

Risk attitude and risk culture in a South African logistics organisation

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PREFACE

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

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

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

ABSTRACT

During the initial research in preparation of the research proposal for the primary study on risk culture, it emerged that the risk culture of an organisation is more than the collective risk attitudes of the individual decision-makers in an organisation. This statement prompted a second explorative study on risk attitude that could verify possible associations with risk culture elements. No previous studies could be found that confirms this association. This paper therefore consists of essentially two complementary studies. The academic article explored risk culture as an indicator of risk maturity in an organisation, identified other measures that could explain increasing maturity and proved that sub-cultures exist between the different management levels in the case study company. The results of the second study, captured in a research note, pointed to some association in the middle management ranks between risk culture and risk attitude, but the results were inconclusive.

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I also want to express my gratitude towards the management team of Transnet for their support and participation in the survey. Their intense involvement during the pilot study and motivation to excel in my studies will be fondly remembered.

A special word of thanks to my mother Sally for encouraging me to excel in my studies and for being so understanding whilst being absent from her life for the past two years.

Finally I want to acknowledge my late partner, Johann Lindeque, for his foresight and encouragement to register for the programme. This programme allowed me to express my passion for the science of risk management. I therefore dedicate this study in loving memory to him.

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RESEARCH PROJECT OVERVIEW

Most global corporate governance guidelines decree that organisations should understand and monitor their corporate risk cultures. Risk culture should support the embedding of the risk management frameworks and align risks with strategy formulation and decision-making. This process starts with risk behaviours and attitudes that are pervasive throughout the whole organisation (Mikes, 2009).

The research setting of this paper is to establish the link between risk attitude and risk culture. The subject of the study is a large integrated logistics company that started operations in 1910. This South African state-owned company with staff complement of more than 60 000. The company is structured around five operating divisions. These divisions are dedicated to rail freight, port operations, cargo terminal operations, storage and distribution of petroleum products through a pipeline network, and the manufacturing and maintenance of freight equipment.

The concepts risk attitude, risk propensity and risk perception have been popular research topics in recent research. Some authors maintain that the risk culture of an organisation is more than the sum of the risk attitude of the individual role-players. However, limited research has been performed on the relationship between risk culture and risk attitude. The aim of this study is to address this gap in the academic debate on the behavioural aspects of risk management.

This study is aimed mainly at academics and executives to debate on numerous aspects of corporate risk culture and the relationship between risk attitudes of groups of decision-makers might have on the risk culture of an organisation.

The following risk culture-related research questions were considered in this study:

1. How do the risk cultures of the three levels of management in the organisation differ?
2. What other dynamics could have an influence on the risk culture of an organisation?
3. What is the risk culture maturity of the organisation?

The following risk attitude-related questions were considered:

4. How do the risk attitudes of the three levels of management in the organisation differ?
5. What is the relationship between the group risk attitude and the corporate risk culture?

The research journey followed in preparation of this paper is depicted in Figure 1.

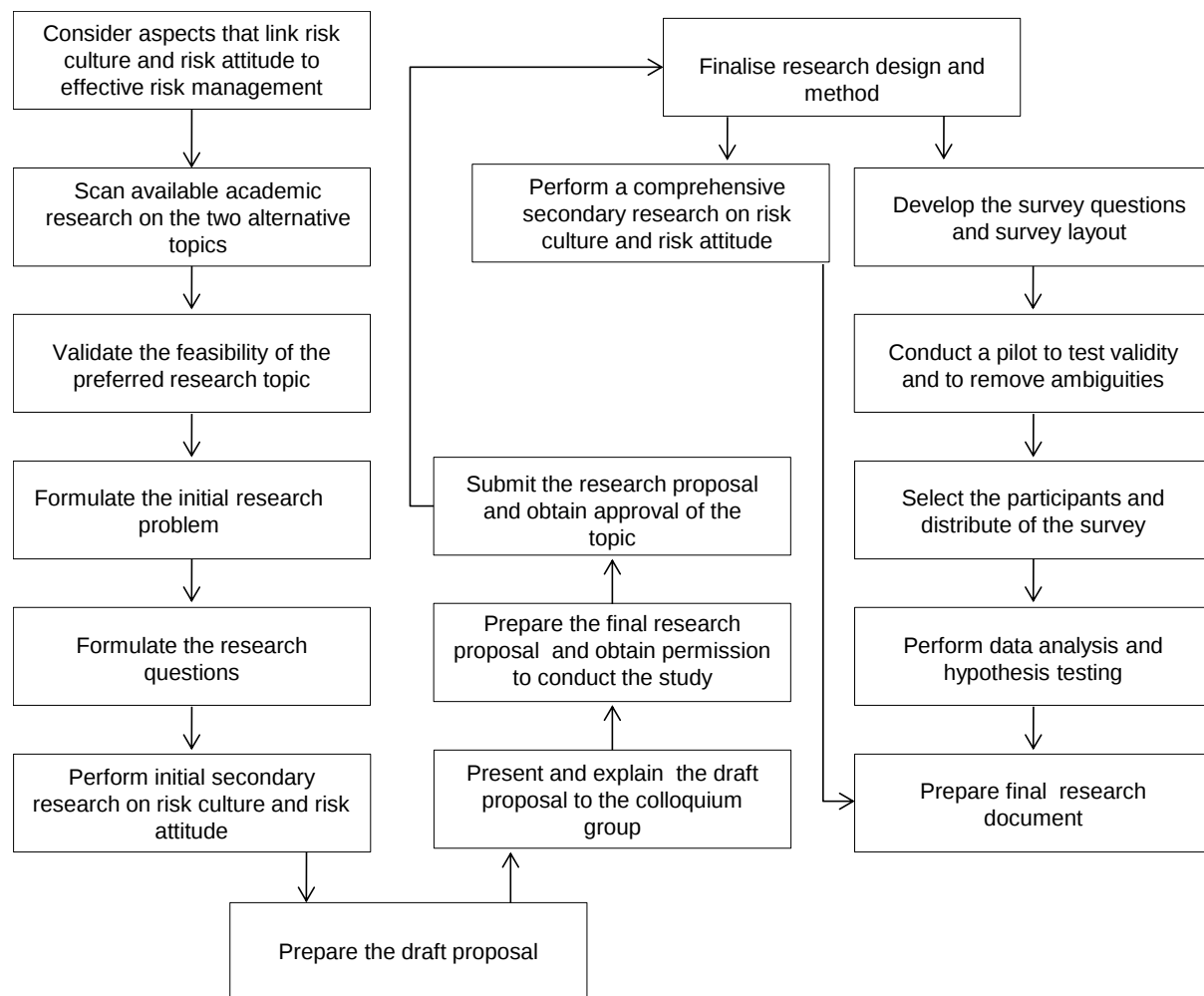


Figure 1: Research journey – the process that was followed

This document consist of an article on risk culture (addressing research questions 1 to 3) and a research note on risk attitude and risk culture relationships (research questions 4 and 5). The *Journal of Risk Research* was chosen for the publication of both the academic article and the research note. This journal is considered to be the most authoritative in both topics, since previous studies on both risk attitude and risk culture were published in this journal. More details on the journal requirements for publication and the writing guidelines can be viewed at http://www.tandfonline.com/action/authorSubmission?journalCode=rjrr20&page=instructions#.V4u_1stPgM8

Reference:

Mikes, A. (2009). Risk management and calculative cultures. *Management Accounting Research*, 20, 23. doi:10.1016/j.mar.2008.10.005

ARTICLE

Measuring risk culture maturity in a South African logistics organisation

1. Abstract

Successful companies actively manage their risks by applying advanced methods and tools to treat these exposures. Risk management practices should become pervasive in the daily operations of a company. One way of evaluating the maturity of the risk management processes is to measure the risk culture of a company. That is the very objective of this study. A pilot risk culture study, using a questionnaire, was undertaken throughout the management levels in a large national logistics company. The standardised Cronbach's alpha coefficient, which determines how well the risk culture questionnaire worked for the specific sample used in this study, was 0.96 and confirmed the reliability of all items used in the survey. From the analysis of the results, two factors were deduced to measure risk culture in an organisation. Insights inferred from the responses of the 734 participants indicated that demographic factors could have an influence on the maturity of risk management in the company. Risk culture seems to be influenced by age, years of experience and years of service of the employees. Although the risk culture was mature for all management levels, middle management scored lower than senior and executive management on understanding of risk, resulting in sub-cultures within the organisation. Improvement opportunities identified by participants include improved risk communication, training and the proactive use of risk information as a management decision support tool.

Keywords: risk culture; risk management; organisational culture.

2. Introduction

For risk management to be effective in any organisation, it needs to be intuitive and embedded into all decision-making processes (Banks, 2012, p. 18). The primary aim of this study was to establish whether there were differences in the risk culture between the different levels of management in a large logistics company with a national footprint. The secondary aim was to investigate if there are any other factors that could have an influence on the risk culture of the organisation. The final objective was to determine the risk culture maturity of the organisation.

