at a chemical firm' to the UARM team       | Feedback provided indicated that my proposed study is quite broad. The addition of the lean manufacturing element almost made the study a time-based one e.g. the effect of risk culture on lean manufacturing. This would require a different scale or measure for lean manufacturing. This was not advised considering the time constraints for the Master's programme                                                                                                                                                                                                                    | Yes                                                     |
| 2020/03/02 | Considering the feedback received, I explored the literature for articles on change initiatives of which lean manufacturing is an example                  | I found an article by Waddell & Sohal (1998) that discussed resistance to organisational change. The authors mentioned that organisational change involves uncertainty - link to risk. One article by Alves & Alves (2015) focusing on culture and lean manufacturing, discussed that culture is important for successful and sustainable change initiatives such as lean manufacturing. This conveyed a clear flow of logic i.e. change initiatives e.g. lean manufacturing introduces risk and it requires a favourable culture to succeed                                                | No                                                      |
| 2020/05/21 | I requested a HR business partner to send me a list of employees' contacts                                                                                 | HR indicated that a lot of mobile numbers are old and incorrect. Filtering the employees relevant to my study demographic will be challenging as all employee names were provided                                                                                                                                                                                                                                                                                                                                                                                                           | Yes                                                     |
| 2020/05/21 | I sent e-mails to all department heads and relevant administration personnel to assist with the collating of employee e-mail addresses and contact numbers | I started receiving responses from the various departments. There is a definite need to send the survey through Whatsapp/SMS especially considering front-line employees who do not have e-mail access                                                                                                                                                                                                                                                                                                                                                                                      | No                                                      |
| 2020/05/25 | As a pilot test, I distributed the questionnaire to 9 individuals. The weblink was issued through e-mail and Whatsapp                                      | No technical glitches were said to be encountered upon accessing the link<br><br><b>Suggestion 1:</b> item nr. 29 - understanding of the term 'change risk' should rather be the 1st question. If the respondent does not understand the term, then what is the basis of answering the previous items? Also modify 'change risk' to 'change initiative risk' so it is more clear and aligns to the description<br><br><b>Suggestion 2:</b> There are too many questions following each other which was frustrating. Why not spread them across a page or two to make it more user friendly? | Yes                                                     |
| 2020/05/26 | I searched the literature to summarise the best practices that form part of initiatives such as lean manufacturing                                         | More detail was added to the mini-dissertation background section to give readers a better understanding of lean manufacturing                                                                                                                                                                                                                                                                                                                                                                                                                                                              | No                                                      |
| 2020/06/07 | I forwarded my thoughts on using the words 'change initiative risk' as part of the survey to my supervisor Fred for his comments                           | With a bit of refinement, Fred suggested to make the survey introduction more concise. This would aid the potential participants in understanding that 'change' refers to an initiative such as lean manufacturing which introduces risk and uncertainty. The items therefore would specify change risk.                                                                                                                                                                                                                                                                                    | No                                                      |
| 2020/06/20 | I started adding the front-line employees' contact numbers to a mobile phone prior to sending the link                                                     | This proved to be quite taxing. I was able to add 3 contacts per minute to the mobile phone. With over 500 contacts to add, it resulted in 2.7-3 hours of work which was not efficient                                                                                                                                                                                                                                                                                                                                                                                                      | No - for the current study<br>Yes - for future research |
| 2020/07/07 | The survey weblink was officially sent out to the target population                                                                                        | Feedback from some participants were received. One individual indicated that the survey be made shorter in the future whilst other feedback proved that the questionnaire asked relevant questions that the organisation needed to take heed of                                                                                                                                                                                                                                                                                                                                             | Yes - for future research                               |

## Appendix E: Change risk culture improvement suggestions per study group

To improve the inclusion of risk in decision-making in the organisation, I believe that we must start with improving...



## Appendix F: Proposed plan to improve the change risk culture at the chemical manufacturer

Using the framework (image below) proposed by AlManei et al. (2018), a plan to improve the change risk culture at the company can be developed. First is to map the improvement areas (understanding, communication, role, leadership, accountability and reward) identified from this study, to the various steps outlined in the change management framework.



### Creating the climate for change

As confirmed in the literature study, strong management commitment and support is a critical success factor for lean manufacturing. The study by Jurburg et al. (2017) to identify factors that motivate employees to partake in continuous improvement projects and activities, highlighted organisational support from leadership as very important. The reasons for undertaking a change initiative needs to be defined and articulated to the workforce (Step 1), otherwise the risk of complacency is high (Pollack & Pollack, 2015). The management team at the chemical manufacturer needs to shape their behaviours (Step 2) to set the example for the employees. Expected behaviours can be workshopped by the management team, agreed upon and actioned out daily to ensure consistency. A vision and the means in which it will be achieved also needs to be developed with metrics to gauge success (Step 3).

## Engaging and enabling the organisation

Communication follows in step 4, whereby management can directly engage with the front-line employees on the shop floor or by engaging in “Town hall” gatherings. Communication will also impact on understanding among the employees. According to Pollack and Pollack (2015), the involvement of senior leadership by providing presentations to various teams is said to be effective. In addition to face-to-face communication, the use of media such as pictures and video is also said to be impactful (Eriksson & Fundin, 2018). Step 4 also includes training of personnel to provide better understanding of the change whilst creating internal capability. Clarifying of roles and responsibilities employees per position can be defined within steps 5 and 6. This can be achieved by involving the employees in daily improvement activities.

## Implementing and sustaining the change

Accountability and reward follow within steps 7 and 8 to ensure that the change is sustainable. Performance management and rewarding and recognising teams for achieving objectives is critical to maintain motivation levels during the change journey.

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