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## **Risk management in public sector construction projects: Case studies in Lesotho**

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### **Abstract**

Construction projects are facing problems that impede their expected performance. Time, cost, quality, and competition limitations place constraints on projects. These challenges require incisive risk-management (RM) practices. This article presents the findings of a multiple case study, which determined how and why public sector construction projects are failing in terms of contemporary RM practices that appear to be lacking in Lesotho construction. The article investigates the stakeholders' perceptions regarding risks' likelihoods and impacts (P-Is) on three public sector construction projects. A 5-point Likert measurement scale was used to collect data for the P-I grids. The data are analysed and presented with Scatter plots. The results obtained through cross-case synthesis show that the interviewees perceive the level of risks' P-Is on the examined construction projects to be high. Moreover, the level of RM practice is found to be inconsistent with best practices. To enhance RM practices in Lesotho, the management of public sector construction projects should promote the use of competent project managers.

**Keywords:** Construction, Lesotho, public sector, risk management,

### **Abstrak**

Konstruksieprojekte staar probleme in die gesig wat hul verwagte gedrag strem, wat deur tyds-, koste-, kwaliteits- en kompetisiebeperkings beïnvloed word. Hierdie uitdagings vereis indringende risiko bestuurspraktyke (RB). Die doel van hierdie artikel is om die bevindinge vanuit 'n omvattende gevallestudie navorsingsmetode aan te bied, gerig op kontemporêre RB-praktyke, wat ontoereikend blyk te wees in die geval van Lesotho konstruksieprojekte. Die ondersoek fokus op die persepsies van aandeelhouers ten

opsigte van die waarskynlikheid en impak (P-Is) van risikos oor drie openbare sektor konstruksieprojekte. 'n Vyfpunt Likertskaal-meetinstrument is gebruik vir die versameling van data vir die P-I roosters en spreidiagramme vir ontleding daarvan. Die data is ontleed en aangebied met verspreidingsgrafieke. Die resulate verkry deur kruisgevalsintese wys dat respondente die vlak van P-Is vir geselekteerde konstruksieprojekte hoog ag. Daar is ook bevind dat die omvang van RB-praktyke afwyk van internasionale praktyk, as gevolg van uitdagings binne die projekte. Ten einde RB-praktyke in Lesotho te bevorder, beveel die outeurs aan dat gesoute bestuurders vir die bestuur van openbare konstruksieprojekte aangewend word.

Sleutelwoorde: Konstruksie, Lesotho, openbare sektor, risikobestuur,

## 1. Introduction

The construction industry has embraced project management (PM), which entails risk management (RM) as one of its essential knowledge areas. According to Mahamid (2013: 45), construction projects are failing due to prevalent risks. In some instances, failures have escalated in the region of 6% to 7% of contract costs, with a 90% failure rate recorded in African projects (Egbu & Sidawi, 2011: 104; Van Olden, 2014: 46). Therefore, RM has become a crucial area in the management of projects. Smart project managers employ risk management processes (RMP) to tackle challenges that impede their goals and objectives. They continually learn about effective RM practices by collaborating with PM professionals and RM training.

The results of the study reveal that project stakeholders perceive the impacts of risks on construction projects and knowledge areas to address the deficiencies in RM practice in Lesotho. Semi-structured interviews, supplemented with a mini questionnaire across three case projects in Lesotho, were used to establish how project actors perceive the likelihoods and impacts of risks. The study also assesses how construction risks change within a project life cycle (PLC) of a public sector construction project in Lesotho.

The paucity of infrastructure in Lesotho has remained a challenge to economic growth. Least developed economies such as Lesotho are unable to fully address the infrastructural challenges and fulfil developmental mandates due to technical skills' inadequacies (Laryea, 2010: 216; Government of Lesotho, 2013: 65). Technical skills are essential in project RM, because risk is a function of project uniqueness and the stakeholders' experience (Nicholas & Steyn, 2011: 363). In particular, Lesotho is faced with a shortage of required infrastructure for economic growth (Ngoma, Mundia & Kaliba, 2014: 16). To address the shortage, the Government of Lesotho planned to invest in public construction projects (Government of Lesotho, 2013: iii). However, in order to realise the plan, project risks

must be closely managed (Schwalbe, 2011: 424). RM is necessary to mitigate cost/time overruns, and attracts potential investors into the public infrastructural projects. Investigating the practice of RM in the local public construction projects could help stakeholders re-evaluate ways to minimise losses and project failure.

## **2. Challenges facing the construction industry**

According to Issa, Emsley and Kirkham (2012: 1221), most of the problems encountered in infrastructural projects are due to regularly identified construction risks. A risk is an uncertain event that has a positive or adverse effect on project objectives (Enshassi & Mosa, 2008: 96; Heldman, 2005: 213; Schwalbe, 2011: 425). Taroun, Yang and Lowe (2011: 87) emphasise the well-known view that "no construction is risk-free". However, the risk could be managed, minimised, shared, transferred or accepted.