Part of the research strategy was to perform a literature review to determine the characteristics and principles of corporate risk culture. The literature review provided a theoretical basis of all aspects of risk culture that were considered in designing a survey.

A survey questionnaire, which forms part of a larger study by North-West University, was used to assess the risk culture of the company. The large sample of respondents allowed for factor analysis on Likert scales, which was performed as part of the UARM research programme. This analysis allowed for testing the validity and relationship of all items of the risk culture survey.

The survey data indicated that different risk sub-cultures exist among the three management levels in the organisation in respect of the risk integration factor and the risk management understanding sub-factor. The statistical analysis confirmed that differences in overall risk culture correlate with age, work experience and years of service at the organisation. Nevertheless, the analysis confirmed a mature risk culture at all management levels. This study thus contributes to the current body of knowledge on the behavioural aspects of risk management.

3. Background

A common theme detected in the reviewed literature frames risk as being present in all business decisions or activities. Discussions and debates about risk culture seem to be more advanced in the field of practice than in academia, therefore contributions from relevant practitioners and specific research performed by professional bodies were also considered in this study.

The first part of the literature research was dedicated to defining the key constructs of organisational culture, risk and finally risk culture.

3.1 Risk management

There seems to be no consensus on the definition of risk. Existing international standards offer different definitions. The COSO framework (2004) defines risk as “the possibility that an event will occur and adversely affect the achievement of objectives”. The ISO 31000 risk management standard (2009b) offers a very different definition: “risk is the effect of uncertainty on objectives”.

Uncertainty without consequences does not pose a risk. Risk cannot be defined unless there is some context. The context relates to organisational objectives. It follows that risk is an

uncertainty that could either have a negative or positive effect on one or more organisational objectives (Chapman, 2013). Despite all the unique definitions, two features are commonly found: risk is related to uncertainty and consequences.

Enterprise risk management is seen as a robust method of managing risk and opportunity in an integrated and coordinated manner across the organisation with the aim to improve business performance. It is required that all staff in the organisation be involved to make the integrated risk management process successful (Chapman, 2013; Duckert, 2011). It can therefore be concluded that integrating risk into organisational decision-making is an essential enabler for the achievement of organisational objectives.

3.2 Organisational culture

In contrast to risk culture, an extensive body of literature in the field of organisational behaviour and culture has been produced over the past few decades. It is clear from previous research that cultures are entrenched in both the material and symbolic practices of an organisation. These practices include formal policies, procedures, standards and informal behavioural customs (DiMaggio, 1997; Schein, 1996).

Substantial work was performed on organisational culture by Pettigrew (1979), who suggested that organisational cultures consist of cognitive systems that explain how people think, reason and make decisions. He argued that organisational culture consists of a complex set of values, assumptions and beliefs that define the way an organisation conducts its business activities. Multiple cultures and subcultures may exist in an organisation. Organisational culture is shaped by customs observed by people within the organisation. The risk management approach within an organisation will be influenced by aspects of the wider dynamic sets of cultural factors.

Hofstede, Hofstede and Minkov (2010) reasoned that an individual's behaviour is partially determined by their "mental programs of thinking, feeling and action". Culture is the customary term for such mental software. Organisational culture is "the collective programming of the mind that distinguishes the members of one organisation from another". However, individuals have the ability to deviate from their mental software. Culture is learned, not innate, which is modified by the influences of collective programming.

The culture onion developed by Hofstede et al. (2010, p. 8) reflects the manifestation of culture at different levels of depth. Figure 1 indicates that symbols are the most superficial and values are the deepest layer of the culture onion.

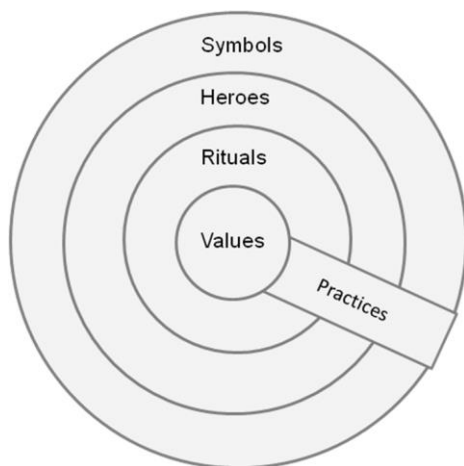


Figure 2: The organisational culture onion
(Hofstede et al., 2010, p. 8)

Values are broad propensities to prefer certain conditions over others, both negative and positive.

Rituals are collective activities within a culture that are socially important to reach a desired state.

Heroes are respected individuals that serve as models for organisational behaviour.

Symbols carry a particular meaning, which is recognised only by the members who share that culture.

These rituals, heroes and symbols are considered to be *practices*, which are visible to outsiders.

3.3 Risk culture

Power, Ashby and Palermo (2013) suggested in their research report that the concept risk culture does not have well-defined features, but is rather something that organisations perform in different ways, and standardisation in approach to risk culture in the near future is not foreseen. According to their research, discussions on risk culture draw mainly on conventional organisation theory. However, making risk culture more visible is at the heart of current regulatory and organisational research focus.

Risk culture is seen as a system of values and behaviours throughout an organisation that shape risk decisions (Farell & Hoon, 2010). Levy, Lamarre and Twining (2010) define risk culture as “the norms of behaviour for individuals and groups within an organisation that determines the collective ability to identify, understand, openly discuss and act on the organisation’s current and future risks”. A similar definition offered by Sheedy, Griffin and Barbour (2015) is the “shared perceptions among employees of the relative priority given to

risk management, including perceptions of the risk-related practices and behaviours that are expected, valued and supported”.

Most of the other sources consulted conceded that each institution will have its own unique risk culture, which influences every action and decision within the institution, often covertly. Organisational risk culture is seen to be more than the sum of the individual personal risk attitudes of its employees. Power et al. (2013) found that risk cultures are unevenly distributed between the different management levels within organisations.

From the above definitions some common aspects of risk culture emerge. First, culture must be recognisable in the behaviour of groups and individuals. Second, the culture is based on organisational values. Finally, the culture is based on the shared perceptions on approach to the collective management of organisational risks. For the purpose of this study, organisational risk culture is defined as how groups of people integrate risk when making decisions on uncertain future events that could have a negative impact on reaching the organisation’s objectives.

3.4 Observed survey approaches

The sources studied in both the practice literature and academic literature indicated that the risk culture survey is a useful tool to measure the prevailing risk culture in an organisation, and seen as a key foundation of a sustainable risk management programme. The material reviewed from the consulting firms share the view that risk culture can be distilled into a number of factors in a formal risk culture model. The survey should consequently provide a means for evaluating results against the key attributes of an effective corporate risk culture. It follows that such an assessment will assist an organisation to evaluate the effectiveness of its risk management value drivers. The Financial Stability Board (2014), from a supervisory point of view, considers the tone at the top, accountability, effective communication and incentives as important indicators of a sound risk culture.

In a similar vein, Levy et al. (2010) argues that numerous critical and mutually reinforcing elements demonstrate a strong risk culture, such as a well-communicated clear risk management strategy; information sharing and high level of analytics; prompt escalations of issues and threats; visible felt leadership by management that demonstrates desired behaviours; and continuous challenging of actions and organisational biases at all levels of the institution.

According to Smith and Kagan (2012), risk culture surveys should be categorised and analysed along key attributes of effective risk management and control. Dimensions such as

leadership and strategy, accountability and reinforcement, people and communication, and risk management infrastructure are proposed.

The risk culture aspect model developed by the Institute of Risk Management (2012) involves grouping the key indicators of risk culture in four themes – tone at the top, governance, decision-making, and competency. The model is a diagnostic tool to identify gaps and requires a self-assessment of the current state by the organisation. The model links with the sociability versus solidarity analysis. The focus is on addressing key identified gaps to ensure incremental improvement over time to move the organisation towards a position that is more conducive to an effective enterprise risk management process.

Power et al. (2013) states that the objective of a survey is to quantify and track the organisation's risk culture in terms of measurable factors and to prioritise those that may require improvement interventions. An increasing factor score over time will signify improvements in the organisation's risk culture.

3.5 Concluding remarks on the literature review

The measurement of risk culture is extensively covered in practice notes and studies conducted by industry boards and regulatory bodies. According to the sources consulted, the organisational risk culture is based on the norms, values, beliefs, knowledge and understanding in an organisation that will shape risk decisions. Sufficient guidance is provided in the literature reviewed for a survey that will measure the current state of organisational risk culture.

4. Method

This section explains how the primary research objective was approached in this study.

4.1 Participants

The primary research in this study focused on the following three management levels within the integrated logistics company:

- Executive management;
- Senior management; and
- Middle management, including professional staff.

