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Operational Risk Management: Control Mechanisms

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ABSTRACT The paper seeks to examine adequacy of risk mitigation mechanisms by using methodologies derived from quantitative risk analysis in a University context. A questionnaire and an interview schedule were administered. A total of 90 respondents were selected by stratified random sampling technique. The design was a case study. The researchers incorporated expert judgements, binomial distribution model and one way-repeated measure ANOVA into the risk mitigation analysis. The findings revealed that (1) the University had no adequate control mechanisms to mitigate risk, (2) the University did not take adequate account of key risks identified by key stakeholders, and thirdly (3) the University's overall approach to risk management, as assessed for one-academic year was not adequate for its strategic objectives. The implication suggests a relationship between various committees taking adequate account of key risks identified by key stakeholders and risk mitigation.

INTRODUCTION

Two distinct approaches have been proposed to explain risk mitigation (McNeil et al. 2005; Cohen et al. 2006). Until recently, these two perspectives have been promoted largely within disciplinary boundaries (financial mathematics). However they are in isolation from each other in social aspect of risk mitigation. Researchers such as Mishra and El-Osta (2002) have seriously addressed the scope for more integration, especially in social settings such as Universities. Quantitative writers argued that as early as 1980s, experts in risk mitigation did not use the same approaches of 'risk mitigation' when assessing risks (McNeil et al. 2005). Arguably, most quantitative experts (quants) focused on quantitative assessments of likelihood and consequences, whereas the general public and most qualitative analyst use a number of qualitative dimensions such as 'experience' or 'lack of knowledge to those exposed' and 'catastrophic potential' subjectively (Nicholas 2004). The qualitative analysis has been very influential, and has become well known in risk mitigation at the expense of quantitative (quants) in social setting. Nevertheless, the most used quantitative analysis as review of literature shows is in the financial institutions, but not in social settings; such as institutions of higher education (IHE) (McNeil et al. 2005). Although, the quants have made an important contribution to the understanding of risk mitigation, but have been subjected to two main criticisms due to the social characteristics of risks. The objection was that quants do not treat qualitative risk characteristics as both inherent attributes of *hazards* themselves and as *constructs* of the respondents. In this respect, research suggests that whether one feels in control of the consequences of a risky event, whether one feels that exposure to a risk is voluntary, or whether one believes that knowledge is available to those exposed to risks are all, at least in part, related to social, cultural, and institutional processes (Stoney 2007).

But, this argument is relatively skewed and distorted. What is often not recognised is that even the simple act of categorising (unquantifiable variable) could be viewed as quantitative, thus, using Likert scale to quantify an unquantifiable variable. Besides, numbers in and of themselves cannot be interpreted without understanding the assumptions which underline them. The bottom line here is that qualitative and quantitative data are, at some level, virtually inseparable (Hedeker 2003). Neither exists in a vacuum nor can be considered totally devoid of the other. To ask which is better or more valid ignores the intimate connection between them. To do good risk mitigation therefore, analyst need both.

The study reported here essentially uses mathematical and statistical methods to understand risk even though the researchers are aware of the view that context-free questions fail to incorporate any analysis of social relations and cannot, therefore, truly tap into risk mitigation.

Research Questions

Main Question

To what degree has the institution adequate control mechanisms to mitigate risk?

Sub Question

- To what degree is an institution's overall approach to risk management, as assessed for one-academic year adequate for its strategic objectives?

RESEARCH METHODS

A questionnaire was administered. The research participants were individuals working in a historically Black South African University who were tasked to undertake risk management activities for the institution. In the data collection process the population included three different types of committees operating in the University. These were (1) committees of senate, (2) joint council and senate committees and (3) management committees. These three categories either had members who belonged to the executive committee of senate or non-executive committee of senate. The reasons for this selection were in three folds. Firstly, the purpose of the research notes that the functionality of institution lies in a risk analyst's ability to predict and model quantifiable risk, based on appropriate polices and procedures. Secondly, the various committees assume a position of risk management in the institution and lastly to limit the study to respondents in management as well as decision-making positions.

The researchers used stratified random sampling for selecting risk analyst identified by different committees. A total of 90 respondents were selected: 20% of these refused to be interviewed, 8% were never at their offices, thus making it a total of 28% who did not take part. Meanwhile, neighborhood of 72% completed the questionnaire, giving a total of 64 respondents. Six respondents, with a 100% response rate were interviewed using a structured interview schedule. Given the length of the interview (the mean time: 57 minutes), the researchers regard both the questionnaire and the interview schedule as a reasonable response rate.