In other words, risks are subjected to various control mechanisms in a project environment. Since projects are complicated, experience and RM knowledge are vital tools in managing them (Ameh & Odusami, 2014: 2; Nicholas & Steyn, 2011: 362-363). Table 1 indicates the problems that are unique to projects in Lesotho. These issues place emphasis on time and cost effects. Delays have been identified as major project risks in public construction projects (Mpaki, 2014a: 25; Ntsukunyane, 2015: 4). Delays are prevalent in construction in developing countries. As in other African countries, Government-related delays stifle projects' progress in Lesotho (Agyakwa-Baah & Chileshe, 2010: 1226). Apart from their impact on advances in work, delays trigger cost overruns in construction projects (African Development Bank Group, 2011: iv; Mpaki, 2014a: 25; 2014b: 26), but employing risk management processes (RMPs) might alleviate the situation. However, Shang, Anumba, Bouchlaghem, Miles, Cen and Taylor (2005: 392) observe that RMPs are not well practised on construction projects.

Table 1 Risk impact on selected major public construction projects in Lesotho

Project	Risk type	Causes of delays	Effect on project performance
The Mpharane-Belabela Road Upgrading Project	Internal market, technical & assumption.	Insufficient road users cost recovery (about 36.5%) Project objectives were not succinct Design brief and feasibility studies were inadequate Heavy rainfall	Delays – 9 months Cost overruns (55.3%)
The Metolong Dam Project	External & internal	Logistical challenges Labour disputes Heavy rainfalls	Delays – 1 year Cost overruns
The Tikoe Industrial Estate Project	External	Delayed funds Inclement weather	Delays – 1 year Cost overruns

Source: Adapted from the African Development Bank Group (2011: IV) and Mpaki (2014a: 25; 2014b: 26).

### 3. Risk management processes (RMPs)

According to Schwalbe (2011: 433), project managers need to consider the impacts of risks on the other project management knowledge areas (PMKAs). The Project Management Institute (PMI) has recommended the use of ten knowledge areas, including integration management, scope management, time management, quality management, human resources management, communication management, procurement management, stakeholder management, cost management, and risk management (PMI, 2013: 60). However, this study uses RM as a lens to examine other relevant PMKAs that project managers must possess. Among the 10 PMKAs, only stakeholder management was not assessed in this study because of the anticipated low number of stakeholders involved in the PM functions in Lesotho. The removal of the stakeholder management KA helps avoid superficial PM perceptions. This limitation is supported by the notion that the effectiveness of a project manager depends on the ability to manage stakeholders and extensive experience gained (Bal, Bryde & Fearon, 2011: 1165).

Risk analysis and assessment have been identified as major RMP elements (Schieg, 2007: 145; Taroun *et al.*, 2011: 87). RM helps

stakeholders understand the nature of projects while promoting accountability (Schwalbe, 2011: 422). RMP involves risk planning, risk identification, risk assessment (both qualitative and quantitative), risk response, risk monitoring, and control. These steps must be undertaken throughout the PLC (Schwalbe, 2011: 427). Analysing risks from a PLC perspective is important as threats change through initiation, planning and design, execution, and closeout phases of the project (Risk Management Technical Group, 2012: 2-19). The RM strategies may be different, but the objectives are the same, due to the use of the same concepts (Kululanga & Kuotcha, 2010: 337). However, the RM plan must precede the identification process so that risk profiling, risk appointments, risk reservation, and documentation can be continuous (Nicholas & Steyn, 2011: 384).

Regarding perceptions, Nicholas and Steyn (2011: 363) note that project managers are accustomed to working with tangible evidence and tend to avoid the likelihood of risks, because they find them too complex to deal with. According to Shang *et al.* (2005: 392), project members mostly concentrate on getting the job done and tend to avoid RM procedures. Schwalbe (2011: 422) supports this perception, with the contention that RM is a commonly overlooked element in PM. When project managers do not forget it, they appear to favour simple methods as opposed to practical methods of RM that may be complex (Forbes, Smith & Horner, 2007: 736). In fact, Hillson (2012a: 30; 2012b: 34) asserts that risk-taking culture as a critical dimension of project leadership is often overlooked, even though it moulds an active RM practice.