4.2 Procedure and Measures

An online survey was distributed via email to the entire management team, consisting of 6 019 employees, to assess the risk culture of the organisation. The main aim of the survey was to assess how participants view the levels of:

- Integration of risk management into the management of the organisation; and
- The practices of risk management as an enabler for achieving the organisational objectives.

The survey was left open for a period of two weeks and two follow-up reminders were sent to possible respondents. Items were set up such that multiple answers could not be provided except where expected. Where respondents indicated they were below 18 years old, the system automatically excluded them from the survey.

In order to derive appropriate data to address the research questions, a two-part survey questionnaire was used. The survey was based on the pilot Risk Culture Questionnaire of 2016 (RCQ-2016) developed by the Centre for Applied Risk Management at North-West University (UARM). Details about the UARM RCQ-2016 are provided in Appendix A. The first part sought some demographic information such as management level, organisational unit, age, gender, length of service, years of experience and qualifications, which served as moderating variables in further analysis of the results. This part of the survey was adjusted for use in this study to imitate company-specific nuances, such as naming conventions for organisational roles and operational areas.

The second part of the UARM RCQ-2016 included risk culture items that were developed during workshops with students and research group members. Survey questionnaire items were based on the key risk management practices that are linked to the definition of risk management. The definition of risk used for the purpose of the survey was *the negative effect of uncertainty on objectives*. The questionnaire consisted of 40 items using a 5-point Likert scale to test the level of how much respondents agreed or disagreed with a particular statement regarding individual risk culture variables. Two sets of 5-point Likert scales were used. The first set consisted of 5 (*Always*), 4 (*Usually*), 3 (*Sometimes*), 2 (*Infrequently*) and 1 (*Never*) and was used for those survey items that determined regularity of an activity. The second set consisted of 5 (*Perfectly*), 4 (*Well*), 3 (*Moderately well*), 2 (*Not well*) and 1 (*Not at all*) and was used for those items aimed at defining the level of acumen.

The UARM RCQ-2016 risk culture maturity model was based on the 5-point Likert-type answer scales for each factor, as reflected in Table 1 of Appendix A. The sample maturity levels were

used as initial indicators of the participants' perception of risk management culture in the organisation.

4.3 Analysis

Descriptive statistics and inferential analysis were used to describe and compare the groups. The emphasis of the analysis was to identify significant differences between the management levels in the organisation. The sample size of 734 respondents translates into a 12 percent response rate. Responses in this study formed part of the factor analysis on the survey items used in the broader study (refer to Appendix A). This inferential hypothesis-testing technique allowed for testing the validity of the risk culture survey items for this particular study. Analysis was performed on the demographic items to test if they could serve as diagnostic indicators of additional influences on risk culture within the organisation.

5. Results

5.1 Demographics

The survey participants were mostly South African citizens of whom 63 percent were male. It was observed that 78 percent were in middle management, 20 percent in senior management and the balance in executive management. Most participants had a tertiary qualification – 35 percent being post-graduate, 29 percent with bachelor degrees and 25 percent with some other form of tertiary education. Almost 35 percent of the participants were below the age of 40, 60 percent between the ages of 40 and 60, with only five percent 60 years or older (refer to Appendix B).

5.2 Risk culture factors

The goal of clustering related risk culture factors was to test which factors correlate with each other. The risk culture factors were based on the broader pilot data, of which this study formed part (refer to Appendix A).

The factor analysis performed on the larger study by North-West University reduced the number of survey items from 40 to 34. This analysis identified two main risk culture factors. The first factor is termed *risk culture - risk integration* and the second *risk culture - diagnostic individual*. Further analysis of the second factor resulted in two sub-factors, being *risk understanding* and *individual responsibility and accountability*. A total of 25 items were derived in terms of the first factor to calculate the maturity scores. In the case of the second factor, seven items were derived for the first sub-factor and only two for the second sub-factor.

5.3 Reliability of questionnaire

A statistical procedure was used to determine how well the risk culture questionnaire worked for the specific sample used in this study. The standardised Cronbach's alpha coefficient of 0.96 confirmed the reliability of the 34 survey items.

5.4 Risk culture responses

Maturity scores were obtained by calculating the mean of items per risk culture factor, as reflected in Table 1. The scores obtained indicate of a relatively mature risk culture at all levels of management.

Table 1: Factor Maturity Scores of all participants and by management level

Organisational level	n	Factor 1: Risk integration	Sub-factor 2.1: Risk understanding	Sub-factor 2.2: Individual responsibility and accountability
All participants	734	3.8	4.0	4.5
Executive management	16	3.8	4.3	4.8
Senior management	148	3.7	4.2	4.6
Middle management	750	3.8	3.9	4.5

The factor scores with respect to factor 1 indicate that risk management is viewed as a high integrated enabler of achieving the organisation's objectives by all the managerial levels. Similarly, the scores for sub-factor 2.1 suggest a high level of understanding of risk in the organisation. Finally, the high scores for sub-factor 2.2 are indicative of all three management levels being completely responsible and accountable for risks connected to their roles. Refer to Table 1 of Appendix A for more detail on the risk culture maturity ranges.

In an attempt to answer the first research question regarding the difference between the risk cultures of the three management levels, the normality of the data was tested. The histograms for the individual items indicated they are mostly skewed to the right. Under normality a bell-shaped distribution is expected. Since the parametric assumption of normality did not hold, a non-parametric test was used to test for differences in distribution between the three groups of management.

6. Discussion

The Wilcoxon scores were used to obtain the Kruskal-Wallis test results. The null hypothesis (H_0) was that the distributions for the three management levels were equal. If $p < \alpha = 0.05$, the H_0 should be rejected because there were significant differences between the three

independent management levels. The detail reflected in Appendix B indicates that significant differences were noticed in eleven individual survey items across the factors. Closer inspection of the differences in the mean Wilcoxon scores of the risk culture factors reveals the following observations and interpretations.

6.1 Risk integration

Executive management scored higher than the other two management levels in respect of the following individual items of factor 1 *risk integration*:

- They are able to challenge risk stakeholders on risk issues in the organisation; and
- They agree with the organisation's risk management framework more than their peers in the other two management ranks.

Middle management scored higher in the following three individual items of factor 1 *risk integration* than the other management levels:

- This level was of the opinion that the organisation clearly links risks and opportunities when defining its objectives;
- They believe that the organisation responds quickly to new risk information; and
- In addition this management level was of the opinion that the organisation actively learns from risk events to improve the management of related risks.

6.2 Risk understanding

Executive management scored consistently higher than the other two management levels in almost all the items of sub-factor 2.1 *risk understanding*. It was expected that executive management would have recorded a higher score because top management has positional power and involved in the approval of the risk management framework and standards of the organisation. It is clear from the survey that this level understands:

- The link between the organisation's risk and objectives;
- The organisation's risk management framework, processes and practices;
- What kind of information their colleagues require to make risk-related decisions; and
- How well the organisation is performing in reaching its objectives.

Senior management scored higher than the other two management levels on the following items:

- Understanding how to manage risk as part of their position role; and
- Understanding the contribution that risk management, as a practice, makes in reaching organisational objectives.

Middle management recorded the lowest mean Wilcoxon scores on all six items of sub-factor 2.1 *risk understanding* compared to the other two management levels. It can therefore be concluded that both executive and senior management better understand organisational risks, which is an indication that these management levels are setting the tone at the top.

6.3 Individual responsibility and accountability

There were no significant differences in the two items for the management levels in the sub-factor 2.2 *individual responsibility and accountability*. This indicates that management across all levels has a similar understanding of their individual roles regarding the management of organisational risks. It is important to note that sub-factor 2.2 also had the highest risk culture maturity score of all the factors.

6.4 Additional influences on risk culture

A trio of noteworthy findings emerged from further analysis of the mean Wilcoxon scores of all the items within the factors. The analysis revealed that the risk culture maturity improves with the age of the participants across all the factors. It was more pronounced in terms of *risk understanding* (sub-factor 2.1). This finding is consistent with seniority of managers. The average age of senior and executive management is higher than that of the middle managers in the organisation.

Similar inferences were made based on the participants' declared years of experience. The years of experience were clustered into three groups: up to 5 years, between 5 and 10 years, and more than 10 years. The mean Wilcoxon scores were consistently higher across all the factors as the years of experience increased. The risk culture seems to be significantly higher when participants have more than 10 years of work experience.

The final finding was that the participants' length of employment by the company in this survey had a direct influence on the risk culture maturity. Judged by the increasing mean Wilcoxon scores for all the factors, it can be deduced that improved knowledge of the collective management of organisational risks and risk management methodologies, which comes with more years of service, will have a positive influence on the risk culture of an organisation. Refer to Appendix C for more detailed analysis.

