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Risk Management Practices in Ethiopian Somali Regional State Construction Projects

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Abstract: Risk management practices are critical for construction companies to prevent any problems caused by uncertainties in the projects. This study examines how risk management is practiced in construction projects of the Somali Regional State in Ethiopia. It also identifies the most influential risk factors in the region which need to be given a higher consideration when practicing risk management. Within this context, a questionnaire survey was conducted among construction professionals in the Somali region. Based on the findings, there is a deficient practice of risk management in Somali Regional State construction projects due to a lack of knowledge or budget. Risk factors like design errors, top management changes, insufficient experienced staff, and delays in payment are found to have the highest probability of occurrence in Somali Regional State construction projects. Findings from this study can help construction managers to better understand the risk factors influencing construction projects in the Somali region in the context of improving project performance.

Keywords: construction; projects; Ethiopia; risk management; Somali Regional State

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1. Introduction

Risk management is a widely used concept in every industry [1,2]. It helps to tackle the challenges posed by an uncertain world and assists in achieving project objectives [3]. Raz and Hillson [4] claim that risk management evolved from different factors including the shift away from dangerous physical works, the role of technology, increasing competitive pressures and turbulence in the business environment, increasing complexity of business and projects, globalization trends, regulations, expanding views of organizations and the growing importance of projects.

Risk management practices are critical for construction companies to prevent any problems caused by uncertainties in construction projects [5–9]. Construction projects face various changes and risks that lead to delays or cost overruns [10–13]. Such risks may cause problems to the project objectives unless managed well. Thus, the construction industry's better performance is directly dependent on the awareness and implementation of risk management practices [14,15]. The construction industry has various uncertain factors due to its construction complexity operations that require a formidable problem-solving capability [16–18]. Therefore, decision making in terms of assumptions, expectations, estimates, and the project's future forecasts involves taking risks [19,20]. Furthermore, several studies show that construction firms know the risks and their consequences but do not have an established risk management method to approach risks [21,22].

Despite the large number of studies on risk management in construction, there are few studies that have examined the risk management practices in construction projects in Ethiopia. Thus, studies investigating the risk management practices in Ethiopian construction projects are needed. This study aims to fill this research gap. Within this context, construction risk management practices in the Somali Regional State (SRS) of Ethiopia are examined in this study through a questionnaire survey among professionals working

in construction projects. This study provides detailed information on risk management practices and risk factors in SRS construction projects. It is believed that the findings can help construction managers to better understand the risk factors influencing construction projects in SRS.

2. Risk Management in Construction

Campbell [23] stated that risk equals expected damage. Rosa [24] defined risk as "a situation or event where something of human value (including humans themselves) has been put at stake and where the outcome is uncertain". Aven and Renn [25] also proposed a similar description and defined risk as "uncertainty about and severity of outcomes or consequences of activity concerning something that humans value". Most of the definitions made by the researchers focused on the negative side associated with risks. The fact that the risk mostly has a negative impact has led individuals to consider the negative side of risk [26].

In today's global environment with dynamic changes, risk management is crucial in every aspect of life [27]. Cooper et al. [28] defined risk management as "the culture, process, and structures that are directed towards the effective management of potential opportunities and adverse effects". The aim of risk management is not to keep the risks out of projects but to constrain risks to an acceptable limit to the owner. In recent years risk management has become a vital tool, and several documents have been published to provide instructions for risk management process practitioners [29]. For a project to be successful, the executing organization should address risk management consistently.

Risk management task enables individuals or organizations to make appropriate decisions on the uncertainties that surround them. Therefore, there is a requirement for a formal risk management process since it is impossible to eliminate all risks [30,31]. Most risk management commentators illustrate a risk management process containing identification, analyses, and response. Cooper et al. [28] classify the risk management process as identifying, analyzing, assessing, treating, monitoring, and communicating. This study uses the classifications of risk management processes demonstrated by PMI [32] and Pritchard [33], namely plan risk management, identify risks, perform qualitative analyses, perform quantitative analyses, plan risk responses, and control risks.