The questionnaire consisted of 8 main sections. The first section of the questionnaire apart from the background information measured risk awareness of the institution. In the second and third parts (identification and prioritisation, risk mitigation), respondents were asked to rate specific situations of the institution with regard to risk mitigation. Other variables included risk planning and, risk quantification. Each item was scored on a 5-point scale from 1- 'disagree strongly' to 5- 'agree strongly'. Using this system to categorise individual's responses, the sample consisted of 14% junior workers, 1.6% a stratum of executive management committee, 10% directors and 23.4% associate professors. There were 35.6% managers in the sample. A neighborhood of 1.6% was made up of employees such as security personnel and secretaries.

Cronbach's Alpha Coefficients Analysis

The risk mitigation scales had Cronbach's alpha coefficients of 0.63, which is a respectable value in socially setting (Cohen et al. 2003). Moreover, the instrument as a whole had a Cronbach's alpha of 0.72, while with standardised items, the value indicated 0.82. Thus high reliability was achieved. This fact together with a high Cronbach's alpha suggest that statistically, a risk analyst can distinctly reason that there is a high level of confidence associated with the various variables and the instrument as a whole. The below elaborates on the research results.

RESULTS

This section aims to address degree of risk mitigation and control mechanisms. In essence, it addresses the question of whether the institution has adequate control mechanisms to mitigate risk. The results revealed responses (using modal responses) of each sub-variable the University undertakes with regards to risk mitigation (see Table 1), while respondents disagreed with the institution having adequate control mechanisms to mitigate risk. The same could be said of the issue of the institution taking adequate account of the key risks identified by key stakeholders. Thus in both cases, the respondents disagreed with the statements. One similar category of such sub-variable was the issue of the institution's overall approach to risk management. As assessed for one-academic year, this was not adequate for its institutional strategic objectives. Similarly, respondents disagreed

with the statement as evidenced in the modal response in Table 1.

Table 1: Sub-variables associated with the University-wide risk mitigation

	Adequate control mechanisms to mitigate risk	*Assigned responsibility of risk*	*Institution's overall approach to risk is adequate*	*Audits or risk are brought to the attention of the executive*
Frequency	64	64	64	64
Mode	2	4	2	4
Percentile				
(25)	2	2	4	3
(50)	4	4	4	4
(75)	4	4	4	4

The responses were categorised using a five-point Likert scale where: Strongly agree = 5; Agree = 4; Unsure = 3; Disagree = 2; Strongly disagree = 1. To sum this subsection, it is important for the University to place much emphasis on the three sub-categories (that is, 1st, 3rd and 4th) as presented in Table 1, the reason being the fact that the modal responses appeared to be disagreed for those three variables and that suggests that the University does not mitigate risk adequately. This as well compromises the mandate of the committees, in which case their mandate is not sufficiently met as evidenced by the distribution of their responses. In terms of this particular variable (risk mitigation), these results suggest that risks are innate attributes of institutions, which could be measured using a questionnaire items.

Mathematical Treatment of Risk Mitigation: Benchmarking Procedure

The essence of this section was to exemplify how to conduct risk mitigation analysis. This seeks to explore the application of objective (quantitative) risk benchmarking as opposed to purely subjective one. Number of authors has argued that benchmarking is very crucial, as subjective and erroneous decisions could be catastrophic (Nicholas 2004; Standard and Poor 2006). To begin with, reference is made of Table 1. Firstly, Table 1 reveals' various modal responses of the sub-variables at different percentiles. Secondly, and for the purpose of this section, Table 1 suggests that while across board the modal response; thus the response favoured by the respondents is 'disagreed' as 2 denotes disagreed, the response changes if subjected to variety of quartiles. Following the presentation in Table 1, where the 25th percentile corresponds to three different responses, at both 50th and 75th percentiles, the response remains constant respectively. Thus, at 50th and 75th percentiles, in each of the sub-variables, it is evidenced by Table 1 that they (respondents) all agreed to each of the sub-variables, which evidently may not be the case, if subjected to 25th percentile. What do the above imply? Judging from the different levels of quintiles, it can be argued that at 25th percentile, the University does not do well in one or more of the sub-variables in risk mitigation. For instance, with the sub-variable "the institution takes adequate account of the key risks identified by key stakeholders"; at 25th percentile, there is the probability or chance of a respondents not responding to 3, which denotes unsure- for argument sake. And if probability moves up, it does not order well for the University as the committee members supposedly are responsible for decision making in the University in terms of risk mitigation and management. The question therefore is, how does risk analyst objectively determine the probability of members responding to say 3, which denotes unsure (or fewer than 3)? To do this, the research uses binomial distribution. Firstly, inferring from the five-point likert scale: The number of responses denoted as n = 5; And 3 which denotes unsure is known. An analyst is required to calculate the probability of responding to three (3) or fewer