6.5 Risk ownership

Respondents were surveyed on who owns the risks in the organisation. The choices offered were the risk managers, strategic managers, operational managers or the auditors. The respondents could choose more than one role player. Only three percent did not participate

in this survey. Analysis of the responses to this question revealed that there exists a co-ownership by strategic management, operational management and risk management (28 percent of the total responses). All role players, as a response, were selected by 14 percent, with 10 percent indicating that both the risk and operational managers own the organisational risks. However, some 12 percent of the respondents indicated that the risk management function is solely responsible for the management of risks, which is contrary to the standards reflected in industry codes such as ISO 31000. This gap in understanding could be addressed by training, communication and providing role clarity.

6.6 Measures to improve risk management

Measures suggested by the survey participants to improve risk management in the organisation are reflected in Figure 3. The survey question allowed for only one response. An analysis was performed on the responses of the individual management levels to determine if there are any significant differences in opinion on the proposed process improvements. The analysis revealed similar outcomes across all three management levels, which was a preference for improved clarity on accountability and responsibility (37 percent of all respondents).

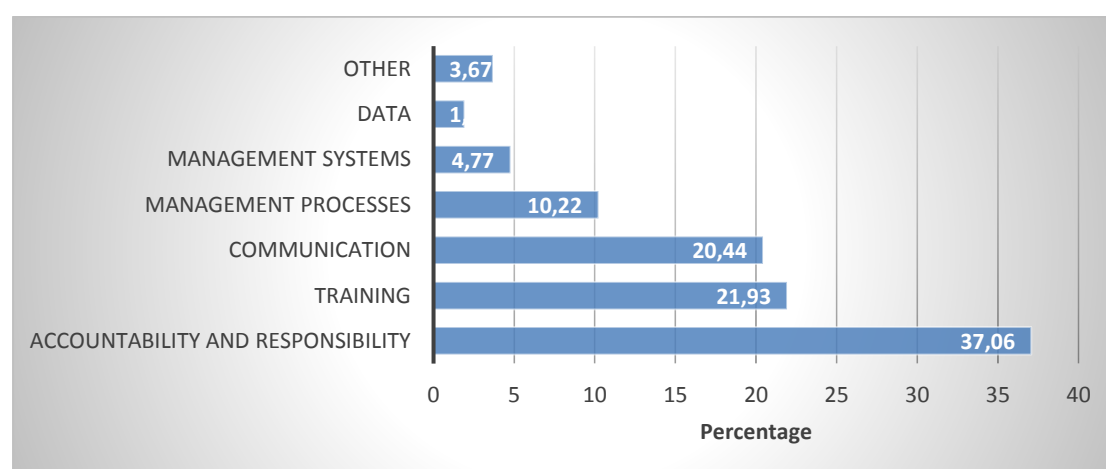


Figure 3: Proposed interventions to improve risk management practices

A small number of participants indicated the need for more than one option by using the free-text portion of this particular survey question. Some proposed that accountability and responsibility for the management of risks should be institutionalised by establishing risk performance measures that are compulsory for all managers in the organisation. Other improvements suggested were to adapt a risk management framework to cater for specific risk types, and the proactive use of risk information as a management decision support tool.

7. Conclusion

For purposes of this study, corporate risk culture is seen as how groups of people use risk management principles when making decisions about future uncertain events that could have a negative impact on reaching the organisation's strategic objectives. Factor analysis performed during the UARM risk maturity research on the risk culture survey items confirmed that two factors exist based on the reduced survey items of 34, namely the first factor *risk integration* and the second factor *risk culture: individual role diagnostic*. The second factor was split further into two sub-factors, *risk understanding* and *individual responsibility and accountability*. The survey results suggest that there exists a significant difference in risk management understanding at a factor level, even though understanding remains high throughout all levels.

Significant differences between the three management levels in the organisation were detected for eleven items in the survey. This is consistent with the findings by Power et al. (2013), that risk cultures are unevenly distributed between the different layers of management within organisations.

Although this study provides a framework for measuring the factors of risk culture, the factor scores per factor were calculated as the average of means of the individual items that made up the factor. This approach is generally acceptable for new questionnaires where the factor loadings have not been confirmed (DiStefano, Shu & Mindrila, 2009; Russell, 2002). In future studies consideration should be given to assigning appropriate factor loadings.

Judged against the criteria used in the survey, the aggregate results suggested that risk culture in the logistical company is mature when compared to the measures reflected in Appendix A. This study uncovered other dynamics that might have an impact on the risk culture maturity of an organisation. These dynamics relate to the years of experience, years of service and the age of the participants. Maturity improved across all three aspects in terms of more years of experience or service, or with age. These results offer an opportunity for further research to substantiate the findings and have implications for organisations with dissimilar demographic profiles to the organisation studied.

Although the sample size is considered to be large enough to make substantive inferences, it is not without any limitations. The response rate was lower than expected for executive management, 16 out of a potential 208, which could have an influence on the results from this management level and indicates an area for further research in the future.

Another limitation that is unavoidable in this type of study is the biases that are inherent when using subjective beliefs of the participants in a survey. Typically it can be expected that executive management teams are inclined to be overconfident due to their access to more organisational information.

Individual differences between the management teams can be closed by how the accountability and responsibility for the management of risks are formally assigned in the organisation. The survey results indicated that middle management's understanding of risk is not at the same as the other, more senior management levels. More emphasis should therefore be placed on vertical and horizontal communication of key strategic and operational risks. Training on risk management frameworks and processes should be shared more widely in the organisation to improve risk understanding and risk integration in decision-making at all levels.

The results of this study can be considered to be valuable for integration into the larger UARM research project on risk culture.

(Total word count: 4686)

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RESEARCH NOTE

An explorative study on risk attitude in a South African logistics organisation

1. Abstract

The corporate risk attitude may have a significant influence on the risk management process of an organisation. It therefore follows that the risk attitude of an organisation needs to be proactively monitored and managed to ensure the effectiveness of the risk management processes. In this explorative study two dimensions of risk attitude were considered – risk perception and risk propensity. Only the financial domain of the Domain Specific Risk Taking (DOSPERT) scale, developed by Weber, Blais and Betz during 2002, were used to derive the survey questionnaire. This risk attitude survey consisted of four investment alternatives and formed part of a wider risk culture study. Analysis of the risk perception and risk propensity responses of the 707 participants assisted with determining if the three management levels in the organisation had different attitudes towards risk. Executive management was found to be more risk-seeking than the collective management team. In contrast, middle management scored lower on all the measures, thus making them more risk-averse. These findings substantiated the prognosis by DeJonghe, Edelsten and Xavier (2013) that a group can adopt a collective risk attitude that is substantially different from individual or intergroup risk attitudes. Some association between risk culture and risk attitude could be inferred in this study.

Keywords: risk attitude; risk perception; risk propensity; risk culture; risk management.

2. Introduction

Group behaviour reflects a distinct attitude when faced with significant uncertainty. This attitude adopted by the group when faced with significant uncertainty could be vastly different to risk attitudes of the constituent individuals or intergroup teams (Hillson and Murray-Webster, 2007). This research note explores the differences in risk attitude of the three management levels of an organisation. A literature review was performed to understand what corporate risk attitude is about. The literature review provided a theoretical basis of all aspects of risk attitude which were considered in designing a survey.

The survey was sent to the total population of 6 019 managers in the organisation and thus avoided any biases by not excluding any member of the target population.

A three-part survey questionnaire was used based on the risk culture survey developed by the Centre for Applied Risk Management (UARM) at North-West University in 2016 (UARM RCQ-2016 in short). Part one contained some demographic information, which served as moderating variables. Part two were items related to assessment of the risk culture. The final part of the survey was based on questions used in previous research to determine individual team and group risk attitudes. The DOSPERT scale, developed in a 2002 study by Weber, Blais and Betz, was utilised. Due to the explorative nature of this study, only four investment domain items were considered.

The secondary emphasis of this study was to establish whether a relationship exists between the components of risk attitude and risk culture in an organisation. This relationship was tested for all management levels, individually and collectively. This area is not well researched in current practice nor by academia. This study thus contributes to the current body of knowledge on both risk culture and risk attitude.

3. Background

The topic of risk attitude is well reported in the academic literature, specifically with respect to the measurement of risk propensity and risk perception. The literature research deliberated the notion that the concepts of risk, risk culture, risk attitude and uncertainty are interlinked.

3.1 Risk attitude

The concepts risk attitude, risk propensity and risk perception have been popular research topics in recent years. Some authors maintain that the risk culture of an organisation is more than the sum of the risk attitudes of the individual role-players. Research by Harwood, Ward and Chapman (2009) on organisational risk propensity and its effects on decision-making was based on the prospect theory. The premise of their study was that risk propensity and risk perception are direct determinants of decision choices. Risk propensity refers to the “cumulative general propensity of an individual to either take or avoid risks”. Risk perception is considered to be “an individual’s assessment of how risky a situation is in terms of probabilistic estimates of the situational uncertainty, how controllable that uncertainty is, and confidence in those estimates”.