#### **4. Probability and impact of risks**

According to Nicholas and Steyn (2011: 363), risk is a factor of the 'likelihood' of setbacks and the 'impact' unique to a project. These can only be minimised by an ascribed process of RM (Nicholas & Steyn, 2011: 363; Roberts, 2013: 110). Risk has a direct impact on time, which mostly contributes to cost overruns (Afshari, Khosravi, Ghorbandali, Borzabadi & Valipour, 2010: 42; Assaf & AL-Hejji, 2006: 349-350). Risk effects on the project parameters of time, cost, quality, and scope have been called a 'quadruple constraint' (Schwalbe, 2011: 9). In PM literature, it becomes apparent that several risks with different impacts emerged at various phases of a project. Common risks in the construction industry pertain to quality, personnel, costs, deadline, strategic decisions' risks, as well as environmental, technical, scheduling, contractual, financial, and management matters (Schieg, 2006: 151). These risks are internal to

a project. Schieg (2006: 79) identifies external risks as those related to natural occurrences, political changes, societal changes, market and sectoral trends' shifts, legal developments, and technological changes. Moreover, these risks are termed using the acronym, PESTLE, i.e. Political, Economic, Sociocultural, Technological, Legal, and Environmental issues (Forbes, Smith & Horner, 2007: 736).

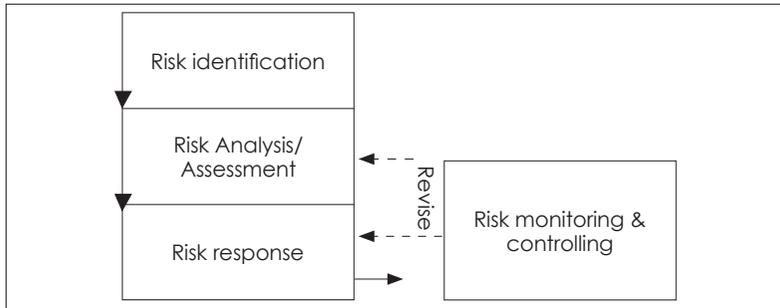


Figure 1: Risk management process

Source: Adapted from Nicholas & Steyn, 2011: 79-80; Schwalbe, 2011: 57-105

As indicated in Figure 1, risk identification is the first step in RMP. When a risk is known, the next step is to investigate it in terms of its likelihood of occurrence and impact. Thus, the second step is required in order to analyse the risk value (Schieg, 2006: 79). The analysis could be done through either qualitative or quantitative systems. According to Schwalbe (2011: 438-442) and Ke, Wang and Chan (2012: 678), qualitative risk analysis involves a probability-impact (P-I) matrix, risk consequence rating (RCR), and Monte Carlo analysis. Quantitative techniques include decision trees analysis, expected monetary value (EMV), risk premium, simulation, and sensitivity analysis (Taroun *et al.*, 2011: 87; Schwalbe, 2011: 428-442). For the purposes of this article, the P-I method, concisely explained in section 4.1, was used, because it presents stakeholders' views that are essential for prioritising project risks qualitatively (Nicholas & Steyn, 2011: 370).

#### 4.1 The qualitative probability-impact (P-I) matrix

The P-I risk analysis model combines both qualitative and quantitative data (Nicholas & Steyn, 2011: 370; Taroun *et al.*, 2011: 90). As an illustration, Table 2 demonstrates a simple 5x5 qualitative risk method where  $P \times I =$  Priority Risk Factor (RPF). The green category where  $PI=0.1$  to  $0.6$ , risks require hardly any attention; yellow category where  $PI=0.4$  to  $1.0$ , risks require slightly more attention; the amber category

requires a right amount of attention, while the red category requires maximum risk attention (2.5-4.5 RPFs).

Table 2: P-I qualitative risk analysis matrix

Impact	0.9	0.9	1.8	2.7	3.6	4.5	Very high
	0.5	0.7	1.4	2.1	2.8	3.5	High
	0.5	0.5	1.0	1.5	2.0	2.5	Medium
	0.3	0.3	0.6	0.9	1.2	1.5	Low
	0.1	0.1	0.2	0.3	0.4	0.5	Very low
		1	2	3	4	5	
		Very low	Low	Medium	High	Very high	
		Probability					

Source: Adapted from Schwalbe (2011: 439) and Nicholas & Steyn (2011: 373)

With impact value ranging from 0.1 (low) to 0.9 (high), Table 3 demonstrates how risks impact on quality, cost and time in a project. Subjective ratings can also be expressed as numerical measures between 0 (low/negligible), 0.3 (minor), 0.5 (moderate), 0.7 (significant), 0.9 (high), and 1.0 (catastrophic) (Nicholas & Steyn, 2011: 373).

