

# The Role of Risk Culture in Enterprise Risk Management Implementation

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## Abstract

Enterprise Risk Management (ERM) and risk culture academics and practitioners have argued that they are inherently related without empirical evidence. They continue to advocate for their implementation by firms to face the dynamic business environment with certainty. The lack of empirical evidence to underpin this relationship partly contributes to their fragmented implementation and the lack of proper attention to risk culture in ERM implementation. The challenge in measuring these two abstract concepts contributes to their dichotomous measures in the literature, with most studies concentrated in the developed economies. The study objective is to provide a comprehensive measurement of the two constructs and empirically determine their relationship in the less-researched context of Africa. The study results empirically confirm risk culture and ERM to have a significant positive relationship. A firm's size and financial leverage were found to be significant determinants for ERM implementation, whereas capital opacity, financial slack, and board composition are not. Organizational leaders are advised by the study not to treat risk culture and ERM as substitutes but as complements. A sound risk culture provides a solid base for ERM implementation. Risk culture should be managed and developed in full alignment with the risk appetite and the ERM framework to improve organizational performance. These shall enable the promotion of a risk-aware culture and ingraining risk-related measures into performance management that help drive the organization forward. The constructs measures presented in the study can be used by academics and risk practitioners to determine the level of risk culture and ERM implementation in organizations.

**Keywords:** enterprise risk management, risk culture, PLS-SEM

## 1. Introduction

ERM is a recent phenomenon whose research domain has not reached the required maturity level (Viscelli, Beasley & Hermanson, 2016; Beasley, Branson & Pagach, 2015; Hoyt & Liebenberg, 2015). It is an evolving discipline (Mikes & Kaplan, 2015) whose set of practices should not be viewed as evolving that will eventually become codified (Jankensgård, 2019). Research direction on the concept is still at an infancy stage (Bromiley, Mcshane, Nair & Rustambekov, 2015). It has mostly been directed to the factors driving its implementation (Aleisa, 2018; Bohnert, Gatzert, Hoyt & Lechner, 2018; Gatzert & Martin, 2015) and its relationship with firm performance (Anton 2018; Bohnert et al., 2018; Alawattegama 2018; Sayilir & Farhan 2017) with mixed results. Recent research direction is on the mediating role of strategic planning on its relationship with firm performance (Sax & Andersen 2019), development of measurement scales for the construct (Marahun, Atan, Yusuf & Said, 2018), theoretical analysis of the ERM concept (Jankensgård, 2019, Mikes & Kaplan, 2015), a research opportunity in the management domain (Bromiley et al., 2015). The difficulties encountered in these streams of research are the unavailability of a single definition and framework of the ERM concept (Kopia, Just, Geldmacher & Bubian, 2017; Mikes & Kaplan, 2015). The lack of a research criterion (Waweru & Kisaka, 2013) and a consensus on what ERM is all about and the constituents of its principal components (Bromiley et al., 2015; Lunqvist, 2014) also limits ERM research.

The aftermath of the 2008 global financial crises caused an increase in the development of risk cultures in organizations (Marshall, 2016). It has also caused financial authorities to demand financial institutions for guidance on risk management, including risk culture, to regain their financial stability (Bott & Milkau, 2018). When organizations have a good risk culture and a robust risk governance framework, consistent support is

provided for appropriate risk awareness, behavior, and judgment about risk-taking Financial Stability Board (FSB, 2014). The United Kingdom Institute of Risk Management (IRM) (2012) states that an organization's leadership should embed its risk management framework into its culture, processes, and structure if they are to realize a sound ERM.

An organization can have an overall positive culture but lacks a sound risk culture because most of the employees see risk management as a compliance issue and not a means of arriving at sound business decisions. As Ian Laughlin (former deputy chair of Australian Prudential Regulatory Authority-APRA) once said, if culture is "*the way we do things around here*," then risk culture is "*the way we do risk around here*." Risk culture can, therefore, be regarded as the impact of organizational culture on risk management. Well-designed and implemented risk cultures provide the cultural context in which risk management processes flourish (Marshall, 2016). ERM requires proactive participation of all employees within the organization in responding to risk. Risk cultures can control organizational risk-taking and can protect against reckless risk-taking by employees. Risk culture's objective is for regulated institutions to establish and maintain sound risk cultures that are aligned with their organizational goals, values, and risk appetite. A proper risk culture shall reduce the potential for undesirable behaviors that jeopardize institutions' financial wellbeing (APRA, 2016). If risk culture is embedded efficiently and effectively in an organization's business processes and practices, it can potentially add value to the business. Furthermore, it can enhance existing processes and ultimately help companies continue to manage and mitigate the existing and emerging risks that they continue to face in a changing world (Baxter & Vermeulen, 2013).

Despite the strong need to integrate ERM and risk culture, their implementation in organizations remain fragmented. Risk practitioners are increasingly focused on designing and implementing risk management frameworks with less consideration to the initial establishment of sound risk culture. This study is undertaking to determine the relationship between risk culture and ERM empirically. The ERM and risk culture constructs are respectively measured from primary data using the Committee of Sponsoring Organization of the Treadway Commission (COSO) 2017 ERM framework and the UK IRM 2012 risk culture aspect model. These frameworks are well-grounded in theory and can do away with prior measurement methods of processing of text data and or the determination of designated risk persons in the organization. The measures provided can be used by risk practitioners to determine the level of risk management and the presence of risk culture in their organizations. Researchers can also use these measures in researches involving these constructs. The study is carried out with data from Africa that has been significantly left behind in ERM and risk culture studies. The findings shall, therefore, open up further studies within the region, and results shall expand studies on the broader world. The research uses partial least squares structural equation modeling (PLS-SEM) to promote its use in risk management studies. The next section details a review of the relevant literature and the development of hypotheses. The research design is then presented, followed by a presentation of data and results. Conclusions are then presented together with recommendations for future research.

## 2. Literature Review and Research Hypotheses

### 2.1 Risk Culture and ERM

There is little academic evidence as to why firms adopt ERM (Hoyt & Liebenberg, 2015). Since the publication of the most popular ERM framework by COSO in 2004, research on evidence regarding the factors impacting ERM implementation has provided mixed results leading to the on-going debate on the ERM academic domain. Factors responsible for its implementation are both internal and external and have arisen from pressures from corporate governance bodies and institutional investors. The use of ERM systems in the rating methodologies also drives firms to adopt ERM. Shareholders' wealth maximization has also been cited as a reason for ERM adoption. Specific firm characteristics have been identified to be drivers for ERM implementation with mixed results. In all these studies, risk culture has failed to feature as a driver for ERM implementation.