People differ in the way they resolve business and personal decisions that involve uncertainty or risk (Weber, Blais, and Betz, 2002). A spectrum of potential risk attitudes may be embraced during similar conditions. The adopted attitudes will direct behaviour, which could result in intended and unintended consequences. Behaviour is generally accepted as the only reliable

diagnostic indicator of inner attitude. Behavioural psychology has therefore been the focal point for those seeking to understand and manage the effects of human factors in business.

Harwood et al. (2009) argues that individuals have divergent propensities toward risk taking, which is determined by underlying personality traits and behavioural tendencies. Hillson and Murray-Webster (2007) cautions to seek a deeper understanding of the prevalent attitudes, instead of focussing on merely presenting behavioural symptoms.

The approach to risk by teams, within an organisation, is largely a function of the risk attitudes of the constituent individuals making up the team. Hillson and Murray-Webster (2007) asserts that that this composite function should not entirely define how a particular group will respond or react to uncertainty. Simple examination of the behaviour of groups clearly shows that groups display distinct risk attitudes, which are chosen responses to significant uncertainty adopted by the whole group, and which can sometimes be directly contrary to the preferred risk attitudes of some of the individuals making up the group. This is largely due to the influence of corporate heuristics on group behaviour.

3.2 Relationship between risk culture and risk attitude

Organisational culture, which forms part of organisation theory, frames the discussion on the relationship between risk culture and risk attitude. To support the view that the concepts of risk culture and risk attitude are intertwined, this section explores the related debate in available literature.

DeJonghe, Edelsten and Xavier (2013) states that the organisational culture is determined in part by its employees, but there are also other fundamentals of risk behaviour that are derived from the group as a whole. A specific risk management approach is an example where a group can adopt a distinct risk attitude when faced with significant uncertainty, which could be vastly different to risk attitudes of the constituent individuals or intergroup teams. The primary research in this paper proves that this statement holds true for the various management levels within an organisation.

At a fundamental level, organisations can be divided into categories on a continuum from being risk-averse to risk-seeking. There is a range of organisational risk attitudes at one extreme leading to aversion to risk, or even hostility in some cases. On the other end of the scale are the risk-seeking organisations, and some may even become risk-addicted. MacCrimmon and Wehrung (1990) argue that a person's or an organisation's standing on greater risk taking is sometimes found with greater personal and corporate success. An aggressive attitude to risk will inevitably lead to corporate failure when the quantum of risk

exposure taken on exceeds the organisation's ability to sustain it. DeJonghe et al. (2013) concurs with this view and found that inadequate risk culture was a key contributor to the global financial crisis of 2008.

3.3 Context of the risk attitude survey

The literature consulted used divergent approaches to assess risk attitude in organisations. Weber et al. (2002) developed a risk-taking scale, named the Domain Specific Risk Taking (DOSPERT) scale. DOSPERT presents a psychometric scale in six content domains, namely ethical, investment, gambling, health/safety, recreational, and social decisions. The first part of the survey requested participants to rate the likelihood that they would engage in the six content domain-specific risky activities. The second part measured the participants' perceptions of the magnitude of the inherent riskiness of these activities.

A revised shorter version of the DOSPERT scale was developed by Blais and Weber (2006) for adult populations. They concurred that other researchers can use the DOSPERT scale to access conventional risk attitudes and perceived risk attitudes across the DOSPERT domains. Conventional risk attitude was defined as the reported level of risk-taking. Perceived risk attitude was defined as the willingness to engage in a risky activity as a function of the perceived riskiness.

Pennings and Smidts (2000) compared two main approaches to measuring risk attitude. The first measure was based on the expected utility model with responses to lotteries. The second measure was based on a psychometric approach with Likert assessments that resulted in a unidimensional risk attitude scale.

The research by Harwood et al. (2009) on organisational risk propensity and its effects on decision-making was based on the prospect theory. The premise of the study was that risk propensity and risk perception are direct determinants of decision choices. Risk propensity refers to the "cumulative general propensity of an individual to either take or avoid risks". Risk perception is considered to be "an individual's assessment of how risky a situation is in terms of probabilistic estimates of the situational uncertainty, how controllable that uncertainty is, and confidence in those estimates". Their study developed an integrative framework of ten organisational propensity properties.

3.4 Concluding remarks on the literature review

It is evident from the literature research that risk attitude and risk culture are expected to be intertwined. Previous academic studies provided a sound basis on how to measure risk

attitude for both individuals and groups. These surveys indicated the risk attitude across the continuum from risk-averse to risk-seeking. Risk attitude is viewed as a chosen response to perception of significant uncertainty. Sufficient guidance is provided in the literature reviewed to derive a survey that will incorporate aspects of risk attitude to measure the current state in an organisation.

4. Method

This section explains how the primary research was approached in this study.

4.1 Participants

The subject of this study was a large integrated freight logistics company, which is fully owned by the South African government. The primary research in this study focused on the following three management levels within the logistics company:

- Executive management;
- Senior management; and
- Middle management, including professional staff.

The total management population of 6 019 were invited to participate in the survey. A total of 707 responded to the survey. The sample was thus 12 percent of the total management population.

4.2 Procedure and Measures

An online survey was conducted via email among the entire management team to assess the risk culture and risk attitude of the organisation. The risk attitude survey formed part of a wider study that assessed the risk culture of the company. The UARM RCQ-2016 survey, developed by the Centre for Applied Risk Management at North-West University, was used to assess the demographics of participants and the risk culture of the company (Appendix A).

The final part of the survey was based on questions used in previous research to determine individual or group risk attitudes. The main aim of the risk attitude survey was to assess any differences in the risk attitudes at different management levels in the organisation and to test if there is an association between the risk culture and risk attitude items.

The DOSPERT scale, developed in a 2002 study by Weber, Blais and Betz, was utilised to assess risk attitude. Only the investment domain was considered in the survey, as the purpose of this study was not to explain the differences between risk perception and risk propensity over all six DOSPERT domains, but rather any differences between the three management

levels within the organisation. The approach in this study was consistent with the prognosis by Willebrands et al. (2012), that a businessman is not a gambler. In their study they used five investment items related to the financial domain. In the study reported here only four investment items, based on the instrument developed and extensively tested in western countries by Weber et al. (2002), were included. Some minor adjustments were made to the investment domain questions to align better with the South African financial market context.

Four investment choices were represented to the participants, ranging from low risk, conservative, medium risk to high risk investment vehicles. Both the risk perception and risk propensity were surveyed for each investment alternative. Both the Blais and Weber (2006) and the Willebrands, Lamer and Hartog (2012) studies made use of the 7-step Likert scales. It was decided to keep to the original 5-step Likert scales used by Weber et al. in the original 2002 study.

In this study two sets of 5-point Likert scales were used. The first set was applied to the risk propensity items and ranged from 5 (*Very likely*) to 1 (*Very unlikely*). The second set was applied to the risk perception items and ranged from 5 (*Extremely risky*) to 1 (*Not at all risky*). A full description of the survey items used is given in Appendix D.

4.3 Analysis

Descriptive statistics and inferential analysis were used to describe and compare the variables. The validity of the risk attitude components was tested. The statistical analysis and hypothesis testing assisted in evaluating the relationship between risk propensity and risk perception of the different investment alternatives. Significant associations were tested using two-way contingency tables and chi-squared tests for the risk attitude components and the risk culture factors of the organisation.

5. Results and Discussion

5.1 Demographics

The survey participants were primarily South Africans. It was observed that two percent of the participants were executive management, 20 percent senior management and 78 percent belonged to middle management. The qualifications of the participants ranged from 35 percent being post-graduate, 29 percent with bachelor degrees to 25 percent with some form of tertiary education. Around one third of the participants were female. The ages of the participants were normally distributed, with 5 percent below the age of 30, 36 percent between the age of 40 and 60, and another 5 percent were 60 years or older.

5.2 Risk attitude responses

A total of 707 respondents participated in this survey. Key insights derived from the analysis of the responses to the risk attitude survey were that the three management levels had different responses to perceived risk of the investment alternatives. The same held true for risk propensity. In an aggregated view, when the arithmetic mean scores for all four investment alternatives were considered, some inferences could be made. It is evident from Table 2 that both executive management and senior management had a higher risk propensity than the overall group which includes middle management. Similarly, both executive management and senior management had a lower perception of the risk than the group as a whole. In contrast, middle management scored higher on risk perception and lower on risk propensity compared to the overall management risk attitudes, thus making this particular group more risk-averse. A more detailed analysis is presented in Appendix E.