Table 3: An illustrated project risk impact values on project parameters

Impact Value	Impact		
	Quality performance	Cost overruns (percentage)	Time delays (months)
0.1 (low)	Minimal	Within budget	Negligible
0.3 (minor)	Small	1-10%	Minor slip (<1)
0.5 (moderate)	Moderate	10-25%	Moderate slip (1-3)
0.7 (significant)	Significant	25-50%	Significant (> 3)
0.9 (high)	Goals not achievable	>50%	Large slip

Adapted from Nicholas & Steyn (2011: 373)

## 5. Research methodology

According to Leedy and Ormrod (2010: 136-137), qualitative strategies can help the researcher gain new insights into the phenomenon, develop new theories about the phenomenon, and discover the challenges within the phenomenon under investigation. Yin

(2011: 6-8) points out that qualitative research represents the views and perspectives of people while offering an attractive and fruitful means of conducting research. The case study research design was adopted so as to obtain data from lived experiences of project actors to uncover RM practice in Lesotho (Yin, 2011: 307).

Based on the exploratory research questions chosen, it was decided that an inductive approach would be appropriate for gaining an understanding of complex RM issues so as to draw conclusions about the studied project patterns. According to Creswell (2007: 39), working back and forth between themes to create a complete set of ideas and engage participants, highlights the importance of an inductive process. Therefore, to explore how people experience and perceive RM in projects, a case study approach was deemed suitable for this study (Yin, 2011: 17-18).

### **5.1 Data analysis and interpretation of findings**

A 5-point Likert scale measurement instrument was employed to capture data for qualitative P-I grids and scatter diagrams, as a case study can also produce numeric data (Yin, 2011: 224-307). The interviewees were able to express their perceptions using a 5-point Likert scale measurement, where 1=Very low, 2=Low, 3=Medium, 4=High, and 5=Very high (please see Appendix). This strategy is supported by the literature where qualitative risk analysis methods such as P-I grids include numerical values (quantitative) being matched with the ratings (qualitative) (Nicholas & Steyn, 2011: 370).

### **5.2 Data collection**

In brief, three major public sector construction projects with contract values exceeding R100 million were purposively selected. The registration status of the main contractors was narrowed to Grade A to B. Professionals involved in each project were chosen based on their exposure to RM. The level of the RM practice provided the key criterion for the sampling strategy; hence, construction project managers, construction managers, quantity surveyors, architects, contract managers, engineers, and their respective assistants were selected as interviewees in each case. Face-to-face, semi-structured interviews were conducted and a mini questionnaire was used to examine and assess how risks' likelihoods and impacts on the project and knowledge areas are perceived across the PLC, using a 5-point Likert measurement scale. The process is shown in Figure 2.

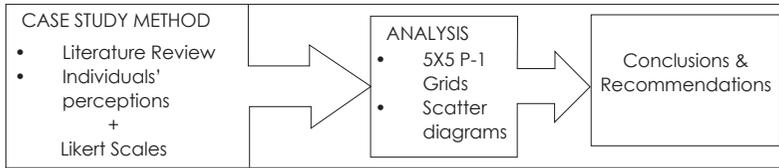


Figure 2: Research process

Figure 2 shows the reviewed literature that provides the support for the research process in this multiple-case study. Questionnaire interviews were conducted among 13 project stakeholders including Project Managers, Assistant Project Managers, Architects, Principal Engineers, Mechanical and Electrical Engineers, Consultants, Quantity Surveyors and Construction Managers to capture the data by means of a Likert scale measurement instrument. The collected data were analysed using qualitative 5x5P-1 risk analysis grids and scatter diagrams derived from the 5-point scale. Table 4 presents the research sample, namely 13 interviewees in the three case projects.

### 5.3 Limitations

As with the majority of studies, there are constraints and limitations. For instance, only eight PMI knowledge areas were selected out of the total of 10. All other PMKAs were tested against RM, which is central to the study, while stakeholder management was excluded, due to the foreseeable narrow number of stakeholders involved in the PM offices so as to avoid superficial perceptions. In addition, during the data-collection process, the second case was far from completion. Hence, there were data limitations as the closeout phase could not be investigated. Moreover, some participants did not want to be recorded when interviewed, while subcontractors did not meet the sample requirements. Despite these limitations, the findings presented in the next section show aspects of RM practice in construction that have not previously been empirically analysed in Lesotho.

## 6. Results and discussions

### 6.1 Respondents profile

The first part of the questionnaire contained questions relative to the demographic profile of the respondents, the people in the best position to report how risks' likelihoods and impacts on the project and knowledge areas are perceived. Table 4 shows the professions of

the respondents, which include architecture, project management, quantity surveying, contract management, and engineering

Table 4: Research sample

Case Interviewee	PM	Assis. PM	Architect	Principal Eng.	M&E Eng.	Consultant	QS	Contracts Mgr.	TOTAL
Case 1	√		√	√	√		√		5
Case 2		√√				√		√	4
Case 3	√	√						√√	4
TOTAL	2	3	1	1	1	1	1	3	13

## 6.2 Risk probability and impact across the PLC

Question three of the questionnaire tested the opinion of respondents in terms of how likely the identified risks (*environmental, financial, technical, and political*) occur and what their impact was. The question elicited responses in terms of a 5-point Likert scale from 1 (very low) to 5 (very high). The findings from each case project are presented in Tables 5 to 7. The results show that the participants have different perceptions on the likelihood of risks at the initiation stage. However, at the planning and design, execution, and closeout stages, the results mostly show medium to very high risks likelihoods. Meanwhile, the impacts of these risks were perceived to be parallel to their likelihoods across the PLC. These indicate that risks likelihood and impacts were proportionally increasing as the project matured.