Culture features prominently in COSO's (2017) definition of ERM and its first component of the framework, primarily due to the growing focus, attention, and importance of risk culture within ERM. Risk culture is believed to influence all aspects of ERM and possibly affects decision making. Klynveld Peat Marwick Goerdeler (KPMG) (2018) stated that risk culture is an integral part of ERM and that it is a crucial element in an organization's ERM framework as it can influence and, at the same time, is influenced by the other aspects of the ERM framework. Risk culture is thus a strong ERM pillar that binds all the elements of risk management and is vital in the effectiveness of risk management processes and practices. Research on the role of culture in the ERM domain is limited, warranting studies as to how organizational culture influences ERM adoption (Viscelli et al., 2016). An organization's risk culture can significantly impact on its capacity to take strategic risks and deliver on

its stated performance (IRM, 2012). Risk culture is a fundamental tool for effective risk management, and that organizations that consider their culture understand the dynamics and efficiency of ERM practices better than those without (Ahmed & Manab, 2016).

Selamat & Ibrahim (2018) argued on the moderating effect of risk culture on the relationship between leadership and ERM implementation and concludes that risk culture moderates the relationship between leadership and ERM implementation without empirical evidence to support the hypothesis. Kimbrough & Componation (2015) found support for the assumption of a positive association between organic cultures and levels of ERM implementation. Roslan & Dahan (2013) argued that there is a significant relationship between risk culture and ERM and that risk culture also affects organizational performance. The organizational culture is critical in explaining its decision to adopt ERM and on the effectiveness of its implementation (Viscelli et al., 2016). Kleffner, Lee & McGannon (2003), from a study of 19 members of the Canadian Risk and Insurance Society, concludes that organizational culture is the main deterrent on ERM implementation. Risk culture is the impact of corporate culture on risk management, so, if organizational culture significantly explains or deters ERM implementation, implicitly risk culture either positively or negatively impact ERM implementation. Consequently, the following hypothesis is stated:

Hypothesis 1: Risk culture is significantly associated with ERM adoption.

Prior researchers have put forward several firm characteristics that impact ERM implementation with mixed results. Control variables consistent with previous researchers are included to reduce the potential for confounding effects in the regression model.

## 2.2 Control Variables

### 2.2.1 Firm Size

Larger firms are more likely to implement an ERM program than smaller firms (Bohnert *et al.*, 2018; Baxter, Bedard, Hoitash & Yezegel, 2013; Pagach & Warr, 2011; Hoyt & Liebenberg, 2011). Larger firms have more resources to implement an ERM program whose implementation by itself is costly. Larger firms stand to benefit from economies of scale, government support, and greater access to capital markets. Larger firms are also more likely to suffer from principal-agency and information asymmetries problems. They also face a greater risk of financial distress and more volatile operating cash flows (Pagach & Warr, 2011), making them more likely to adopt an ERM program. Other scholars have found contrary evidence that firm size has a significant and direct relationship with ERM implementation (Waweru & Kisaka, 2013; Golshan & Rasid, 2012). From the results of the mixed findings, the following hypothesis is stated:

Hypothesis 2: Larger Firms are more likely to implement ERM.

### 2.2.2 Capital Opacity

When firms have high intangible assets, they find it difficult to dispose of them at market value during financial distress and are most times under-valued. Firms with highly opaque assets are thus more likely to adopt and implement ERM to reduce information asymmetries (Pagach & Warr, 2011). According to Hoyt & Libenberg (2011), the decision to adopt an ERM is significantly related to the firm's capital opacity. However, Bohnert et al. (2018) did not establish Opacity as a statistically determinant factor for ERM implementation.

Hypothesis 3: Firms with higher opaque assets are more likely to implement ERM.

### 2.2.3 Financial Leverage

Financial leverage is the use of debt by a firm to pay out its liabilities, thereby exposing it to a higher risk of default. Financial risk is enhanced with greater financial leverage (Baxter et al., 2013). Firms that are optimistic about their risk management program may tend to increase their financial leverage since they are confident to face negative uncertainties (Bohnert et al., 2018; Hoyt & Liebenberg, 2011). Greater leverage increases the chances of financial distress with the likelihood of implementing an ERM program (Pagach & Warr, 2011). Bohnert et al. (2018), Hoyt & Liebenberg (2011) empirically established a significant negative impact of leverage on ERM implementation. However, Golshan & Rasid (2012) espoused that firms with higher financial leverage are more likely to have an ERM in place. According to Sax & Anderson (2019), ERM is associated with lower financial leverage. From the various findings, the following hypothesis is put forward for investigation:

Hypothesis 4: Firms with a higher level of financial leverage are more likely to implement ERM.

### 2.2.4 Financial Slack

Hoyt & Liebenberg (2011) indicated that firms that adopt ERM might increase financial slack to lower the

probability of financial distress. Improved risk management practices may also lead firms to reduce the level of financial slack (Pagach & Warr, 2010). Financial slack is not a significant determinant for ERM implementation (Bohnert et al., 2018). The researcher, therefore, hypothesizes that:

Hypothesis 5: Firms with higher financial slack are more likely to implement ERM.

#### 2.2.5 Board Composition

Board independence is a function of its composition in terms of executive and non-executive directors. Boards of directors are now demanded to increase their risk oversight roles on the organizations they govern. Their level of independence is thus expected to be critical on the level of ERM implementation by management. The level of board independence has no significant relationship with ERM implementation (Waweru & Kisaka, 2013; Golshan & Rasid, 2012). Contrary to these findings, Beasley, Clune & Hermanson (2005), Kleffner et al. (2003) studies concluded that the level of board independence has a significant impact on ERM implementation. This finding is because board independence is strongly associated with better corporate governance. From the results of the mixed findings, the following hypothesis is thus put forward for investigation:

Hypothesis 6: Board Composition is positively associated with ERM implementation.

### 3. Research Design and Methods

#### 3.1 Data Sources and Sample Selection

The study focuses specifically on listed firms that have a greater public disclosure of ERM activities and are well regulated. An online survey questionnaire was administered to senior staff knowledgeable on the risk management practices of their organizations to obtain data for measurement of risk culture and ERM. Out of a total of 280 listed firms in Nigeria, Kenya, and Ghana as of December 2018 targeted, a total of 141 fully completed questionnaires were received and analyzed, giving a response rate of 50.4%. The individual response rate per country is 55%, 44%, and 54%. The study sample is representative in terms of sectors and three different countries for the generalization of the findings of this research within Africa. Responses on risk culture and risk management practices were collected on a 5-point Likert scale ranging from strongly disagree (1) to strongly agree (5). Information on ERM practices was collected from 20 questions framed from the 20 principles of the COSO 2017 ERM framework and 33 questions using the UK IRM 2012 risk culture aspect model to solicit information on risk culture (Appendix).