Construction projects are prone to risks due to their increasing size and complexity [34]. Risks need to be appropriately managed to complete a project on time, within budget, and to ensure quality and safety expectations [35]. The impact of risks on construction projects depends on the project's sensitivity to risks and the organization's ability to manage risks [36]. For a construction project to be fully capable, risk management must be addressed to the whole project phases, including the pre-design phase, design phase, pre-construction phase, construction phase, and post-construction phase. The type of the project, whether local or international, plays a significant role in the typology of risk. External and internal risks are the primary classifications of construction risks [37]. External risks originate from outside the project scope [38] and can be economic, financial, political, social, and cultural risks. Internal risks are relevant to all projects and could be a risk to owners, designers, contractors, subcontractors, and suppliers [37]. Lam et al. [39] identified five main risks, namely capability risks, contractual and legal risks, economic risks, physical risks, and political and societal risks. Zhi [40] also classified risks in terms of initial sources, national or regional level, construction industry, company level, and project level.

Many studies have been conducted on risk management in construction [41–47]. Rostami et al. [48] examined the difficulties of implementing risk management in small and medium enterprises in the United Kingdom (UK) construction industry. They found that scaling risk management processes, tools and techniques adoption, cost-effectiveness, and inappropriate culture of practicing were the key important challenges that UK organizations need to overcome.

Bing et al. [49] conducted a study to explore risk allocation preferences in public–private partnership (PPP)/private finance initiative (PFI) construction projects in the UK.

They found that the majority of risks in PPP/PFI projects, especially those in the meso-level risk group (i.e., directly associated with the project itself), should be allocated to the private sector.

Hastak and Shaked [50] developed a model for international construction risk assessment. The model assists the decision maker in evaluating the potential risk at the macro, market, and construction project levels.

Nyqvist et al. [51] conducted research in Finland to examine the current state and issues of uncertainty and risk management. They proposed a novel uncertainty network model to assist construction project stakeholders in managing risk and uncertainty.

Lozano-Torró et al. [52] examined the importance of risk management in the success of Spanish engineering consulting firms in the international construction market. The results of their study show that the size of the companies interviewed has no influence on the importance that they gave to risk management, but international experience does relate to the assessment of risk identification and management as a success factor.

Bryde and Volm [53] conducted research with practitioners in German construction owner organizations to explore their perceptions of project risk. The results showed no common definition of project risk and a general belief that risk equated to threat.

Myrczek et al. [54] presented selected problems of risk management in business activities of construction enterprises operating in Poland. According to their results, the surveyed contractors do not generally manage risks in any organized or integrated way.

Visser and Joubert [55] studied risk management in terms of the formal risk culture, risk framework, and risk practices of the South African construction industry. They found that construction companies have weak risk management practices, though risk management awareness was high at the construction project level.

Zou et al. [56] investigated the key risks in construction projects in China. They compared these risks with the findings of a parallel survey in the Australian construction industry context to highlight the unique risks associated with construction projects in China. Based on the findings, the unique risks associated with construction projects in China were determined as project funding problems, contractors' poor management ability, difficulty in reimbursement, unwillingness to buy insurance, and lack of awareness of construction safety and pollution.

Liu et al. [57] explored the risk paths in international construction projects performed by Chinese contractors and examined the risk effects on the objectives of these projects. They determined that host government-related risk, contractor's lack of experience, and contractors' lack of managerial skills had significant effects on project cost, quality, and schedule objectives, respectively.

Siraj and Fayek [58] examined common risk identification tools and techniques, risk classification methods, and common risks for construction projects. They conducted a systematic review and detailed content analysis of 130 selected articles published over the last three decades. According to their analysis, the most frequently identified risks were found as unpredicted changes in inflation rate, design errors and poor engineering, and changes in government laws, regulations, and policies affecting the project.

El-Sayegh et al. [59] assessed the risks in sustainable construction projects in the United Arab Emirates. Based on their analysis, the top five risks are determined as shortage of clients' funding, insufficient or incorrect sustainable design information, design changes, unreasonably tight schedule for sustainable construction, and poor scope definition of sustainable construction.