Table 2: Aggregated arithmetic mean across all investments

Organisational level	Risk Propensity			Risk Perception		
	n	Mean	Std Dev	n	Mean	Std Dev
All management levels	705	3.14	1.21	707	2.86	1.07
Executive management	16	3.23	1.16	16	2.83	1.12
Senior management	143	3.27	1.19	143	2.81	1.09
Middle management	546	3.10	1.22	548	2.88	1.06

Further probing of the data revealed that executive management perceived the described risk in the item level higher than the other management levels for a relatively riskier investment, but in addition opted for a higher commitment in this type of investment. Executive management could thus be considered to be risk-seeking when the stakes are higher. When faced with moderately risky investment decisions, all the decision-makers tend to perceive the risk at the same level, but both executive and senior management would invest more than the middle management level. Executive management appeared to be risk-neutral when considering perceived low-risk investments and in both investment alternatives opted for lower investments than the collective. These findings support the argument by DeJonghe, Edelsten and Xavier (2013) that a collective management team can adopt a distinct risk attitude when faced with uncertainty that could be very different from the intergroup risk attitudes. Appendix E reflects more details on the key differences among the management levels.

The final research question was to determine if there was a relationship between the group risk attitudes and the corporate risk culture. Chi-squared tests were performed to determine if there was a significant relationship per management level. Although some association could

be detected at the middle management level, the overall results were inconclusive, as reflected in Appendix F.

6. Conclusion

Risk attitude was split into two components for this study – risk perception and risk propensity. The primary data confirmed that the risk attitudes of the different management levels were indeed dissimilar. However, some similarity was observed between executive and senior management. Deviation about the group mean indicated that the top two management levels tend to take on more risk. These management levels also perceived risk to be lower than the organisational view. Middle management consistently scored lower on all risk measures of risk propensity, thus indicating that this level is more risk-averse. The primary research supported the notion that risk attitudes exist on a spectrum ranging from being risk-averse to risk-neutral and risk-seeking as contemplated by Hillson and Murray-Webster (2007).

This study on risk attitude was explorative in nature and limited to the financial DOSPERT domain only. A business-oriented risk attitude survey instrument, covering more domains, should be considered in future studies. The association between risk culture and risk attitude could not be substantiated in this study. Future studies should explore the relationship between risk culture and risk attitude in more detail.

(Total word count: 2903)

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REFLECTION

The two research studies answered some of the pertinent questions I personally had about the proper measurement of risk culture in an organisation and where risk attitude fits in the picture. My studies have positively influenced a more holistic understanding of enterprise risk management. I became more attentive to the behavioural aspects of risk management. It has shaped my view of how risk management practices should be embedded in an organisation and made me more aware of how decisions are made when people are faced with uncertainty.

This is the third year that my particular company has attempted to measure risk culture. Previous attempts were based on the risk management framework of the organisation and the surveys were developed without any academic rigour. The main differentiating factor in the present study was that the risk culture survey was developed from the recognition that risk culture is a sub-set of the wider organisational culture and the influence of corporate heuristics. The factor analysis performed on the wider UARM Risk Culture Questionnaire (UARM RCQ-2016) resulted in 34 survey items that could be used in future risk culture surveys in my organisation. Informal feedback received on the survey from my colleagues was overwhelmingly positive. The results inform the change management strategy to be employed to further enhance the risk management maturity in our organisation. This study provides a practical tool to measure risk culture in any organisation. Being part of the planning and design of UARM RCQ-2016 was a good learning experience as I now understand better how to approach similar studies in future.

My personal learning during this project was experiencing first-hand how the research journey works. The research strategy to gauge risk attitude was to use existing instruments to measure risk propensity and risk perception. Many academic articles were considered to develop an explorative study on risk attitude. I went the full circle by considering very diverse approaches to measure risk attitude. I have considered the prospect theory of Kahneman (1982) as his research was often mentioned in other studies. Of particular interest was his prognosis that if an organisation is performing well financially the organisation tends to be risk-averse; the converse is true during trying times, such as in the current business environment of the organisation studied. More controversial approaches were considered, such as the study by Harwood et al. (2009) that proposes an integrative framework of organisational risk propensity covering ten properties. According to Harwood, risk perception and risk propensity influence all decision-making. There was, however, uncertainty around the survey instrument used. I finally opted to use the DOSPERT, which was developed by Weber (2002). DOSPERT is a domain-specific scale to measure conventional risk attitude consisting of 40 questions in 6

domains – ethical, investing, gambling, health/safety, recreational, and social items. The use of Likert scales was a better fit to test the relationship between risk culture and risk attitude.

This was indeed an incredible journey that ensued from the very first assignment in this course. My study experience at North-West University was very positive from the outset and inspired me in achieving distinctions in all my assignments. The key differentiator was all the tools and support the university offered to the students at each stage of their studies. The ingredients of success were the passionate academic staff, the participative contact sessions, the eFundi student portal that offered all the required tools and online library services, but most of all, an incredible supervisory team that provided technical and moral support during the preparatory phases of this mini-dissertation.

My personal circumstances were less than ideal during the last part of my studies due to a restructuring at my company. This process was at times physiologically and physically draining. My studies often removed me emotionally from the company reality and allowed me to channel my energies more positively towards my mini-dissertation. I am grateful that I have persevered during this process and managed to secure a senior position in the reorganised company and to complete my mini-dissertation at the required competency level and on time.

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Appendix A: UARM Risk Culture Questionnaire Pilot

UARM RCQ-2016 Summary

Sep 2016

Hermien Zaaiman (Research project leader)

This document provides a brief overview of the 2016 pilot version of the UARM Risk Culture Questionnaire (UARM RCQ-2016).

Aim of UARM RCQ-2016

The aim of the UARM behavioural risk research programme is to develop tools to assess and improve the integration of formal risk management principles into organisational management. The aim of the UARM risk culture research project is to develop tools that can be used to assess the risk management culture ('risk culture') of organisations and identify possible problem areas related to risk culture.

We distinguish between risk management as a function in the organisation and the use of risk management principles during decision making in the organisation. We expect that participating organisations will have a formal risk management function intended to facilitate and oversee the use of risk management principles at an organisation's strategic and operational management levels. As the specific implementation of risk management tends to differ from organisation to organisation, the UARM risk culture survey has been developed independently of how risk management is implemented in the organisation.

Terms

The term risk culture can have many meanings. This implies that risk culture must be carefully defined to allow for optimally reliable and valid assessment of the perceived risk management culture in an organisation. We took a value of risk management to the organisation based approach in the UARM Risk Culture research project. The terms necessary to understand our definition of risk culture are now defined.

Risk: For the purpose of this research project, we define risk as *the negative effect of uncertainty on objectives*. This definition links Hubbard's definitions of risk:

'Long definition: The probability and magnitude of a loss, disaster, or other undesirable event' or *'Shorter (equivalent) definition: Something bad could happen'* Hubbard (2009, p. 8)

to the ISO 31000 definition of risk as *'the effect of uncertainty on objectives'* (ISO, 2009b, p. 1).

Risk management: We use the ISO 31000 definition for risk management as *'coordinated activities to direct and control an organization with regards to risk'* (ISO, 2009b, p. 2). Hubbard (2009, p. 10) expands on this in his long definition of risk management: *'The identification, assessment and prioritization of risks followed by coordinated and economical application of resources to minimize, monitor, and control the probability and/or impact of unfortunate events'*.

Expected value of risk management to organisations: ISO 31000 recommends that *'organizations develop, implement and continuously improve a framework whose purpose is to integrate the process for managing risk into the organization's overall governance, strategy and planning, management, reporting processes, policies, values and culture'*. Such integration is expected proactively to increase the likelihood of achieving objectives by, in part, establishing a reliable basis for decision making and planning. (ISO, 2009a, pp. v, vi)

Based on this ISO 31000 view of the value of risk management, we view the integration of risk management principles into organisational decision making as an essential enabler for achieving the organisation's objectives. Taking risk into account during decision making at all organisational levels and management processes should contribute to reaching the organisation's objectives.

Risk Culture: We used the Hofstede approach to culture as starting point for the development of the UARM Risk Culture Questionnaire (RCQ). Hofstede, Hofstede, and Minkov (2010, p. 516) define culture as the trained unwritten rules of the social game or the *'collective programming of the mind that distinguishes the members of one group or category of people from another'*. An organisation can be seen as a cultural group that consists of subgroups, each with their own subculture.

For this study, we define organisational risk culture as the way in which groups of people use risk management principles when making decisions on uncertain future events that could have a negative impact on reaching the organisation's objectives. This definition allows for an assessment of the expected value of integrated risk management to achieving the objectives of the organisation.

The UARM risk culture questionnaire and items should:

- Be applicable across organisational sectors, work roles and risk types;

- Have a strong academic theoretical foundation;
- Be applicable in practice, i.e. with relevant and clear items, as briefly expressed as possible.

The RCQ items are based on key practices linked to the integration of risk management into the organisation's management at all levels of the organisation. The main aim of the questionnaire is therefore to assess how respondents view the levels of:

- Integration of risk management principles into the management of the organisation;
- The practice of risk management as an essential enabler for achieving the organisation's objectives.

The questionnaire also includes items that can be used as diagnostic indicators of where further questions should be asked about the risk culture of the organisation. The pilot version of the questionnaire (UARM RCQ-2016) was not intended to be a complete diagnostic tool. Based on the positive results from the questionnaire, we intend to further develop the risk culture diagnostic categories in the next versions of the questionnaire.