The sample size of 141 exceeds minimum sample requirements of 97 using Cohen's (1992) power tables (effect size,  $f^2 = 0.15$ ; the probability of error,  $\alpha = 0.05$ ; 80% statistical power; highest number of independent variables of 6). An F-test on G\*Power 3.1.9.7 ( $f^2 = 0.15$ ,  $\alpha = 0.05$ , statistical power = 0.80, six predictors, linear multiple regression fixed model,  $R^2$  deviation from zero) requires a sample size of 98. Kock & Hadaya (2018) 'inverse square root' and 'gamma-exponential' methods minimum sample size without prior information on the absolute minimum path coefficients is 160 and 146 respectively (Memon *et al.*, 2020). A sample size of 141 is considered to be medium and adequate to detect the effects of interest.

#### 3.2 Variable Definition and Model Design

##### 3.2.1 Dependent Variable

The ERM construct is measured formatively by the five components of the framework, which are, in turn, measured reflectively by the 20 principles giving a reflective-formative model of the second-order (Fig. 1) with the measurement items as described in Appendix. The Pearson correlation between the five lower order constructs is significantly different from zero ( $0.552 < r < 0.923$ ). A Confirmatory Tetrad Analysis – CTA PLS (5,000 subsamples, two-tailed, and 1% significance level) have zero straddled between most of the adjusted lower and upper confidence intervals. The test statistic is insignificant, and the null hypothesis (i.e., the tetrad equals zero and vanishes) is accepted. The reflective measurement mode of the model is confirmed (Gudergan, Ringle, Wende & Will, 2008) and assessed according to indicator loadings, internal consistency reliability, convergent validity, and discriminant validity (Sarstedt, Hair, Cheah & Becker, 2019; Hair, Risher, Sarstedt & Ringle, 2019; Benitez, Henseler, Castillo & Schuberth, 2019). Fig. 1 shows the full indicator loadings and constructs Average Variance Extracted (AVE) and path coefficients (path weighting scheme, maximum of 300 iterations, and stop criterion of  $10^{-7}$ ).

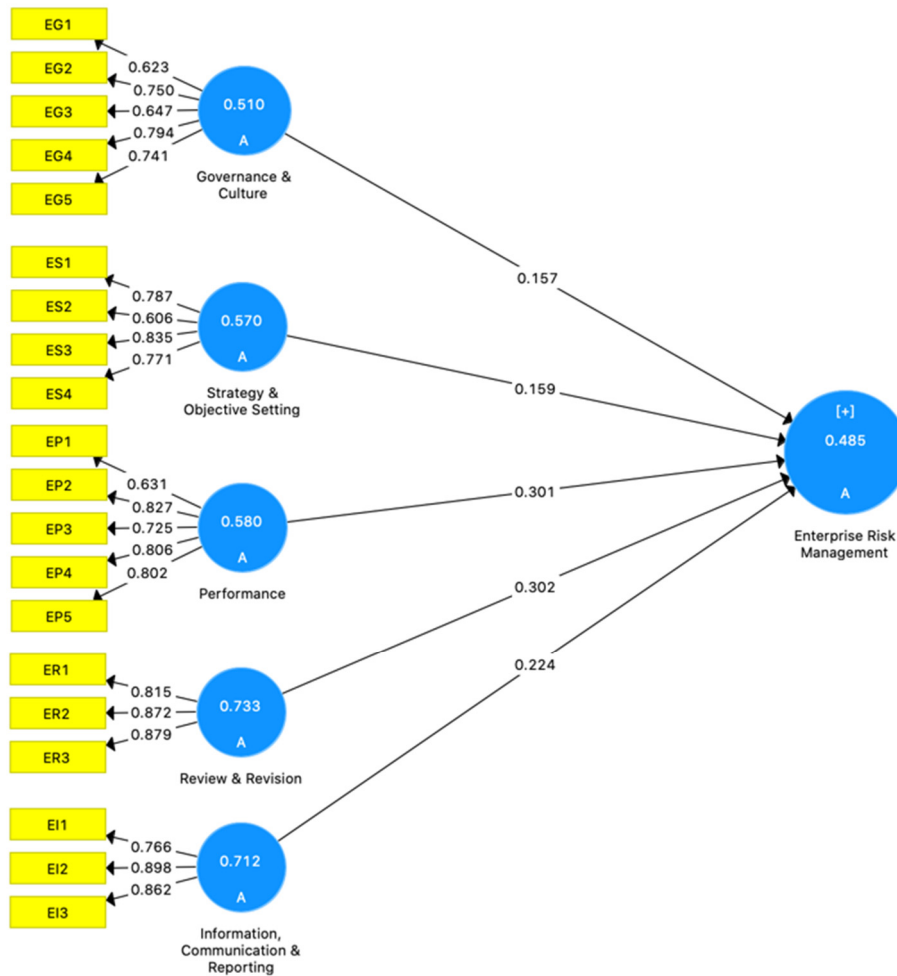


Figure 1. ERM measurement model

The four indicators, EP1 (Identification of Risks), ES2 (Defines Risk Appetite), EG1 (Exercise Board Risk Oversight), and EG3 (Definition of Desired Risk Culture), have loadings below 0.708. These indicators were deleted since their deletion increased the AVE of the latent variable they are theoretically connected to (Table 1), and at least three items still measure the constructs. These constructs have explained more than 50% of the indicator variance, with no other significant indicator omitted (Hair et al., 2019).

**Table 1. ERM and Risk Culture Constructs Reliability and Validity**

Construct	$\alpha$	$\rho_A$	$\rho_C$	AVE	2.5% CI	97.5% CI
Governance & Culture	0.742	0.740	0.854	0.661	0.819	0.883
Information, Communication & Reporting	0.796	0.806	0.881	0.712	0.846	0.911
Performance	0.822	0.829	0.882	0.652	0.843	0.915
Review & Revision	0.817	0.822	0.892	0.733	0.843	0.926
Strategy & Objective Setting	0.755	0.762	0.860	0.672	0.827	0.887
Accountability & Governance	0.867	0.873	0.904	0.654	0.873	0.928
Competence	0.909	0.926	0.924	0.578	0.900	0.943
Dealing with Bad News	0.765	0.782	0.864	0.680	0.817	0.900
Decision Making	0.890	0.910	0.910	0.592	0.882	0.934
Governance	0.912	0.921	0.927	0.587	0.904	0.945
Informed Risk Decision	0.802	0.804	0.883	0.716	0.842	0.916
Rewarding Appropriate Risk Taking	0.807	0.808	0.874	0.634	0.832	0.907
Risk Leadership	0.800	0.806	0.870	0.595	0.961	0.978
Risk Resources	0.886	0.888	0.917	0.627	0.824	0.902
Risk Skills	0.796	0.823	0.883	0.720	0.900	0.937
Risk Transparency	0.843	0.847	0.895	0.681	0.843	0.916
Tone at the Top	0.875	0.863	0.897	0.527	0.860	0.923