Yousri et al. [60] investigated the likelihood of occurrence and the consequences of the risks in Egyptian building projects. Based on their findings, funding problems from contractors, material price fluctuations, unrealistic estimated durations for project activities/phases, shortages of construction materials in the market, changing laws, the currency exchange rate, and changes in material types and specifications during construction were found as the major risks.

Qalbin et al. [61] evaluated the risks in construction projects in Jordan. The results of their study showed the high importance of environmental and legal risks and indicated that the most important risk factors are the difficulty of issuing licenses and permits and the inappropriate definition of the scope of work.

Studies on construction risk management practices in Ethiopia are very limited. Debela [62] studied construction risk management through insurance in Ethiopian federal road projects. Based on the study findings, all the respondents had some knowledge of risk management however, implementing risk management processes was limited. Moreover, contracting parties provided insurance coverage to road projects to meet the demand of the clients, rather than to avoid possible risks. Mesfin [63] studied contract risk management practices in Ethiopian construction projects. The findings indicated that most of the parties in Ethiopian construction projects lack adequate knowledge about the risk management processes. Individual judgment and experience were highly used to deal with the risks in Ethiopian building construction projects.

3. Construction Industry in Ethiopia

Construction activities in Ethiopia accounted for 18% of the country's GDP for the financial year 2017–2018. Between 2014 and 2015, a total number of 7259 contractors, including building contractors (BC), road contractors (RC), and general contractors (GC), were registered by the Ministry of Urban Development and Construction [64]. There are also more than 187 consulting firms in the Ethiopian construction industry [63], which are classified as Consultancy Architects (CA), Consultancy Architects and Engineers (CAE), Consultancy Highway and Bridge (HBC), Consultancy Engineers (CE), and Specialized Consultancy (SC). These contractors and consultants have varying grades due to the difference in their tendering limits and material requirements. GC from grade 1 to 10 can work in any construction project except water works. BC from grade 1 to 10 can work in any building construction. RC from grades 1 to 10 can operate in road construction, and specialized contractors (SC) from grades 1 to 4 can work in any specialized area like painting. All consultancies in the Ethiopian construction industry are divided into six grades (grades 1 to 6). On the other hand, clients do not need to have a particular class.

SRS is the second largest region in Ethiopia next to the Oromia region. It is a predominantly pastoral region and has the lowest access to necessary facilities and construction projects compared to other regions of Ethiopia [65]. The registered state-owned and private construction companies by Somali Regional State's Urban Development Construction and Industry Bureau (UDCIB) contain 296 contractors and 6 consultancies. The grades and classifications of these contractors and consultants are shown in Table 1. Within SRS, there are only five contractors and one consultant having grade 1.

Table 1. Licensed construction companies in SRS UDCIB.

Grade	Classification					
	GC	BC	RC	SC	CE	CAE
1	3	2	-	-	1	-
2	4	3	-	-	-	-
3	9	6	-	-	-	-
4	12	44	-	4	-	-
5	43	58	-	-	-	1
6	8	17	-	-	-	4
7	10	13	-	-	-	-
8	16	24	1	-	-	-
9	3	16	-	-	-	-
10	-	-	-	-	-	-
Total	108	183	1	4	1	5

4. Materials and Methods

The research data was collected using both primary and secondary sources. A questionnaire was developed based on the literature study. A pilot study was carried out with two construction managers to receive comments on the readability and accuracy of the survey questionnaire. The questionnaire was revised based on the comments from the pilot study. Representative samples from contractors, consultants, and clients in the SRS were randomly selected. A total of 105 licensed companies in the region were chosen. The Somali region was in a transition period at the time of the study, where most of the construction works were stopped, some of the companies were bankrupted, and others needed to renew their license. Therefore, only 43 companies, including both private companies and state-owned construction enterprises, were available for the research. A total of 105 questionnaires were distributed by email to these 43 companies containing clients, contractors, and consultants working on SRS construction projects. Due to the reluctance of some of the construction professionals to participate in this survey, only 32 firms' participants returned the questionnaire. Therefore, in total, out of 105 questionnaires, only 63 were returned. Eight of the questionnaires were incomplete or improperly responded to. Thus, only 55 responses representing a response rate of 52% were used to assess the risk management practices in SRS.