The pilot UARM RCQ-2016 online questionnaire consists of demographic, risk culture and diagnostic items. It took less than 15 minutes to complete for an initial test sample of respondents, with an average completion time of 10 minutes. This is brief enough to allow for adequately high response rates in the student research studies.

For ethical reasons, the questionnaire requires the participants to confirm that they are older than 18 years, have read the introductory information, and consent to participation on a voluntary basis before being allowed to continue with the questionnaire. Consent to participate is followed by standard and research-project-specific demographic items, such as age; gender; highest level of formal education completed; level in the organisation (e.g. board, executive, senior and middle management, non-management); function type (e.g. risk management, organisational management, operations); and length of time employed in the organisation.

Risk culture items

Forty risk culture items were devised during workshops with UARM students and research group members. The UARM student and research group members are all fully employed in risk-related roles across industry sectors. This allowed relevant, practical input into the development of the items.

The student research-project data were used to conduct a detailed factor analysis of the responses to the UARM RCQ-2016 version of the UARM Risk Culture Questionnaire. One would expect factors related to risk culture to correlate with each other. Initial exploratory analyses on the individual student data sets supported this expectation by indicating that the factors were not orthogonal, but correlated. The final factor analysis was therefore performed using the principal axis factor method with promax rotation and listwise exclusion of responses with missing data, as advised by writers such as Fabrigar, Wegener, MacCallum, and Strahan (1999).

Two factors were identified involving 34 of the original 40 items. The 34 items showed consistent high internal reliability with Cronbach's alpha coefficients of between 0.95 and 0.96 for all seven student research projects. The second factor was divided into two sub-factors based on the results of further factor analyses. The factors were named using the contents of the items per factor and sub-factor:

Factor 1: Risk Integration (25 items)

Factor 2: Risk Culture Diagnostic: Individual (9 items)

2.1: Risk Understanding (7 items)

2.2: Individual Responsibility and Accountability (2 items)

The items in Factor 1 assess the participant's perception of the integration of risk management principles into decision making with the aim of achieving the organisation's objectives. The items related to the contribution of the formal risk management function(s) to objectives driven decision-making are also included in this factor. These items will be further refined, based on the initial research results to create an even more reliable and valid UARM RCQ to be used for research in 2017 (UARM RCQ-2017).

The items in Factor 2 do not directly measure risk culture as defined for the purposes of this research project. The personal ('I') risk understanding and risk responsibility-accountability items divided into two sub-factors that can be used diagnostically to investigate further underlying aspects of risk culture. More diagnostic items will be developed in further research to allow for a more comprehensive diagnostic set of factors that can be used to evaluate the underlying reasons for participant perceptions of risk culture in organisations.

Calculation of factor score

At this stage in the development of the UARM RCQ, the factor scores per factor are calculated as the average of the means of the items making up the factor. This approach is generally

recommended for new questionnaires where the factor loadings have not been confirmed (DiStefano, Zhu, & Mindrila, 2009; Russell, 2002).

The factor scores were calculated for each student's sample data using the items listed in Appendix UARM RCQ-2016 per factor. As the factor score values are calculated by averaging the self-reported perceived status of risk culture in the organisation, they cannot be seen as absolute measures of organisation's prevailing risk culture. The factors provide a summary of the participant's views of risk culture in the organisation. The possible influence of item response biases on the scores (e.g. directional, confirmatory, social desirability and acquiescence biases) should be investigated in further research studies to establish whether the items adequately assess risk culture levels.

We may expect that the organisations in which the student studies of risk culture were done have levels of high risk management maturity as they operate in well-regulated sectors and therefore expect high factor scores for the 2016 student studies. Studies in organisations with lower levels of risk management maturity will also have to be conducted to assess the validity of the questionnaire. Nonetheless, the perceived risk culture factor scores should permit preliminary conclusions about the perceived risk integration, individual understanding of risk and risk responsibility and accountability in the samples studied. Statistically significant differences between item responses of sample subgroups should also provide diagnostic information on risk culture differences between groups within organisations.

The UARM risk culture maturity model

The factors allowed us to define a risk culture maturity model. Maturity levels corresponding to the five level Likert-type answer scales for each factor are provided in Table 1. At this stage, the sample maturity levels may be used as initial indicators of participant perception of the risk management culture in the group studied.

Note: The maturity levels are used for interpreting the results of the questionnaire. This information does not appear in the questionnaire itself and is not seen by the research participants.

The 25 UARM RCQ-2016 risk culture items in Factor 1 show promise as a measure of perceived risk culture where the value of risk management is viewed specifically in terms of:

- Integration of risk management principles into the management of the organisation;
- The practice of risk management as an essential enabler for achieving the organisation's objectives.

Based on their nature, the items belonging to Factor 1 can also be seen to assess the perceived risk management tone of the organisation.

The Factor 2 diagnostic items can be used to provide limited additional information on two aspects that may influence risk culture in the organisation. The current items for Factor 2.1 measure the respondent's risk understanding. Factor 2.2 assesses personal responsibility and accountability for risks connected to the person's role. These items, combined with responses on the items in Factor 1 and the diagnostic items 41 (risk ownership) and 42 (what should improve) will be used as the basis for compiling a more comprehensive risk culture diagnostic questionnaire (i.e. what to ask the respondents to be able to diagnose the source of risk culture issues?). This question will be addressed in further UARM research projects.

Note:

The development of the questionnaire will be written up in detail as a separate article.

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Table 1. UARM Risk Culture Maturity Model (UARM RCQ-2016)

Factor	Factor Name	Risk Culture Maturity Levels				
Factor 1	Risk Integration	1.0 ≤ FS < 1.5 Risk Management Not viewed as an integrated enabler of achieving the organisation's objectives	1.5 ≤ FS < 2.5 Risk Management viewed as a low integrated enabler of achieving the organisation's objectives	2.5 ≤ FS < 3.5 Risk Management viewed as a medium integrated enabler of achieving the organisation's objectives	3.5 ≤ FS < 4.5 Risk Management viewed as a high integrated enabler of achieving the organisation's objectives	4.5 ≤ FS < 5.0 Risk Management viewed as a fully integrated enabler of achieving the organisation's objectives
Factor 2	Risk Culture Diagnostic: Individual					
Sub-factor 2.1	Risk Understanding (Personal assessment of own understanding of risk in the organisation)	1.0 ≤ FS < 1.5 Do not understand risk in the organisation	1.5 ≤ FS < 2.5 Low level of understanding of risk in the organisation	2.5 ≤ FS < 3.5 Medium level of understanding of risk in the organisation	3.5 ≤ FS < 4.5 High level of understanding of risk in the organisation	4.5 ≤ FS < 5.0 Completely understand risk in the organisation
Sub-factor 2.2	Individual Responsibility and Accountability	1.0 ≤ FS < 1.5 Not at all responsible and accountable for risks connected to role	1.5 ≤ FS < 2.5 Low level of responsibility and accountability for risks connected to role	2.5 ≤ FS < 3.5 Medium level of responsibility and accountability for risks connected to role	3.5 ≤ FS < 4.5 High level of responsibility and accountability for risks connected to role	4.5 ≤ FS < 5.0 Completely responsible and accountable for risks connected to role

Note: FS denotes Factor Score

Appendix B: Item level analysis – Kruskal-Wallis test for management level differences

The information in the table only reflect significant differences between the risk culture factors.

Management level	n	Mean Wilcoxon score	Chi-square test statistic	p-value
Factor1: Risk integration				
6. I am able to challenge risk stakeholders on risk issues in the organisation.				
Executive management	16	482.81	21.77	0.00
Senior management	147	413.81		
Middle management	554	340.88		
9. I agree with the organisation's risk management framework.				
Executive management	16	413.75	6.60	0.04
Senior management	146	382.83		
Middle management	543	343.19		
13. The organisation clearly links risks and opportunities when defining its objectives.				
Executive management	16	310.00	6.83	0.,03
Senior management	148	330.84		
Middle management	564	374.88		
36. The organisation responds quickly to new risk information.				
Executive management	16	352.47	9.23	0.01
Senior management	147	317.54		
Middle management	559	373.32		
39. The organisation actively learns from risk events to improve the management of related risks.				
Executive management	16	325.47	6.29	0.04
Senior management	148	330.94		
Middle management	565	375.04		
Sub-factor 2.1: Risk understanding				
7. I understand the link between the organisation's risks and objectives.				
Executive management	16	439.25	15.02	0.00
Senior management	148	418.23		
Middle management	570	352.31		
8. I understand the organisation's risk management framework (processes, practices, etc.)				
Executive management	16	536.00	29.68	0.00
Senior management	148	426.98		
Middle management	570	347.33		
11. I understand how to manage risk as part of my work role.				
Executive management	16	408.94	10.47	0.01
Senior management	148	411.72		
Middle management	570	354.86		

Management level	n	Mean Wilcoxon score	Chi-square test statistic	p-value
32. I understand what kind of information my colleagues need to be able to make risk-related decisions.				
Executive management	16	416.56	8.21	0.02
Senior management	148	402.80		
Middle management	567	354.97		
34. I know how well the organisation is performing in meeting our objectives.				
Executive management	16	468.69	24.31	0.00
Senior management	148	430.15		
Middle management	569	347.72		
35. I understand the contribution that risk management as a practice makes in reaching the organisation's objectives.				
Executive management	16	389.22	11.13	0.00
Senior management	148	415.34		
Middle management	570	354.47		

Appendix C: Other influences on Risk Culture

An analysis was performed on three demographical features to investigate if those aspects had an influence on the survey results.