Internal consistency reliability, as indicated by (Cronbach's Alpha  $\alpha$ , True Reliability  $\rho_A$ , and Composite Reliability  $\rho_C$ ), have values between 0.700 and 0.950 thresholds (Table 1). The results are good, with no redundant items that can reduce the validity of the constructs (Hair *et al.*, 2019; Henseler, Hubona & Ray, 2016; Dijkstra and Henseler, 2015). Bootstrapping 5,000 samples, two tailed-test, 5% significance level of composite reliability results (Table 1) have lower bound results above the 0.700 thresholds with all upper bound results below the 0.950 thresholds. The measurement scale is thus reliable and valid (Hair *et al.*, 2019; Aguirre-Urreta & Rönkkö, 2018). The AVE results of the five lower-order constructs before and after deletion of poorly loaded indicator variables are above the minimum threshold of 0.500 and hence acceptable (Hair *et al.*, 2019; Henseler *et al.*, 2016). The correlations between constructs are lower than the square root of the AVE for each construct, confirming the absence of discriminant validity issues (Fornell & Larcker, 1981). Discriminant validity issues are also absent from an examination of cross-loadings as each measurement item correlates weakly with all other constructs except the one to which it is theoretically associated (Gefen and Straub, 2005; Chin, 1998). The results of Heterotrait-Monotrait (HTMT) ratio of correlations have two results (Review & Revision -> Information, Communication and Reporting; Review & Revision -> Performance) indicating discriminant validity problems using the  $HTMT_{0.90}$  threshold criterion (Table 2) (Franke and Starstedt, 2019; Henseler *et al.*, 2016).

**Table 2. ERM and Risk Culture Constructs HTMT Results**

Path	Result	2.5% CI	97.5% CI
Information, Communication & Reporting -> Governance & Culture	0.71192	0.48975	0.90862
Performance -> Governance & Culture	0.69369	0.48073	0.87507
Performance -> Information, Communication & Reporting	0.85534	0.73709	0.95747
Review & Revision -> Governance & Culture	0.76135	0.55394	0.95491
Review & Revision -> Information, Communication & Reporting	0.94074	0.86545	1.01354
Review & Revision -> Performance	0.94309	0.81893	1.04445
Strategy & Objective Setting -> Governance & Culture	0.60924	0.38037	0.84139
Strategy & Objective Setting -> Information, Communication & Reporting	0.70526	0.53143	0.86497
Strategy & Objective Setting -> Performance	0.79989	0.60811	0.96116
Strategy & Objective Setting -> Review & Revision	0.84260	0.66244	1.01069
Dealing with Bad News -> Accountability & Governance	0.86727	0.73636	0.97539
Informed Risk Decision -> Accountability & Governance	0.84388	0.73831	0.93163
Informed Risk Decision -> Dealing with Bad News	0.76398	0.61771	0.89448
Rewarding Appropriate Risk Taking -> Accountability & Governance	0.94421	0.85506	1.02579
Rewarding Appropriate Risk Taking -> Dealing with Bad News	0.92695	0.81626	1.02977
Rewarding Appropriate Risk Taking -> Informed Risk Decision	0.99652	0.92287	1.07531
Risk Leadership -> Accountability & Governance	0.88419	0.75863	0.98121
Risk Leadership -> Dealing with Bad News	0.90930	0.81630	1.00544
Risk Leadership -> Informed Risk Decision	0.91091	0.81486	1.00485
Risk Leadership -> Rewarding Appropriate Risk Taking	0.99634	0.92106	1.07394
Risk Resources -> Accountability & Governance	0.86472	0.78565	0.93611
Risk Resources -> Dealing with Bad News	0.80506	0.68927	0.90066
Risk Resources -> Informed Risk Decision	0.85632	0.74686	0.94918
Risk Resources -> Rewarding Appropriate Risk Taking	0.95713	0.87994	1.02442
Risk Resources -> Risk Leadership	0.93887	0.86126	1.00933
Risk Skills -> Accountability & Governance	0.72736	0.56425	0.86213
Risk Skills -> Dealing with Bad News	0.82924	0.69391	0.95236
Risk Skills -> Informed Risk Decision	0.72387	0.57662	0.84707
Risk Skills -> Rewarding Appropriate Risk Taking	0.86640	0.74921	0.97240
Risk Skills -> Risk Leadership	0.85700	0.73726	0.96180
Risk Skills -> Risk Resources	0.87617	0.77278	0.95631
Risk Transparency -> Accountability & Governance	0.88797	0.80393	0.95503
Risk Transparency -> Dealing with Bad News	0.92673	0.82304	1.02019
Risk Transparency -> Informed Risk Decision	0.80324	0.65184	0.92054
Risk Transparency -> Rewarding Appropriate Risk Taking	0.94983	0.86912	1.02569
Risk Transparency -> Risk Leadership	0.91197	0.80171	1.01040
Risk Transparency -> Risk Resources	0.88649	0.77826	0.96706
Risk Transparency -> Risk Skills	0.89726	0.79249	0.98444

These constructs are not empirically distinct and may be measuring the same thing to some respondents. The restriction of discriminant validity assessment in PLS-SEM through the comparison of a pair of constructs makes it problematic, needing future research to resolve (Franke & Starstedt, 2019; Hamid, Sami & Sidek, 2017). This criterion also has high sensitivity and specificity in detecting discriminant validity problems.

16 of the 20 measurement items are validated using the indicators loading, internal consistency, convergent, and discriminant validity. The second-order model was reduced to a first-order model by saving the latent variable scores of the five lower-order constructs in the first stage as a new dataset in line with the embedded two-stage approach. The first-order model becomes parsimonious with ERM measured by five multi-items with the five lower-order constructs respectively measured as single items that capture each construct latent variable scores from the previous stage.

### 3.2.2 Independent Variable

The measurement specification of the lower-order constructs is confirmed reflective and hence assessed using

Indicator Loadings, Internal Consistency, Convergent Validity, and Discriminant Validity. The full indicator loadings are shown in Fig. 2 with the constructs AVE and path coefficients. The three indicator variables RTR1 (Distinct Tone at the Top), RCS2 (Visible Internal Controls) & RCS4 (Encouragement & Development of Risk Skills) have loadings below 0.708 and were therefore considered for deletion. The AVE of the "Risk Skills" latent variable is 0.606 without the deletion of these two measurement indicators. The latent variable "Competence" to which this latent variable is connected to also has its AVE as 0.581. The omission of these two measurement indicators will leave the latent variable with two measurement indicators. The theory will thus suggest their retention since the AVE is already above the 0.50 threshold. RCS4 with lower loading of 0.636 was deleted while RCS2 was retained to have at least three indicators measuring the latent variable. RTR1 connected to the Risk Leadership construct was deleted to leave four measurement indicators for this construct. Doing so resulted in an increase of AVE of the latent variable "Risk Leadership" from 0.580 to 0.595 and "Risk Skills" from 0.606 to 0.720 and was therefore permanently deleted (Table 1) (Hair et al., 2019).