Participants were employed in different types of construction companies (Table 2). Among the respondents, 23 contractors, 12 of them were GC, 1 of them was RC, and the remaining 10 companies were BC. One of the six consultant companies was CE, and the other five companies were CAE. The questionnaires were sent to general managers, deputy managers, office engineers, project managers, and site engineers because they are assumed to have enough knowledge about the risk management practices in their organizations.

Table 2. Distribution of questionnaires.

Company Type	Number of Companies	Total Questionnaires Sent	Number of Respondents' Companies	Number of Participants with Valid Responses	Valid Percent of Respondents
Client	3	9	3	6	10.9
Contractor	34	66	23	34	61.8
Consultant	6	30	6	15	27.3
Total	43	105	32	55	100.0

At the beginning of the questionnaire, explanations on the question forms were given that helped respondents obtain a view of risk management techniques and practices. The questionnaire consisted of 28 questions which were divided into 5 parts. The first and second parts were about the general profiles of the companies and the participants. The third part was about the knowledge of risk management of the respondents. The fourth part contained questions on risk management practices by asking respondents whether their company practices risk management or not. Some of the questions of this survey are taken from the study conducted by Mesfin [63] in order to compare the results of this study with the research findings of Mesfin [63]. The questionnaire contained both close-ended and open-ended questions. The main aim of the close-ended questions was to save time for respondents by selecting the most appropriate choice from multiple-choice questions. Open-ended questions were used to obtain detailed responses to questions.

The last part consisted of the evaluation of potential risk factors in SRS construction projects. In this study, 53 risk factors were identified from the literature review [66–71]. Through semantic analyses, the risk factors were subdivided into ten risk categories, namely managerial, contractual, financial/economic, technical, material, environmental, social and cultural, political, safety, and legal risks. Managerial risks are the risks associated with ineffective, destructive or underperforming management. In this study, risks associated with ineffective decisions and poor capabilities of the managers are listed in the managerial

risk category. Contractual risks originate from the type of contract and procurement used for the project execution and operation. Financial risks are the risks concerning project financing from pre-design to post construction. Economic risk can be described as the likelihood that an investment will be affected by microeconomic or macroeconomic conditions. Technical risks are the risks reflecting "engineering difficulties and novelty" [72]. Material risks are risk issues involving the materials to be used in the project. In this study, poor quality of construction materials, lack of materials needed for the project, and unfavorable suppliers and sub-suppliers are identified as material risks. Environmental risks are risks concerning environmental problems such as weather and seasonal consequences, geology and soil type of the project site, unforeseen ground conditions, and floods [68]. Social and cultural risks are risks arising from language barriers, inconsistency cultural differences, bribery, and corruption acts, insecurity and crime pestilence, religious differences, diseases, as well as informal relationships [40]. Political risk is a "highly subjective and business specific event" [73]. Therefore, it can be defined in different ways by both academicians and decision-makers. Connick et al. [74] define political risks as "the probability of disruption of the operations of companies arising from acts of governments and political institutions as well as minority groups or separatist movements". The most sensitive political risks are civil disorders, wars, and continuous changes in government policies. Ashley and Bonner [73] claim that many experts in this field have an opinion that the "probability of encountering political risks abroad is directly proportional to the relative stability of the host country's political system". The construction industry is one of the most hazardous industries worldwide [75–77]. Working at heights and the use of heavy machines in construction sometimes cause losses to individuals, organizations, and societies as a whole [78]. In this research, safety risks are included as the ones rising from the safety standards used throughout the project lifecycle. Legal risks are the ones that emerge from the potential losses caused by regulatory or legal action. It mostly arises from the prospect that contracts may not be enforced. The respondents were requested to evaluate the probability of occurrence of the identified risks and their impact on construction projects by using a 1–5 Likert scale, where 1 indicated "very low" and 5 indicated "very high".