Age Group	n	Wilcoxon Mean score	Chi-square test statistic	p-value
Factor 1: Risk integration				
<30	35	304.78	13.11	0.11
≥ 30 < 40	215	339.65		
≥ 40 < 50	258	367.38		
≥ 50	216	393.88		
Sub-factor 2.1: Risk understanding				
<30	36	258.69	17.19	0.00
≥ 30 < 40	217	357.37		
≥ 40 < 50	260	367.99		
≥ 50	219	392.74		
Sub-factor 2.2: Individual responsibility and accountability				
<30	34	280.71	15.54	0.01
≥ 30 < 40	217	339.02		
≥ 40 < 50	256	374.50		
≥ 50	217	382.18		
All factors				
<30	35	293.87	14.10	0.08
≥ 30 < 40	215	343.26		
≥ 40 < 50	259	367.92		
≥ 50	217	392.96		

Years of Experience	n	Mean Wilcoxon score	Chi-square test statistic	p-value
Factor 1: Risk integration				
3 < and ≥ 5 years	251	342.48	10.37	0.14
5 < and ≥ 10 years	166	354.08		
> 10 years	306	383.53		
Sub-factor 2.1: Risk understanding				
3 < and ≥ 5 years	254	341.81	12.36	0.03
5 < and ≥ 10 years	173	357.50		
> 10 years	306	392.86		
Sub-factor 2.2: Individual responsibility and accountability				
3 < and ≥ 5 years	250	333.37	14.36	0.01
5 < and ≥ 10 years	171	360.98		
> 10 years	302	385.72		
All factors				
3 < and ≥ 5 years	251	341.81	11.02	0.11
5 < and ≥ 10 years	168	355.19		
> 10 years	306	385.58		

Length of Service	n	Mean Wilcoxon score	Chi-square test statistic	p-value
Factor 1: Risk integration				
3 < and ≥ 5 years	196	331.80	12.48	0.08
5 < and ≥ 10 years	137	349.91		
> 10 years	382	381.19		
Sub-factor 2.1: Risk understanding				
3 < and ≥ 5 years	199	347.07	9.42	0.26
5 < and ≥ 10 years	139	358.06		
> 10 years	395	379.89		
Sub-factor 2.2: Individual responsibility and accountability				
3 < and ≥ 5 years	197	321.31	18.05	0.00
5 < and ≥ 10 years	138	355.04		
> 10 years	389	384.59		
All factors				
3 < and ≥ 5 years	196	334.32	12.18	0.11
5 < and ≥ 10 years	137	351.89		
> 10 years	385	381.12		

Appendix D: Risk Attitude survey items

Two sets of 5-point Likert scales were used. The first set was applied to the risk propensity items (1, 3, 5, and 7) and ranged from 5 (*Very likely*) to 1 (*Very unlikely*). The second set was applied to the risk perception items (2, 4, 6, and 8) and ranged from 5 (*Extremely risky*) to 1 (*Not at all risky*).

Domain-Specific Risk-Taking (DOSPERT) Scale – Risk Propensity

Respondents were asked to provide a single rating using the following scale:

1	2	3	4	5
Very unlikely	Unlikely	Indifferent	Likely	Very likely

Item 1: How likely are you to invest 10% of your annual income in a moderate growth investment fund?

Item 3: How likely are you to invest 10% of your annual income in a very speculative share (venture capital)?

Item 5: How likely are you to invest 10% of your annual income in a conservative share (blue chip company)?

Item 7: How likely are you to invest 10% of your annual income in government bonds (SA retail bonds)?

Domain-Specific Risk-Taking (DOSPERT) Scale – Risk Perception

Respondents were asked to provide a single rating using the following scale:

1	2	3	4	5
Not at all risky	Somewhat risky	Moderately risky	Very risky	Extremely risky

Item 2: How risky do you think an investment in a moderate growth investment fund is?

Item 4: How risky do you think an investment in a very speculative share (venture capital) is?

Item 6: How risky do you think an investment in a conservative share (blue chip company) is?

Item 8: How risky do you think an investment in government bonds (SA retail bonds) is?

Appendix E: Risk Attitude arithmetic mean scores across all management levels

Management Level	Risk Propensity				Risk Perception			
	n	Mean	Standard deviation	Mode	n	Mean	Standard deviation	Mode

Low risk Investment (Items 7 and 8)

Executive management	16	2.69	1.30	1	16	2.31	1.25	1
Senior management	142	3.13	1.30	4	143	2.29	1.67	1
Middle management	544	2.99	1.34	4	548	2.64	1.19	3
All management level	702	3.01	1.33	4	707	2.56	1.19	3

Medium-low risk investment (Items 5 and 6)

Executive management	16	3.38	0.96	4	16	2.25	0.58	2
Senior management	143	3.69	1.00	4	143	2.41	0.75	2
Middle management	545	3.36	1.12	4	546	2.58	0.95	2
All management levels	704	3.43	1.10	4	705	2.53	0.91	2

Medium-high risk investment (Items 1 and 2)

Executive management	16	4.00	0.73	4	16	2.75	0.78	3
Senior management	143	3.66	1.00	4	143	2.70	0.69	3
Middle management	547	3.40	1.10	4	548	2.76	0.79	3
All management levels	706	3.47	1.08	4	707	2.75	0.77	3

High risk investments (Items 3 and 4)

Executive management	16	2.88	0.73	4	16	4.00	0.78	3
Senior management	143	2.61	1.00	4	143	3.85	0.69	3
Middle management	547	2.64	1.10	4	548	3.54	0.79	3
All management levels	706	2.64	1.08	4	706	3.61	0.77	3

All Investment items

Executive management	16	3.23	1.16	4	16	2.83	1.12	2
Senior management	143	3.27	1.19	4	143	2.81	1.09	3
Middle management	547	3.10	1.22	4	548	2.88	1.06	3
All management levels	706	3.14	1.21	4	707	2.86	1.07	3

Appendix F: Significant relationships between the group risk attitude and corporate risk culture across management levels

Risk Attitude Item	Risk Culture Factor	Chi-squared test statistic	p-value
<i>All management levels</i>			
Item 1. How likely are you to invest 10% of your annual income in a moderate growth investment fund?	Factor 1	11.22	0.02
	Sub factor 2.1	24.54	0.00
	Sub factor 2.2		
Item 4. How risky do you think an investment in a very speculative share (venture capital) is?	Factor 1		
	Sub factor 2.1		
	Sub factor 2.2	7.82	0.10
Item 6. How risky do you think an investment in a conservative share (blue chip company) is?	Factor 1		
	Sub factor 2.1	8.24	0.08
	Sub factor 2.2		
Item 7. How likely are you to invest 10% of your annual income in government bonds (SA Retail bonds)?	Factor 1		
	Sub factor 2.1		
	Sub factor 2.2	10.22	0.04
Item 8. How risky do you think an investment in government bonds (SA retail bonds) is?	Factor 1	8.53	0.07
	Sub factor 2.1		
	Sub factor 2.2		
<i>Middle management</i>			
Item 1. How likely are you to invest 10% of your annual income in a moderate growth investment fund?	Factor 1	9.67	0.05
	Sub factor 2.1	17.74	0.00
	Sub factor 2.2		
Item 2. How risky do you think an investment in a moderate growth investment fund is?	Factor 1		
	Sub factor 2.1		
	Sub factor 2.2	7.82	0.10
Item 4. How risky do you think an investment in a very speculative share (venture capital) is?	Factor 1	8.47	0.08
	Sub factor 2.1		
	Sub factor 2.2		
Item 5. How likely are you to invest 10% of your annual income in a conservative share (blue chip company)?	Factor 1		
	Sub factor 2.1	7.84	0.10
	Sub factor 2.2		
Item 8. How risky do you think an investment in government bonds (SA retail bonds) is?	Factor 1	8.57	0.07
	Sub factor 2.1		
	Sub factor 2.2		

Notes:

Only significant associations indicated in the table.

Risk Culture Factor 1: Risk integration.

Risk Culture Sub-factor 2.1: Risk understanding.

Risk Culture Sub-factor 2.2: Individual responsibility and accountability.