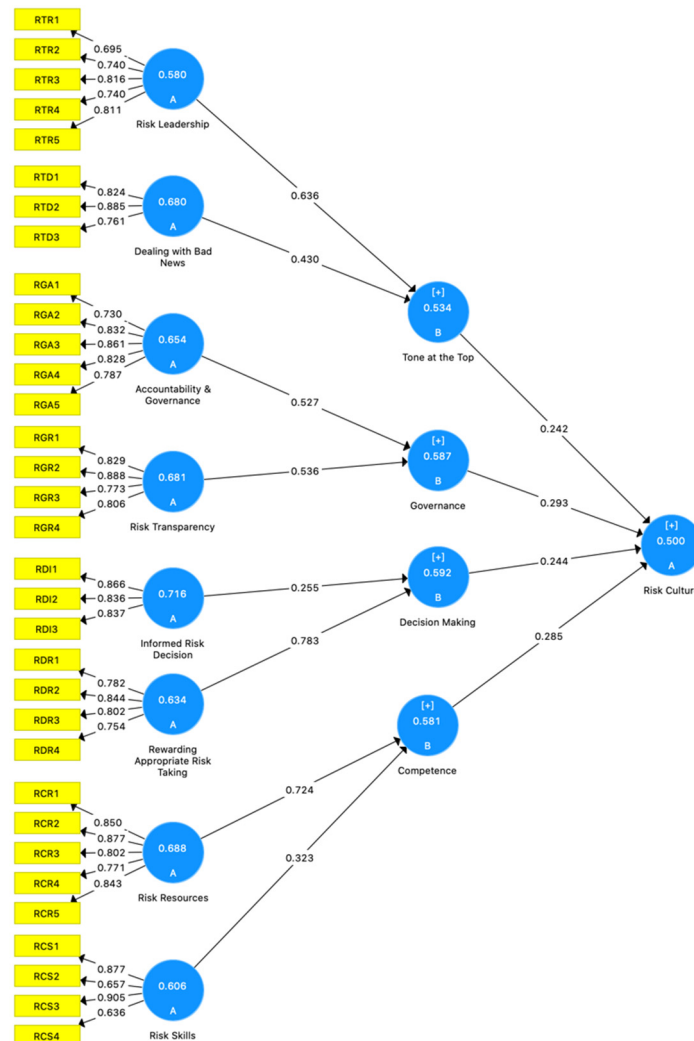


Figure 2. Risk culture measurement model

The results of all three measures of construct reliability (Table 1) are above 0.700 and below 0.950 thresholds meaning that the results are good and acceptable (Hair et al., 2019; Henseler et al., 2016; Dijkstra & Henseler, 2015). The results of bootstrap confidence intervals (5,000 samples, two tailed-test, 5% significance level) have results of composite reliability lower bound significantly above the 0.700 thresholds with all upper bound results (except Risk Leadership) below the 0.950 thresholds (Table 1). These results also confirm the measurement scale as reliable and valid (Hair et al., 2019; Aguirre-Urreta & Rönkkö, 2018). The AVE for all first and second-order constructs in the measurement model (Table1) is above the 0.50 threshold, indicating that there are no



convergent validity issues (Hair *et al.*, 2019; Henseler *et al.*, 2016).

The square root of the AVE for each first-order latent variable is greater than the correlation involving the constructs except "Rewarding Appropriate Risk-taking with "Risk Leadership" and "Risk Resources," which are marginally higher. These three first-order constructs are not empirically distinct in the model and may measure the same thing to some respondents. The results of the cross-loadings results, except RCS2 connected to the latent variable "Risk Skills," indicates that each measurement item correlates weakly with all other constructs except the one to which it is theoretically connected, thereby confirming that the measures are discriminant valid (Gefen & Straub, 2005; Chin, 1998). RCS2 has an outer loading less than 0.708 (i.e., 0.687) but was retained to have a minimum of three measurement indicators to the construct as required. Using Henseler Ringle & Sarstedt's (2015) HTMT method for discriminant validity, eleven of twenty-eight results exceeded the threshold of 0.900. This is possibly due to the conceptually very similar constructs in the model, which is typical in higher-order models (Teo, Su Luan & Sing, 2008). The results for which HTMT  $\geq 1$  have nine items slightly exceeding the 1.000 thresholds. It is reasonable to accept that discriminant validity issues between constructs are not very critical (Hair, Hult, Ringle & Sarstedt, 2017).

The latent variable scores of the four second-order constructs in the model are saved and added as new variables to the data set in line with the embedded two-stage approach. The model is thus parsimonious, and the higher-order model is avoided in further analysis, as advised by methodological researchers. Risk Culture is measured in further analysis with four multiple items as required for abstract concepts (Diamantopolous, Sarstedt, Fuchs, Wilczynski & Kaiser, 2012; Hayduk & Littvay, 2012). Such a risk culture measurement is superior to "Text Analysis" used to measure risk culture in prior studies (Carretta, Farina & Schwizer, 2017).

### 3.2.3 Control Variables

The study control variables are as indicated in Table 3, with their measurement methods together with references from the literature.

**Table 3. Control Variables Measurement**

Variable	Abbreviation	Measurement	Citations
Firm Size	SIZE	Natural logarithm of the book value of Assets	Anton, 2018; Bohnert <i>et al.</i> (2018); Lechner & Gatzert (2017); Wang <i>et al.</i> (2017)
Capital Opacity	CAOP	Intangible assets / Book value of Assets	Bohnert <i>et al.</i> (2018); Lechner & Gatzert (2017); Ghazali & Manab (2013); Golshan & Rasid (2012)
Financial Leverage	LEVG	Book value of Liabilities / Book value of Assets	Wang <i>et al.</i> (2017) Ghazali & Manab (2013); Manab & Ghazali (2013); Golshan & Rasid (2012); Pagach & Warr (2007, 2010)
Financial Slack	FSLK	Cash and short-term investments / Book value of assets	Bohnert <i>et al.</i> (2018); Ghazali & Manab (2013)
Board Independence	BDCO	Number of non-executive members of the board / total number of BOD * 100	Waweru & Kisaka (2013); Golshan & Rasid (2012)

### 3.2.4 Model Specification

From the various hypotheses developed, the following mathematically equation is put forward for empirical analysis:

$$ERM_i = \beta_{0i} + \beta_{1i}RISC_i + \beta_{2i}SIZE_i + \beta_{3i}CAOP_i + \beta_{4i}LEVG_i + \beta_{5i}FSLK_i + \beta_{6i}BDCO_i + \varepsilon_i$$

Where:

$ERM_i$  is the dependent variable, ERM, for firm i.