Descriptive statistics were employed to analyze the data using Statistical Package for Social Scientists (SPSS). Frequency technique was used to figure out how many responses fit into a particular category. A Likert scale of 1–5, which is the most widely used scale in survey research, was used to identify the degree of risk's impacts and its probability of occurrence. The respondents were requested to determine the relative likelihood and impact of each risk to the construction projects. Then, the levels of impact and occurrence probabilities were analyzed according to their mean values and standard deviations.

5. Results

5.1. Demographic Profile of Companies and Respondents

The reliability of the measurement scale was measured by determining its internal consistency with Cronbach's alpha. According to Pallant [79], the internal consistency of scores is one of the main issues that should be considered when checking the reliability of data. The Cronbach's alpha coefficient value of the scale was calculated as 0.87, indicating a high degree of internal consistency.

As mentioned before, there are different types of grades for contractors and consultants in the Ethiopian construction industry. Based on the findings, 7 companies have grade 1, 4 companies have grade 2, 5 companies have grade 3, 5 companies have grade 4, 4 companies have grade 5, 1 company has grade 6, 2 companies have grade 7, and 1 company has grade 8. The results show that most of the surveyed companies can perform different types of construction projects as they have higher grades. Half of the companies (50%) had 6–15 years of experience in the construction industry, whereas 34.4% of companies had 11–20 years of experience, 6.2% of the companies had 21–30 years of experience, and the remaining 9.4% of companies had 0–5 years of experience in construction. Two companies having 21–30 years of experience in construction were operating

nationally in Ethiopia whereas all other remaining companies were operating only in the Somali region.

The majority of the participants (73%) had 0–5 years of experience in construction whereas 22% of the participants had 6–10 years of experience in construction, and the remaining 5% had 11–20 years of experience in construction. Approximately 78% of the participants had a bachelor's degree whereas 22% held a master's degree. Most of the participants (22 out of 55) were office engineers. Moreover, 9 general managers, 9 project managers, 9 site engineers, 2 deputy managers, 2 quantity surveyors, 1 residential engineer, and 1 construction engineer participated in this study.

5.2. Risk Management Practices in the Companies

The survey results show that all respondents were aware of the risk management concept. The participants were asked how they came to know about risk management. An amount of 63.6% of the participants stated that they learned risk management from construction management courses at the universities they graduated. Less than half of the participants (34.5%) replied that they took training about risk management funded by their company, while only one respondent said that he learned risk management through experience. On the other hand, the majority of the participants (90.9%) believe that risk management plays a major role in the successful completion of construction projects.

The participants were asked about their level of risk management awareness. More than half of the respondents (58.2%) stated that they have a medium level of risk awareness, whereas 36.4% have a low level of risk awareness and only 5.5% of the participants rated their perception of risk management as high. Although all of the respondents claimed that they know risk management, most of the respondents do not have enough confidence to rate their awareness as high. This implies that most of the respondents may not effectively implement risk management principles in their projects. Therefore, increasing their risk management awareness is needed to upgrade their confidence to implement risk management techniques in construction projects.

Most of the respondents (60%) declared that their companies do not practice risk management principles. They presented three barriers to the implementation of risk management. The main barrier to implementing risk management practices was determined as a lack of knowledge (51.5%). This result supports the argument of Hwang et al. [80] and Smith and Bohn [81] who stated that lack of knowledge hinders risk management implementation in small-sized projects. Lack of budget which relates to the expense of risk management implementation was found as the second important barrier (30.3%). The remaining obstacle was the complex nature of risk management techniques compared to the project sizes (18.2%). Since most of the projects conducted by the respondents were small in size, the respondents believed that any money spent on risk management in these projects would be relatively large when considering the project cost.

Only 40% of the respondents stated that their companies perform risk management principles. Based on the analysis, the main goal of these companies practicing risk management was to increase the profitability of the company (60%). Accelerating the market value of the company (55%) was determined as the second important goal for risk management practices. More than one third of the respondents (35%) selected securing the company's existence as one of the goals for risk management. Reducing cash flow fluctuations was one of the main goals for only 25% of the respondents.