Table 5: Perceptions regarding project risk P-I across the PLC in Case 1

Phase / Interviewee	Architect	Quantity Surveyor	Structural Engineer	M&E Engineer	Contractor's PM
Likelihood:					
Initiation	Medium	Very low	Very high	Very high	Very low
Planning & Design	Medium	Medium	Very high	Very high	Very low
Execution	Low	High	Very high	High	High
Closeout	High	Medium	Very high	High	Very high

<i>Phase / Interviewee</i>	<i>Architect</i>	<i>Quantity Surveyor</i>	<i>Structural Engineer</i>	<i>M&amp;E Engineer</i>	<i>Contractor's PM</i>
Impact:					
Initiation	Medium	Very low	Very high	Very high	Very low
Planning & Design	Medium	Medium	Very high	Very high	Very low
Execution	Low	High	Very high	High	High
Closeout	High	Medium	Very high	High	Very high

In Case 2, the interviewees were unable to give their perceptions concerning the closeout stage as the project was far from completion. The respondents in this project had wide-ranging views regarding the likelihood of risks at the initiation stage. They mostly perceived that risks were rampant across the planning and design, and execution stages relative to the perceived magnitude of the project and complexities. However, the closeout stage was not covered, as the project was still at the execution stage, as highlighted in the limitations.

Table 6: Perceptions regarding project risk P-I across the PLC in Case 2

<i>Phase / Interviewee</i>	<i>Contracts Manager</i>	<i>Project Engineer</i>	<i>Assistant PM</i>	<i>Consultant</i>
Likelihood:				
Initiation	Very low	Very low	High	High
Planning & Design	Medium	Very low	High	High
Execution	High	High	Low	Very high
Closeout	-	-		-
Impact:				
Initiation	Very low	Very low	High	High
Planning & Design	Medium	Very low	Very low	High
Execution	High	High	High	Very high
Closeout	-	-	-	-

Similar to Case 1, the participants generally viewed risks' likelihoods and impact to be proportionally increasing as the project matured.

Table 7: Perceptions regarding project risk P-I across the PLC in Case 3

Phase / Interviewee	Contracts Manager	Project Engineer	Contractor's Contracts Manager	Construction manager
Likelihood:				
Initiation	Very low	Very low	Very low	Very low
Planning & Design	Medium	Very low	Medium	Medium
Execution	High	High	Very high	Very high
Closeout	Medium	Very high	High	Medium
Impact:				
Initiation	Very low	Very low	Very low	Very low
Planning & Design	Medium	Very low	Medium	Medium
Execution	High	High	Very high	Very high
Closeout	Medium	Very high	High	Medium

### 6.3 Risk impact on the other knowledge areas (KAs)

Question four of the questionnaire tested the respondents' opinion on what impact the identified risks (*environmental, financial, technical, and political*) have on the eight knowledge areas (*Integration, Scope, Time, Cost, Quality, Human Resources, Communications, and Procurement management*) by using a 5-point Likert scale from 1 (very low) to 5 (very high). The results are shown in Tables 8 to 10.

Table 8: Risks' impact perceptions on the other PMI knowledge areas in Case 1

KAs / Interviewee	Architect	Quantity Surveyor	Structural Engineer	M&E Engineer	Contractor's PM
Impact:					
Integration	Medium	Very high	Very high	Very high	Very high
Scope	Very high	High	Very high	Very high	High
Time	Very high	Very high	Very high	Very high	Very high
Cost	Very high	Very high	Very high	Very high	Very high
Quality	Medium	Very high	Very high	Very high	Low
Human resources	Low	Very high	Very high	High	Low
Communications	Low	Very high	Very high	Medium	Medium
Procurement	Very high	Very high	Very high	Very high	Very high

Relative to how risks affect other selected PMI's knowledge areas with the exclusion of risk management which is central to the research area and stakeholders' management due to the anticipated

respondents and project scope limitations. The results show that Structural Engineer followed by the Quantity Surveyor and the M&E Engineer most perceived that these selected areas are prone to risks as opposed to others who had mixed varying perceptions. Generally, time, cost, and procurement management were perceived to be the most affected, due to their perceived critical role.