$$\rho(3)\ ;\ \rho(2)\ ;\ \rho(1)\ ;\ \rho(0)\ \ldots \text{.....} \quad \text{Equation (1)}$$

Note: I recommend readers to read ñ (3) and others as 'probability of choosing unsure (3).

Inferring from Table 1 and working or benchmarking at 25th percentile as probability ρ = 25% = 0.25; then according to the equation (2) below, the probability of responding to three being unsure is given as:

$$p(x=3) = \binom{n}{x} p^x (1-p)^{n-x} = \frac{n!}{(n-x)!x!} p^x (1-p)^{n-x} \quad \text{..... Equation 2}$$

Substituting ρ =0.25 and x= 3 into Equations 2: we have

$$p(x=3) = \binom{n}{x} p^x (1-p)^{n-x} = \frac{5!}{(5-3)!3!} 0.25^3 (1-0.25)^{5-3}$$

$$= 10(0.25^3 (1-0.25)^{5-3})$$

$$= 10(0.02)(0.75)^2$$

$$= 0.1125$$

The probability of exactly 3 out of 5 responses is 11.25 percent: This implies that with the

current understanding and knowledge of risk mitigation process in the University, there is till 11.25% chance of a respondent being unsure of the situation in the University. Thus there is 11.25% chance of respondents being unsure (p=3) of the University's situation pertaining to the question "the institution takes adequate account of the key risks identified by key stakeholders" at 25th percentile.

The other probabilities need to be calculated.

$$\rho(2) = \rho(x=2) = \binom{n}{x} p^x (1-p)^{n-x} = \frac{5!}{(5-2)!2!} 0.25^2 (1-0.25)^{5-2}$$

$$= 10(0.25^2 (1-0.25)^{5-2})$$

$$= 10(0.06)(0.75)^3$$

$$= 0.2531$$

Thus 25.31% will disagreed (p=2) with the University's situation pertaining to the question "the institution takes adequate account of the key risks identified by key stakeholders" at 25th percentile.

$$\rho(1) = \rho(x=1) = \binom{n}{x} p^x (1-p)^{n-x} = \frac{5!}{(5-1)!1!} 0.25^1 (1-0.25)^{5-1}$$

$$= 5(0.25^1 (1-0.25)^{5-1})$$

$$= 5(0.25)(0.75)^4$$

$$= 0.7910$$

Thus 79.101% will strongly disagreed (p=1) with the University's situation pertaining to the question "the institution takes adequate account of the key risks identified by key stakeholders" at 25th percentile.

$$\rho(0) = \rho(x=1) = \binom{n}{x} p^x (1-p)^{n-x} = \frac{5!}{(5-0)!0!} 0.25^0 (1-0.25)^{5-0}$$

$$= 1(0.25^0 (1-0.25)^{5-0})$$

$$= 1(0.75)^5$$

$$= 0.2373$$

Thus there is 23.73% chance of risk not even identified by the committee members (p=0) with the University's situation pertaining to the question "the institution takes adequate account of the key risks identified by key stakeholders" at 25th percentile. Note that this category of members is different from the strongly disagreed. The category is assumed to have no idea of what is in the University. What the indexes above imply is that with the current understanding and knowledge of risk identification in the University supposedly known by the members of the committees, there is enough evidence at these four different probabilities (p=3, p=2, p=1, p=0) to suggest that respondents would choose unsure or fewer than unsure (cf. Table 1), if the University benchmarks at 25th percentile.