In terms of risk management practices in the project phases, most of the companies (63.2%) used risk management in the construction phase. More than one third (36.8%) practiced it in the design phase and 26.3% of the companies performed it in the pre-design phase. Risk management options in the project's early stages are very broad [82] and need to be argued enough with high strategic decisions [29]. According to the survey results, risk management was practiced least in the pre-design phase which shows that managing risk was not considered enough with high strategic decisions in the pre-design phase.

Based on the results, the responsible bodies of risk management in construction projects in the Somali region were determined as project managers (41%), clients (4.5%), and consultants (54.5%). The project managers were responsible for managing risks occurring on the site when the construction began. However, the clients had the responsibility to respond to any risk that occurred before and during the construction period. There is no specialized team for risk management in the region. This finding supports the study results of Mesfin [63] who determined that there is no dedicated risk management team in most Ethiopian building construction projects.

In order to determine how risk management is practiced in construction companies, respondents were asked four questions concerning the methods of risk management. The questions were as follows: How do you identify risks? How do you assess the likelihood of risks? How do you estimate the risk's severity on project objectives? And how do you respond to risks?

In terms of risk identification, respondents chose different alternatives. Previous projects were the primary source and the references of potential risks. Respondents widely used databases (75%) from previous projects in risk identification processes. Consulting with management experts (56.2%) was the second most used technique. In SRS construction projects almost all companies had an employee providing consultation for the wellbeing of the company and warning about the risks that might happen when performing a project or any activity in the company. The risk breakdown structure technique was applied for more detailed works by some practitioners (25%). On the other hand, 12.5% of the practitioners who provide the project's technical services used checklists to identify risks.

In general, risks are analyzed by performing a qualitative risk analysis and quantitative risk analysis technique [32,33]. Performing qualitative analysis enables the managers to minimize risk uncertainty and evaluate the consequence of the assumed risks. Whereas, performing quantitative analysis enables managers to analyze numerical risks affecting project objectives. All the practitioners assessed the probability of risk by using either experience or expert judgment. Ranking the importance of risks based on experience (68.2%) was determined as the mainly used qualitative risk analysis technique, whereas probability risk rating based on expert judgment (31.8%) was found as the other qualitative risk analysis technique. Sensitivity analysis (59.1%) was determined as the most used quantitative analysis method followed by event tree analysis (31.8%). According to the results, none of the respondents used Monte Carlo Simulation. This result supports the findings of Gajewska and Ropel [21] and Lyons and Skitmore [83], who also found that structured methods like risk impact assessment or Monte Carlo Simulation are not frequently used in construction.

Most of the respondents (83.3%) agreed that risk reduction was the primary risk response method used in the companies followed by risk avoidance. The findings are in parallel with the studies conducted by Mesfin [63], Gajewska and Ropel [21], and Lyons and Skitmore [83] who determined that risk reduction was the most used risk response technique in construction. The majority of the respondents try to reduce the risk's possibility that can influence the project objectives. Participants also took any action that can eliminate the likelihood or consequence of risk if it occurs. Transferring risk to other parties was determined as the least used response method. State-owned construction firms mostly accept any threats because of the government's support when the firm goes into liquidation. Moreover, all of the respondents stated that many of their projects failed to achieve their objectives due to several risks encountered in these projects.

5.3. Risk Factors

The respondents were requested to evaluate the probability of occurrence of the identified risks and their impact on construction projects by using a 1–5 Likert scale where 1 indicated "very low" and 5 indicated "very high". The probability of occurrence and impact level of each risk were analyzed according to their mean values and standard deviations. After obtaining the mean values, risk values for each risk factor were calculated

by multiplying the probability by the impact level. Then, the sum of the risk values under each risk category was calculated to obtain the average risk value for each risk category. Finally, the overall rank of the risk categories was determined according to their average risk values.

As illustrated in Table 3, design errors ranked first in terms of the probability of occurrence and ranked second in terms of the impact level. Design errors were determined as the most critical risk factor among technical risks followed by insufficiently experienced staff in terms of probability of occurrence and lack of relevant training in terms of impact level. The latter two risk factors may emphasize that the probability of a design error is high when inexperienced staff or untrained personnel perform the design. Financial/economic risks were found as the most influential risk category. Delays in payment were determined as the most important risk factor among the financial/economic risk category. Contractual risks were found as the third important risk category. Changes in the scope of work and design were determined as the most important contractual risk which causes constant changes in contract and order of variations followed by inaccurate quantity and cost estimates.