Table 9: Risks' impact perceptions on the other PMI knowledge areas in Case 2

<i>KAs / Interviewee</i>	<i>Contracts Manager</i>	<i>Project Engineer</i>	<i>Assistant PM</i>	<i>Consultant</i>
Impact:				
Integration	High	Very high	Very low	Low
Scope	Medium	Medium	Very low	Very high
Time	Very high	Very high	Very low	High
Cost	Very high	Very high	Unsure	High
Quality	High	Medium	Very low	High
Human resources	Medium	Very high	Medium	Unsure
Communications	High	Very high	Very low	Unsure
Procurement	Medium	Very low	Very low	Unsure

In this case, participants presented relatively similar perceptions regarding the impact of these risks across the PMKAs. The consultant was mostly unsure about the impact of these risks on some areas.

Table 10: Risks' impact perceptions on the other PMI knowledge areas in Case 3

<i>KAs / Interviewee</i>	<i>Contracts Manager</i>	<i>Project Engineer</i>	<i>Contractor's Contracts Manager</i>	<i>Construction Manager</i>
Impact:				
Integration	High	Very high	Very high	Very high
Scope	Medium	Medium	Medium	Medium
Time	Very high	Very high	Very high	Very high
Cost	Very high	Very high	Very high	Very high
Quality	High	Medium	Very high	Very high
Human resources	Medium	Very high	Very high	Medium
Communications	High	Very high	Very high	Low
Procurement	Medium	Very low	Very high	Medium

The results indicate that time and cost, followed by integration management, were perceived to be mostly affected. Generally, the participants viewed risks to be rampant across the PLC.

## 7. Case analysis and implications

### 7.1 Risk probability and impact across the PLC

#### 7.1.1 Case 1

The RM perceptions were gathered from five interviewees as indicated in Table 11. For the project initiation stage, two of the interviewees rated the P-I 'very low' and 'very high', respectively, with one 'medium' score. The planning and design stage had two interviewees rating 'medium' and 'very high', respectively, while one rated this stage 'very low'. Three interviewees rated the execution stage 'high', while others each rated it 'very high' and 'low'. The closeout stage saw two respondents' rating of 'high' and 'very high', while one rated it with a 'medium' score. From the analysis of scores, it can be inferred that the level of RM practice was very low, hence adverse outcomes in Table 11.

Table 11: Summary of risk P-I across the PLC in Case 1

Impact					7 (4.5)	Very high
				5 (2.8)		High
			4 (1.5)			Medium
		1 (0.6)				Low
	3 (0.1)					Very low
	Very low	Low	Medium	High	Very high	Probability

#### 7.1.2 Case 2

Regarding the 5-point Likert scale designed to gather individual perceptions, Table 12 represents the rated risk P-I perceptions of four interviewees. The execution stage was rated 'high' by two interviewees, 'very high' by one, and 'low' by the other. However, three respondents regarded the P-I at the execution stage to be 'high', while one rated it 'very high'. Two respondents considered the initiation stage to be experiencing 'very low' likelihoods of risks, while another two disagreed, claiming that this phase was suffering 'high' P-Is. The closeout stage was not graded, as the project was still in the execution phase.

Table 12: Summary of risk P-I across the PLC in Case 2

Impact					1 (4.5)	Very high
				6 (2.8)		High
			1 (1.5)			Medium
						Low
	4/3(0.1)	1 (2.0)				Very low
	Very low	Low	Medium	High	Very high	Probability

### 7.1.3 Case 3

The perceptions of interviewees in Case 3 are summed up in the P-I grid (Table 13). The respondents perceive that the risks' P-Is would be equal. Two informants indicate that 'very high' P-I had been experienced at the execution stage, while one understood that the closeout was experiencing similar problems across the PLC. Another two interviewees regarded the execution stage to be experiencing 'high' P-I, where another 'high' score was graded on the closeout stage by an interviewee. The four interviewees regard the initiation as the least troubled stage. Three respondents rated the planning and design stage 'medium', whereas one respondent rated it 'very low'. Meanwhile, the execution stage was rated 'high' by two interviewees and 'very high' by the other two, thereby identifying it as the most troubled phase.

Table 13: Summary of risk P-I across the PLC in Case 3

Impact					3 (4.5)	Very high
				3 (2.8)		High
			5 (1.5)			Medium
						Low
	5(0.1)					Very low
	Very low	Low	Medium	High	Very high	Probability

## 7.2 Risk impact on the other knowledge areas (KAs)

### 7.2.1 Case 1



Figure 3: Case 1 – summarised perceptions of the impact of risks on the other KAs throughout the PLC

Figure 3 indicates how interviewees perceived the impact of risk on the other functional areas of the project. Some red dots (representing P-Is) appear to be dominant in the top tier of the diagram, implying that the project is contending with challenges according to the interviewees' perceptions. The areas regarded to be highly affected include integration, which four respondents rated 'very high' and one rated it 'medium'; scope was rated 'very high' by four and 'high' by one interviewee, while quality was rated 'very high' by three respondents, and time, cost and procurement were each rated 'very high' by all. For a project to succeed, the project management body of knowledge (PMBOK) concedes that the activities must be mapped against the nine project management knowledge areas (PMKAs) (Schwalbe, 2011: 83). The perceptions indicated that the project stakeholders did not adhere to this concept. Hence, the project succumbed to problems as a result of neglected risks.