The above benchmarking model and variety of others as noted by Nicholas (2004), can assist institutions to enhance their risk mitigation process which subsequently enhances their mitigation approaches. Nicholas' (2004) argument is also supported by other research study (King III Report 2009) which cautioned the ineffective use of risk mitigation process in an organisation due to lack of technical know how of mitigation procedures especially in socially settings. In conclusion to this section, it is imperative to note that the mathematical model developed in conjunction with the data in section 1 suggests that risk mitigation can be broken down into two components: (1) risk elimination and (2) risk reduction as revealed. The research argues that risk elimination process should be aggressive and proactive for top priority risks. This may follow model(s) as depicted in this section (Mathematical treatment of risk mitigation) above. Noting that identification and prioritised risks are essential to achieve the full benefits of University-wide risk mitigation. Thus, risk elimination (which is circumstantial) requires carrying out the necessary action(s) to completely remove the identified issue or risks from the University.

This is the reason for an additional model such as the above to reduce the level of subjectivity. The next sub-section addresses composite risk responses associated with the University-wide risk mitigation.

Specific Patterns of Risk Relationships that Generates Distinctive Ways of Risk Mitigation

The relationship between specific patterns of risk relationships and distinctive ways of risk mitigation was measured by comparing the results between variables that measure specific patterns of risk relationships and risk mitigation. In essence, the patterns of risk relationships are various attributes in risk mitigation, which makes it possible to analyze the impact of different factors separately. This follows the objective of the research as stated in the context of the study.

A specific pattern of risk relationships was determined based on the response of individual risk analyst in the University. Three hypotheses generated were tested using the one-way repeated measures ANOVA. The researchers chose one-way repeated measures ANOVA to interpret the results, which was the correct statistical test. First, the choice was appropriate because the intent was to measure the variance in specific

patterns of risk relationships that generates risk mitigation. Second, the test was correct choice because the dependent variable, specific patterns of risk relationships, is measured by their responses, and their score is measured as a continuous variable. In this regards, a number of assumption needed to be observed. A one-way repeated measure ANOVA requires the dependent variable follow a normal distribution. To demonstrate this assumption, a bell shaped histogram was used. Inspection of the shape of the histogram revealed a normally distributed curve. Thus the scores are reasonably normally distributed, with most scores occurring in the centre, tapering out towards the extremes. Also other preliminary analysis (linearity and homoscedasticity) performed ensured no violation of assumptions. Below is an elaboration of the hypotheses.

Hypothesis 1

Ho: There is no significant relationship between individual key risks been assigned to appropriate managers (committees) and risk mitigation.

Ha: There is a significant relationship between individual key risks been assigned to appropriate managers and risk mitigation.

A one-way repeated measures ANOVA was used to test for assigning individual key risks to appropriate managers and risk mitigation. The result differed significance across two committees and risk mitigation, F (2, 27) = 5.77, p = 0.008. Tukey post-hoc comparisons of the two groups indicate that the second group (M = 5.41) gave significantly higher preference ratings than the first group (M = 4.43), p =0.007. The significant relationship between individual key risks been assigned to appropriate managers, in this case committee members and risk mitigation suggests that the null hypothesis be rejected.

Hypothesis 2

Ho: There is no significant relationship between various committees taking adequate account of the key risks identified by key stakeholders and risk mitigation.

Ha: There is significant relationship between various committees taking adequate account of the key risks identified by key stakeholders and risk mitigation.

On the other hand though, another one-way repeated measure ANOVA was conducted to compare scores on the various committees taking adequate account of the key risks identified by key stakeholders and risk mitigation. The means and standard deviations are as presented below. There was a significant effect for risk mitigation (wilks' lamda = 0.25, F (2, 28) = 41.17, p<0.0005, multivariate partial eta squared = 0.75). Noting that this results suggests a large effect size. Suggesting that there is significant relationship between various committees taking adequate account of key risks identified by key stakeholders and risk mitigation.

DISCUSSION

The research in the first place noticed that among other things, the University lacked risk mitigation in various forms: (1) the University lacked mechanisms for the institution to have adequate control to mitigate risk; recommendation that follows is that further research be carried out to identify such mechanisms, (2) lack of adequate account for key risks identified by the institution key stakeholders; recommendation that follows is that further research should be carried out to identify such key risks identified by the institution key stakeholders, (3) lastly the University's overall approach to risk management, as assessed for one-academic year such that it is adequate enough to meet its strategic objectives is inadequate. To achieve the above though, the research suggests the creation of a coherent strategy for mitigating the risks in a cost effective manner. In view of this, Xolani (a respondent) argued that: *...any suggested mitigation activities must take into account cost, time to implement, likelihood of success, completeness, and impact over the entire institutional risks.* This risk mitigation strategy must be constrained by the business context and should consider what the University could afford, integrate, and understand so to be sufficient and adequate. The strategy must also directly identify validation techniques that can be used to demonstrate that risks are properly mitigated. Typical of such strategies may include the benchmark developed to assess the degree of control mechanisms of the institution with regards to risk mitigation. Other authors (Nicholas and Steyn 2008) shared similar view. In fact, Standard and Poor (2009) explained that other