Table 3. Evaluation of risk factors.

No.	Risk Category	Risk Factor	Probability of Occurrence		Level of Impact		Overall Rank
			Mean	Rank	Mean	Rank	
1	Financial/ Economic	Delays in payment	3.125	4	3.872	1	1
2		Improper forecasting of market demand	2.673	18	3.340	8	
3		Local taxes	2.456	36	3.244	13	
4		Economic crises	2.170	49	3.244	13	
5		Financial difficulties	2.979	7	3.232	15	
6		Change in labor costs	2.787	14	3.224	16	
7		Inflations	2.479	33	2.979	34	
8		Bankruptcy of a project partner	2.395	41	2.804	42	
9	Technical	Design errors	4.018	1	3.708	2	2
10		Lack of skilled labor	2.446	38	3.340	7	
11		Lack of relevant training	2.808	13	3.333	9	
12		Insufficiently experienced staff	3.272	3	3.285	12	
13		Inadequate engineering experts	2.530	27	3.148	21	
14		Insufficient site examination	2.540	25	3.065	27	
15		Inadequate contractor experience	2.698	17	3.061	28	
16		Lack of consultant experience	2.540	24	2.937	36	

Table 3. *Cont.*

No.	Risk Category	Risk Factor	Probability of Occurrence		Level of Impact		Overall Rank
			Mean	Rank	Mean	Rank	
17	Contractual	Change in scope of work and design	3.020	5	3.636	3	3
18		Inaccurate quantity and cost estimate	2.933	9	3.224	16	
19		Lack of fairness during tendering process	2.530	27	3.142	22	
20		Inaccurate time estimates	2.574	23	3.140	24	
21		Change orders	2.536	26	3.127	25	
22		Low bid price	2.340	42	2.934	37	
23		Ambiguous clauses in the contract	2.238	45	2.883	40	
24	Managerial	Insufficient contract management capability	2.822	11	3.500	5	4
25		Top management changes	3.387	2	3.163	20	
26		Insufficient organizational management capability	2.673	18	2.714	46	
27	Material	Supply of defective materials, equipment, and plants	2.820	12	3.518	4	5
28		Unfavorable suppliers and sub-suppliers	2.510	31	3.020	31	
29		Lack of materials needed in the project	2.750	15	2.620	51	

Table 3. *Cont.*

No.	Risk Category	Risk Factor	Probability of Occurrence		Level of Impact		Overall Rank
			Mean	Rank	Mean	Rank	
30	Legal	Customs and import restrictions and procedures	2.954	8	3.319	10	6
31		Incorrect confirmation of contract document	2.720	16	3.142	22	
32		Constraints of employment and material availabilities	2.411	40	3.066	26	
33		Legal use of land and property	2.428	39	3.041	29	
34		Breach of contract	2.510	31	3.000	33	
35		Legal disputes among different parties	2.673	18	2.960	35	
36		Complex planning approval and permit procedures	2.540	24	2.795	43	
37	Safety	Trips and falls	2.062	52	3.207	18	7
38		Problems in safety standards	2.666	21	3.020	32	
39		Fire and electricity	1.829	53	2.702	47	
40	Environmental	Floods	2.220	46	3.488	6	8
41		Geology and soil type of the site	2.479	33	2.914	39	
42		Weather and seasonal consequences	2.608	22	2.764	45	
43		Unforeseen ground conditions	2.163	51	2.700	48	
44	Political	Influence of power groups	2.860	10	3.306	11	9
45		Hostilities with neighboring region/country	2.170	49	2.920	38	
46		Political changes	2.456	36	2.804	41	
47		Regional or national political opposition	2.520	30	2.784	44	
48		Civil strikes or disorders	2.280	44	2.642	49	
49		Fragmented political structure	2.220	46	2.625	50	