$\beta_{0i}$  is the constant term for firm i.

$\beta_{1i}$  to  $\beta_{6i}$  are the coefficients of firm i relating the 6 explanatory variables to the dependent variable.

$\varepsilon_i$  is the error term for firm  $i$ .

The independent variable (risk culture) and dependent variable (ERM) are latent variables with multiple indicators making the use of SEM advantageous to ordinary multiple linear regression modeling (Gefen, Rigdon & Straub, 2011). PLS-SEM has become a standard and prevalent tool in business and social science research where multivariate statistical methods are employed in analyzing complex inter-relationships between observed and latent variables (Hair *et al.*, 2019; Sarstedt *et al.*, 2019; Aguirre-Urreta & Rönkkö, 2018). The path coefficients can be obtained, and the null hypotheses tested by PLS-SEM with bootstrapping (Henseler *et al.*, 2015). The method is used in studies with relatively small sample sizes, in capturing sub-dimension of constructs, data obtained from secondary sources, use of financial ratios, non-normality of data, and in testing a theoretical framework from a prediction perspective (Hair *et al.*, 2019; Benitez *et al.*, 2019; Gefen *et al.* 2011), hence the choice of PLS-SEM in this study.

### 3.3 Descriptive Statistics

Table 4 shows the demographic characteristics of respondents with the various sectors of study firms presented in Table 5. Graduates and postgraduates' respondents respectively represent 96.4% and 65.2%. 79.4% of respondents are members of professional bodies such as accounting and risk management. In terms of experience, 60.2% have more than ten years, with 12.8 % having less than five years of experience. 53.9% of respondents are at senior or directorate level in their organizations who report directly to the board of directors. It is reasonable to assume that the respondents have the requisite professional education, experience, and responsibility levels within their organization to report on their risk management practices.

**Table 4. Demographic Statistics of Respondents**

Category	Sub Category	Frequency	Percentage
Gender	Male	126	89.4%
	Female	15	10.6%
Education	Postgraduate	92	65.2%
	Graduate	44	31.2%
	Other(s)	5	3.5%
Professional Membership	Yes	112	79.4%
	No	29	20.6%
Main Job Position	Director	18	12.8%
	Senior Management	58	41.1%
	Middle Management	43	30.5%
	Junior Management	16	11.3%
	Other(s)	6	4.3%
Years at Position	less than 5 years	74	52.5%
	6 - 10 years	56	39.7%
	11 - 15 years	4	2.8%
	16 - 20 years	3	2.1%
	more than 20 years	4	2.8%
Years in Organization	less than 5 years	76	53.9%
	6 - 10 years	38	27.0%
	11 - 15 years	19	13.5%
	16 - 20 years	3	2.1%
	more than 20 years	5	3.5%
Total Years of Experience	less than 5 years	18	12.8%
	6 - 10 years	38	27.0%
	11 - 15 years	43	30.5%
	16 - 20 years	13	9.2%
	more than 20 years	29	20.6%
<b>Sample Total (N)</b>		<b>141</b>	

The banking sector is mostly represented (22.7%), followed by the insurance industry (15.6%). The least sector represented is mining and exploration (1.4%) and construction & allied (2.8%). The study firms are drawn from 10 different sectors of the economy, providing a perfect representative sample. The influence of the financial service industry in terms of risk regulation does not impact the study results strongly as the other sectors represent 61.7%.

**Table 5. Samples per Sector**

Sector	Frequency	Percentage	Cumulative
Agriculture	6	4.3%	4.3%
Banking	32	22.7%	27.0%
Commercial & Services	27	19.1%	46.1%
Construction & Allied	4	2.8%	48.9%
Energy & Petroleum	10	7.1%	56.0%
Insurance	22	15.6%	71.6%
Real Estate & Investment	5	3.5%	75.2%
Manufacturing & Allied	27	19.1%	94.3%
Mining & Exploration	2	1.4%	95.7%
Telecommunication & Technology	6	4.3%	100.0%
<b>Sample Total (N)</b>	<b>141</b>		

The variables firm size, capital opacity, and board composition have results of skewness and kurtosis lying between -1 and +1 are therefore not highly skewed and peaked (Hair *et al.*, 2017). The other variables' financial leverage and financial slack have peaked, and skewed distribution as the results exceeded the limits of -1 and +1. Non-normality is confirmed from the results of Kolmogorov-Smirnov (K-S) and Shapiro-Wilk (S-W) tests (Table 6), especially the latter that is more specific and powerful in the case of small sample size (Ryan, 2020). The significance of each of the K-S and S-W test results are shown in parentheses. The K-S and S-W test results for firm size are insignificant, indicating that the data for this variable follows a normal distribution. This is so because firm size is calculated as the natural logarithm of the book value of assets. Data for all other variables is asymmetric and can be handled by the non-parametric method of PLS-SEM.

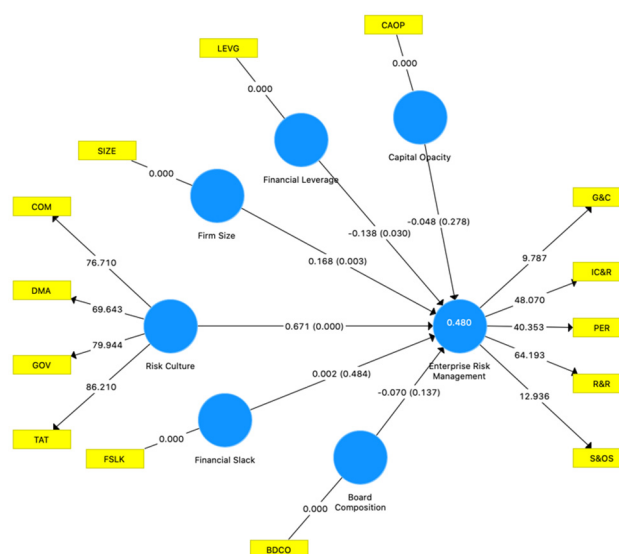
**Table 6. Descriptive Statistics of Secondary Data**

Variable	Min.	Max.	Mean	Std. Dev.	Skewness	Kurtosis	K-S	S-W
Firm Size	13.048	23.886	18.477	2.336	0.222	0.222	0.065(0.200)	0.983(0.075)
Financial Leverage	0.022	2.852	0.566	0.331	2.207	14.694	0.106(0.001)	0.833(0.000)
Capital Opacity	0.099	99.837	63.496	30.438	(0.327)	(1.284)	0.151(0.000)	0.900(0.000)
Financial Slack	0.004	53.224	11.125	11.323	1.358	1.270	0.204(0.000)	0.833(0.000)
Board Composition	50.000	100.000	77.388	11.128	(0.599)	(0.513)	0.160(0.000)	0.942(0.000)
<b>Sample Total (N)</b>	<b>141</b>							

### 4. Empirical Results

#### 4.1 Regression Results

The regression results are obtained from a 5,000 bootstraps sample, BCa, one-tailed, 5% significance level, and are as shown in Fig. 3 and Table 7.