metrics to consider may be financial in nature and include estimated cost takeout return on investment in relation to student pass rates as well as through put. Following this strategy, Standard and Poor (2009) argued that risk identification and prioritisation are only beneficial if actions are defined and executed to mitigate the risk. In respect of this argument, Standard and Poor (2009) suggest that risk mitigation actions must be defined individually for each risk. The authors add that in some cases, immediate actions are necessary. Especially following the inferential analysis made. For other risks, future plans and considerations are more appropriate. In this study though, the question then is; what should be the University's risk mitigation strategy?

Following a series of interviews with the respondents, a respondent (Jalil) commented that *… risk mitigation strategy should include actions that are proactive to prevent a risk from occurring and impacting an institution or reducing the impact of the risk.* To make this point clearer, Jalil explains that if a risk analyst shows that an institution has unacceptably high levels of risks using models then one needs to take some actions to counter them. In this respect, Nicholas and Steyn (2008) come in handy with the idea that: (1) reduce the probability of the risk affecting the institution (2) limit the impact of the risk if it does occur.

This approach follows Nicholas and Steyns' (2008) definition of risk. In this definition, the authors pointed out that risk is a function of the probability (likelihood) and the impact of an event should the event occur. Thus mathematically, there is a direct relationship between risk, its likelihood and impact. Hence to control risk, it makes sense to control either its likelihood and or impact. In this section specific pattern of risk relationships that generated risk mitigation was compared. The results revealed that there was a significant relationship between individual key risks been assigned to appropriate managers and risk mitigation. Moreover, there was significant relationship between various committees taking adequate account of the key risks identified by key stakeholders and risk mitigation. The final aspect revealed that there was significant relationship between institution's overall approach to risk management, and its strategic objectives on risk mitigation.

Thus in theory, there is good reason to control either the likelihood or impact of the pattern of risk relationships that generated risk mitigation. In practice though, an analyst would often wish to do both, thus likelihood and impact. However, generally an analyst should try to reduce the probability of the risk affecting the institution in the first place. In this regard a respondent (Liile) noted that: *…one way of doing this is risk avoidance.*

This strategy precisely resonates with Nicholas and Steyns' (2008) view of avoidance. In both Liile (respondent) and Nicholas and Steyn's (2008) views, avoiding is 'not doing' the things that could lead to a problem occurring, such as not entering into a line of business –say recruiting more students even though the University is ill-equipped, and or a particular deal or a new infrastructural project of the University, which has no sufficient significant basis. However, the advantages of using quantitative models are also obvious; firstly, the use of expert judgements (by ranking responses) becomes consistent and transparent through the application of quantitative risk analysis models (Hamilton 2003). But, this must be done to create a model that must define the concepts of social settings more exact, thus helping to interpret final results.

CONCLUSION

Following the above, the key findings are (1) the University has no adequate control mechanisms to mitigate risk (2) the University does not take adequate account of the key risks identified by key stakeholders and thirdly (3) the University's overall approach to risk management, as assessed for one-academic year is not adequate for its strategic objectives. Notwithstanding the concerns raised above two positive sides are (1) the responsibility for the oversight of individual key risks has been assigned to appropriate managers, (2) the issues arising from audits are brought to the attention of the executive management team as appropriate. Following the context and methodology of the study, it is recommended that the research be conducted in white dominated University to compare and contrast the results, or be replicated in a country other than Southern African country for risk mitigation and analysis policy.

RECOMMENDATIONS

The study showed that there was a significant relationship between individual key risks being assigned to appropriate managers and risk mitigation. Hence, it is recommended that key risks be assigned to appropriate managers. Moreover, there was significant relationship between various committees taking adequate account of the key risks identified by key stakeholders and risk mitigation. Hence, attention be given to committees taking adequate account of the key risks.

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