### 7.2.2 Case 2

In Case 2, the project was regarded as experiencing major time and cost-related impacts by two interviewees, while one respondent perceived that other areas were severely affected, as indicated in Figure 4 (extracted from Table 9). Therefore, the respondents seemed

to have addressed some of the functional areas; hence, this project can be regarded as managed at a medium risk level according to the equal distribution of the red dots in Figure 4 (scatter diagram).

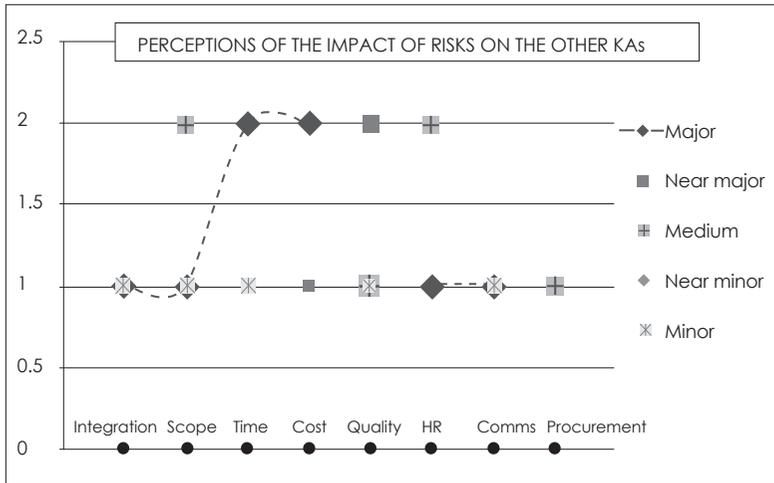


Figure 4: Case 2 – summarised perceptions of the impact of risks on the other KAs throughout the PLC

### 7.2.3 Case 3

In Case 3, all interviewees rated scope as 'medium', while time and cost were rated 'very high' by all interviewees, as indicated by the top tier skewed distributed red dots in Figure 5. The results show a perceived high-risk impact on the project, because there was a slight gap between those who recognized the high impact and those who were still optimistic about the challenges. There was also mention of two project areas: time and cost. These were followed by integration. Therefore, the overall impression shows a perception of high adverse impact on the project, thereby implying poor RM practice.

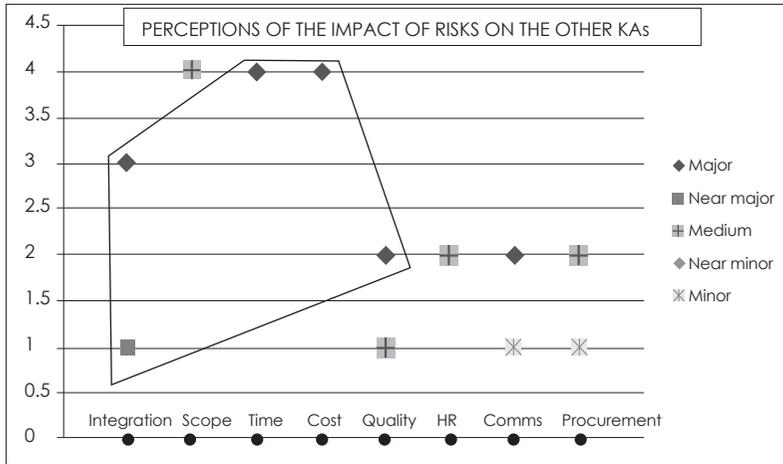


Figure 5: Case 3 – summarised perceptions of the impact of risks on the other KAs throughout the PLC

### 7.3 RM perceptions in public projects

The analysed responses indicate that, in Case 1, the interviewees were convinced that the level of RM was very low, while in Cases 2 and 3, the P-I's perceptions on the projects were found to be medium and near medium, respectively. Therefore, when all three are aggregated, the combined score is a low level of perceived RM practice (Table 14). On average, the initiation stage earned the most 'very low' score across the cases, while planning and design earned 'medium', and execution stage scored 'high' and 'very high', as shown in Table 14. It is notable that the closeout stage was not adequately addressed, because Case 2 did not award P-I scores for this stage, as the project was still being executed. However, the results from the other two projects tend towards a 'medium' score. Finally, the interviewees perceived the risks' P-I's to be 'high' and 'very high' at the execution stage. The majority of the respondents regarded the initiation stage as immune from the risks.