**Figure 3. Structural model**

**Table 7. Model Path Coefficients**

Path	Coefficient	P Values	T Values	5.0% CI	95% CI
Board Composition -> ERM	-0.070	0.137	1.095	-0.173	0.041
Capital Opacity -> ERM	-0.048	0.278	0.589	-0.181	0.085
Financial Leverage -> ERM	-0.138	0.030	1.875	-0.260	-0.016
Financial Slack -> ERM	0.002	0.484	0.041	-0.103	0.098
Firm Size -> ERM	0.168	0.003	2.718	0.067	0.270
Risk Culture -> ERM	0.671	0.000	11.980	0.575	0.757

**5,000 bootstrap samples, BCa, one-tailed, 5%**

Significant and robust path coefficients for risk culture, firm Size, and financial leverage with ERM were reported using both the p-value criterion ( $p < 0.05$ ), t-value ( $t > 1.960$ ), and the 95% BCa confidence intervals.

#### 4.2 Discussion of Empirical Results

*H1: Risk culture is significantly associated with ERM adoption.*

The path coefficient between risk culture and ERM is 0.671 and significant at the 5.0% level ( $\beta = 0.671$ ,  $p < 0.005$ ). This result supports the hypothesized relationship that the two constructs have a significant positive relationship. This finding confirms the proposition of KPMG (2018) that risk culture influences and is influenced by ERM. The findings are also consistent with prior researchers who opined the effect of culture on ERM implementation (Viscelli *et al.*, 2016; Kimbrough & Componation, 2009; Kleffner *et al.*, 2003). The empirical results provide evidence to Roslan & Dahan (2013) argument that risk culture and ERM has a significant positive relationship. When a sound risk culture exists in an organization, risk issues are discussed and escalated at all levels within the organization. Everybody in the organization takes responsibility and account for his/her actions. Employees can easily embrace any risk management program and will not see ERM as a compliant issue. ERM implementation can thus flourish in organizations with sound risk culture.

*H2: Larger Firms are more likely to implement ERM.*

This hypothesis is supported by this study ( $\beta = 0.168$ ,  $p = 0.003$ ). The revealed relationship is significant at a 5% significance level, and the strength of the relationship is relatively strong and positive, i.e., larger firms are more likely to implement an ERM program. This finding finds support to those of Bohnert *et al.* (2018); Baxter *et al.* (2013); Pagach & Warr (2011); Hoyt & Liebenberg (2011), who found out that larger firms are more likely to adopt ERM than smaller firms. However, the results are contrary to those of Waweru & Kisaka (2013); Golshan & Rasid (2012), who failed to find a significant and direct relationship between firm size and ERM implementation. Larger firms have a lot of resources at their disposal that can be used to implement an ERM program. They suffer from information asymmetries because of their size, requiring them to implement an ERM program to obtain information on all risks the organization faces at all levels. Hence, increasing scope and complexity of risks, as well as a greater risk of financial distress of larger companies, lead to more high-quality risk management implementations.

*H3: Firms with higher opaque assets are more likely to implement ERM.*

The decision to adopt an ERM is found to have an insignificant relationship with ERM adoption ( $\beta = -0.048$ ,  $p = 0.278$ ). This finding does not support those of Pagach & Warr (2011); Hoyt & Liebenberg (2011) but consistent with the results of Bohnert *et al.* (2018), who did not establish Opacity as a statistically determinant factor for ERM implementation. The study establishes that firms with higher opaque assets are less likely to adopt an ERM program. The finding contradicts the assumption that such firms have a higher likelihood of implementing an ERM to provide public information about their risk management practices in order to dispose of their assets at fair market value when in financial distress. Due to the "principal-agency" conflict, they may fail to do so as self-seeking managers take actions in their best interest against the interest of the organizations they govern.

*H4: Firms with a higher level of financial leverage are more likely to implement ERM.*

The relationship between financial leverage and ERM adoption revealed is negative and significant. The hypothesis is accepted at the 5% level ( $\beta = -0.138$ ,  $p = 0.030$ ). This result fails to support the findings of Golshan & Rasid (2012), Pagach & Warr (2011), who found a higher likelihood of ERM adoption by highly financially levered firms. However, support is provided by this study for the findings of Sax & Andersen (2019), Bohnert *et al.* (2018), Hoyt & Liebenberg (2011), who empirically established a significant negative impact of financial

leverage on ERM implementation. The results support the argument that firms with higher ERM quality may reduce leverage to decrease the risk of debt payout defaults.

*H5: Firms with higher financial slack are more likely to implement ERM.*

A direct and insignificant relationship between financial slack and ERM adoption was established ( $\beta = 0.002$ ,  $p = 0.484$ ). The study did not support the findings of Pagach & Warr (2010), who established a significant indirect relationship, and Hoyt & Liebenberg's (2011) findings that ERM adoption is matched with an increase in financial slack to lower the probability of financial distress. This study supports Bohnert et al. (2018) findings that the decision to adopt ERM is not dependent on the level of a firm financial slack. Firms are expected to use available cash to fund net-present value projects for the continued increase in firm value. Such firms with very high disposable cash are in a position to implement an ERM program. "Principal-agency" theory requires management to hold on to a high amount of cash to use for their self-benefits rather than that of the organization.

*H6: Board Composition is positively associated with ERM implementation.*

The relationship between board composition and ERM adoption is insignificant ( $\beta = -0.070$ ,  $p = 0.137$ ). This finding supports the studies of Waweru & Kisaka (2013), Golshan & Rasid (2012). It contradicts those of Beasley et al. (2005) and Kleffner et al. (2003) studies that concluded that the level of board independence has a significant impact on ERM implementation. Corporate governance requires organizations to have more non-executive directors on their boards. It does become a complaint issue for organizations and does not guaranty risk oversight as required.