Table 14: Combined interviewees' average score of P-I across the projects' PLC

Project stage	Very low	Low	Medium	High	Very high
Initiation	63%	0%	7%	17%	13%
Planning & design	32%	0%	47%	8%	13%
Execution	0%	15%	0%	53%	32%
Closeout	0%	0%	23%	22%	22%

Source: The researcher

## 8. Discussion

In general, nearly all the interviewees in the three case projects were of the opinion that appropriate consideration of risks, their likelihoods, and impacts was lacking. The focus of attention was more on achieving the projects' goals without paying sufficient attention to risk factors. The interviewees claim that overruns are realised at the project completion stages, while eight of them were of the opinion that inadequacies in technical information (for example, detailed specifications) are usually overlooked at the design stage. This could result in random variation orders. Employers tend to be reluctant in promoting RM culture, according to eight interviewees.

The nature of these findings is consistent with the studies of Yusuwan, Adnan and Omar (2008: 122), who contend that, despite project stakeholders' exposure to risks, they still have confidence in old elusive concepts. Wang, Zhao, Zhang and Wang (2015: 165) affirm this scenario and argue that proper risk decisions warrant an active RM practice. For instance, variation orders cannot be avoided, as they are commonly accommodated in contracts – but first, their applications and limitations must be understood (Sunday, 2010: 102). In brief, it appears that stakeholders' risk awareness and perceptions *vis-à-vis* the level of RM practice for these three projects was very low. Table 15 shows how the interviewees perceive the extent of RM about inhibiting P-I factors in each case. Their perceptions point to a low average level of RM across the three cases.

Table 15: Summary of findings

Research element	Case 1	Case 2	Case 3	Summary
RM perceptions	Very low	High	Low	Low level

## 9. Conclusions and recommendations

The results of this study present the underlying problems facing public sector projects regarding the dynamics of construction risks in Lesotho. This study provided insights into the impacts of risks on projects and amplified their likelihood and impact at the building stage. The findings verify the reported lack of up-to-date practice, because examined risks remain high as projects near completion. According to the findings across the three cases, the most affected project areas were time, cost, integration, quality, and procurement management. These results reflect that requisite RM skills do not exist.

Therefore, recommendations should target improved RM education and training that could influence practice. This could be accomplished through adequate training of professionals at the business and operational levels of construction management. The use of accredited institutions could be an immediate means of improving the practice of RM in Lesotho. Regular RM workshops should be encouraged in the industry.

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**APPENDIX A: INTERVIEW SCHEDULE AND MINI QUESTIONNAIRE**

- Please tick the appropriate box below to indicate your organisation and job title.

<b>RD</b>	<input type="checkbox"/>	<b>BDS</b>	<input type="checkbox"/>	<b>Main Contractor</b>	<input type="checkbox"/>	<b>Subcontractor</b>	<input type="checkbox"/>	<b>Consultant</b>	<input type="checkbox"/>
PM	<input type="checkbox"/>	Asst. PM	<input type="checkbox"/>	Contract. Man	<input type="checkbox"/>	Architect	<input type="checkbox"/>	Asst. Arch.	<input type="checkbox"/>
Engineer	<input type="checkbox"/>	Asst. Eng.	<input type="checkbox"/>	CM	<input type="checkbox"/>	QS.	<input type="checkbox"/>	Asst. QS.	<input type="checkbox"/>

- General project information: (IF PM/QS/Principal Agent)

Start date:	<input type="text"/>	Tender amount:	<input type="text" value="R"/>
Anticipated finish date:	<input type="text"/>	Anticipated final cost:	<input type="text" value="R"/>

- At each PLC stage,
  - How **Likely** is it for these risks to occur, and
  - What is their **Impact**? – Scale your perceptions by using a 5-point Likert scale from 1 (very low) to 5 (very high).

Project phase	Unsure	Probability					Unsure	Impact				
		Low.....High						Low.....High				
		1	2	3	4	5		1	2	3	4	5
Initiation (I)	U	1	2	3	4	5	U	1	2	3	4	5
Planning & design (P)	U	1	2	3	4	5	U	1	2	3	4	5
Execution (E)	U	1	2	3	4	5	U	1	2	3	4	5
Closeout (C)	U	1	2	3	4	5	U	1	2	3	4	5

- At each project phase, what **Impact** do the risks (identified) have on the 8 knowledge areas? – Scale your perceptions by using a 5-point Likert scale from 1 (very low) to 5 (very high).

PMI knowledge area	Unsure	Impact				
		Low.....High				
		1	2	3	4	5
Integration	U	1	2	3	4	5
Scope	U	1	2	3	4	5
Time	U	1	2	3	4	5
Cost	U	1	2	3	4	5
Quality	U	1	2	3	4	5
HR	U	1	2	3	4	5
Communications	U	1	2	3	4	5
Procurement	U	1	2	3	4	5