#### 4.3 Robust Test

##### 4.3.1 Common Method Bias

Data for ERM and risk culture were gathered from a single source with the possibility of creating common method bias. Procedurally, this was handled by assuring respondent anonymity, the presence of no right or wrong answer, and the option to skip or omit any question that is not comfortable to the respondent. Statistically, a full collinearity assessment at factor level with ERM serving as the dependent variable has an inner VIF value of 1.047, which is less than 3.3, confirming that the model is free from common method bias (Kock, 2015).

##### 4.3.2 Model Fit

The model standard root mean residual (SRMR) is less than 0.080, indicating a good model fit (Henseler & Sarstedt, 2013; Hu & Bentler, 1999). Original values of the geodesic distance ( $d_G$ ) fall below the upper bound of the 95% confidence interval with the squared Euclidean distance ( $d_{ULS}$ ) slightly above the upper bound of the 99% confidence interval indicating that the model has a "satisfactory to good fit" (Dijkstra & Henseler, 2015; Henseler et al., 2013).

Table 8. Model Measures of Fit

Discrepancy	Value	HI <sub>95</sub>	HI <sub>99</sub>
SRMR ( <i>Estimated</i> )	0.049	0.044	0.049
$d_{ULS}$ ( <i>Estimated</i> )	0.250	0.204	0.248
$d_G$ ( <i>Estimated</i> )	0.126	0.182	0.203

Note. 5,000 bootstrap samples, BCa, one-tailed,  $\alpha = 5\%$

##### 4.3.3 Model Predictive Capability

The coefficient of determination ( $R^2$ ) for the ERM construct with all control variables included is 0.480 ( $p < 0.05$ ) (Table 9). With the removal of all control variables, the  $R^2$  value is 0.449 ( $p < 0.05$ ). The  $R^2$  effect size is calculated as 0.06, and this is considered as small (Cohen, 1988). The improvement of  $R^2$  by 6.5% justifies the inclusion of control variables in the model. The  $R^2$  value is above 0.33 and almost 0.50 and can be considered as moderate (Hair, Hult, Ringle & Sarstedt, 2017; Chin, 1988). The "cross-validated redundancy approach" results for the out-of-sample predictive relevance using the blindfolding procedure gives a  $Q^2$  value more than zero, indicating predictive relevance (Geisser, 1974; Stone, 1974). The  $Q^2$  is more than 0.250, which is considered as a medium with a small effect size  $q^2$  of 0.035 (Hair et al., 2019, 2017).

Table 9. Model predicted results

	R <sup>2</sup>	Adjusted R <sup>2</sup>	SSO	SSE	Q <sup>2</sup> (1-SSE/SSO)
Scenario A	0.480	0.457	705.000	482.272	0.316
Scenario B	0.449	0.445	705.000	495.366	0.297

Note. Scenario A (All six variables as predictors) and Scenario B (Risk Culture only as a predictor).

## 5. Research Conclusion

The study has empirically established a significant positive relationship between risk culture and ERM of publicly listed firms in three stock exchanges in Africa. It has extended previous academic works on determinants of ERM implementation and found support for firm size and financial leverage as significant determinants for ERM implementation. Other firm characteristics like capital opacity, board independence, and financial slack do not significantly influence the decision to adopt ERM. Risk culture is one of the constructs that are not easily quantified, creating challenges in its measurement and management. The study has confirmed the UK IRM 2012 risk culture aspect model as useful in promoting a risk-aware culture and embedding risk-related measures into performance management. The measure shall help organizations to understand and monitor their own evolving risk culture.

The relatively small sample size in this study may influence the extent to which these findings may be generalized to other emerging markets. Also, firms have been studied across industries with the potential to weaken the direct effects of the studied variables on ERM implementation. Some of the independent and dependent variables' measures are derived from executive respondents that may be influenced by subjective biases. Though this was circumvented by including more objective measures of ERM and risk culture, the researcher cannot be fully confident that such biases did not exist. ERM and risk culture were measured by well-established frameworks, and how the firm's leadership and employees implemented these frameworks were not taken into consideration. Notwithstanding these limitations, the responses obtained provides a rich opportunity to explore the extent to which risk culture and ERM are empirically related. Future research in this direction should be carried out with a larger sample size from other emerging economies that could bring new contributions to the growing empirical research on risk culture and ERM.

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**Appendix: Description of Observed Variables**

<b>Variable</b>	<b>Description</b>	<b>Variable</b>	<b>Description</b>
EG1	Exercise Board Risk Oversight	RDT3	After Treatment of Whistle Blowers
EG2	Establishment of Operating Structures	RGA1	Clear Specific Risk Management
EG3	Definition of Desired Risk Culture	RGA2	Clear Risk Management Process
EG4	Demonstration of Commitment to Core Values	RGA3	Documentation and Communication of Risks
EG5	Attracts, Develops, and Retains Capable Individuals	RGA4	Communication and Review Structures of Risk
ES1	Analyse Business Context	RGA5	Risk Governance
ES2	Defines Risk Appetite	RGR1	Transparent Risk Information
ES3	Evaluate Alternative Strategies	RGR2	Strategic Direction for Risk Taking
ES4	Formulate Business Objectives	RGR3	Celebration of Successful Risk Taking
EP1	Identification of Risks	RGR4	Learning from Inappropriate Risk taking
EP2	Assessment of Severity of Risks	RDI1	Timely and Transparent Risk Information
EP3	Risk Prioritisation	RDI2	Determination of Boundaries and Risk Appetite
EP4	Implementation of Risk Responses	RDI3	Risk Integration into Decision Making
EP5	Development of Risk Portfolio	RDR1	Reward for Appropriate Risk Taking
ER1	Assessment of Substantial Changes	RDR2	Sanction for Inappropriate Risk Taking
ER2	Revision of Risk and Performance	RDR3	Value and Nurturing Appropriate Behaviours
ER3	Pursuit of improvement in ERM	RDR4	Performance Management of Risk Competency
EI1	Leverage on IT to support ERM	RCR1	Risk Function Access to Senior Management
EI2	Communication Channels to support ERM	RCR2	Credibility of Risk Function
EI3	Reporting on Risk, Culture and Performance	RCR3	Required Resources for the Risk Function
RTR1	Presence of Distinct Tone at the Top	RCR4	Risk Function Discussions of Key Risks
RTR2	Provision of Direction to Risk Management	RCR5	Support of Risk Function
RTR3	Visible, Consistent and Sustained Commitment	RCS1	Risk Competency and Capability as Key Assets
RTR4	Executive Sponsor of Risk Management	RCS2	Awareness of Internal Controls
RTR5	Tangible Actions of Executive Sponsor	RCS3	Management of "Concern for Risk"/ "Risk Awareness"
RTD1	Encourage Risk Information and "Bad News"	RCS4	Encouragement and Development of Risk Skills
RDT2	Support and Celebrate Whistle Blowers		

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