Table 3. *Cont.*

No.	Risk Category	Risk Factor	Probability of Occurrence		Level of Impact		Overall Rank
			Mean	Rank	Mean	Rank	
50	Social/Cultural	Bribe and corruption	3.020	6	3.191	19	10
51		Language barriers	2.469	35	3.022	30	
52		Insecurity and crime	2.204	48	2.571	52	
53		Cultural differences	2.319	43	2.446	53	

Managerial risks were determined as the fourth important risk category. Continuous change of top management personnel in the companies was determined as one of the most critical risk factors in terms of its higher probability of occurrence. The large-size companies in the survey were state-owned construction enterprises in which the regional government appoints their top management. In this study, it was found that all the senior managers were working for less than two years in their positions. On the other hand, the most impactful risk among managerial risks was determined as the insufficient capability of the companies in contract management.

Poor quality of construction materials was determined as the most critical risk factor among material risks. This result may be attributed to the use of low-standard materials available in the Somali construction market. Trips and falls have the highest rank in terms of the level of impact among the safety risks category. This result may be attributed to the use of the scaffolding systems. Most of the scaffoldings used in the SRS construction sites were made up of timber. Many of the scaffoldings were not strong enough to support the workers and construction materials. The availability of new machines and quality materials was limited in the construction projects due to the restrictions of the customs and import procedures in the region that resulted in the use of low-quality materials in construction safety applications.

Floods were found as the most impactful risk factor especially for the companies working on dams and irrigation works, while weather and seasonal consequences had the highest probability among the environmental risks. The influence of power groups (high-ranking officials in the regional government) had the highest impact and probability among political risks. Awarding bids to an unsuitable contractor by the command of a government officer might play an important role in determining this factor as the most important risk factor among political risks. In terms of the social/cultural risk category, bribes and corruption were found as the most critical risk factors. On the other hand, cultural differences have no impact on construction projects in the region. This finding may be expected since the companies were working locally and the firm owners, as well as top managers, have similar cultural backgrounds with their societies.

The respondents were also asked to evaluate the impact of each risk category on project objectives in terms of time, cost, and quality. The overall rank was determined using the average risk value which was previously explained. Table 4 shows that financial/economic risks have the highest impact on the project's schedule and cost. The respondents believe that financial/economic and technical risks have the most significant impact on the project's cost while social/cultural risks have the lowest impact on schedule, cost, and quality. In general, the respondents believe that financial, technical, contractual, managerial, and material are the highest five critical risk categories on project objectives. When comparing the evaluations in Tables 3 and 4, it can be seen that the rank of each risk category is similar in both tables.

Table 4. Impact of risk types on construction projects.

Risk Type	Impact						Overall Impact	
	Time		Cost		Quality			
	Mean	Rank	Mean	Rank	Mean	Rank	Mean	Rank
Financial/Economic	3.20	1	3.24	1	3.23	4	3.223	1
Technical	3.13	2	3.23	2	2.95	1	3.103	2
Contractual	3.08	3	3.08	3	3.00	3	3.053	3
Managerial	2.98	4	3.08	3	2.90	5	2.987	4
Material	2.69	9	3.00	6	3.11	2	2.933	5
Legal	2.85	5	3.02	5	2.81	8	2.893	6
Safety	2.78	6	2.83	7	2.88	7	2.830	7
Environmental	2.77	7	2.44	8	2.89	6	2.700	8
Political	2.75	8	2.39	9	2.53	10	2.557	9
Social/Cultural	2.49	10	2.32	10	2.79	9	2.533	10

6. Discussion

Risk management plays a critical role in the success of any business. The primary aim of this study was to examine the status quo of risk management in SRS construction projects. The specific objectives of this study were to investigate the level of risk management awareness of construction stakeholders in the region, identify the level of risk management practice in construction projects, determine the barriers to the implementation of risk management practices, and examine the identified risk factors.

The research findings can be summarized as follows:

- All of the stakeholders in SRS construction projects were aware of the importance of risk management however, very few respondents had adequate knowledge to apply the risk management techniques to their projects.
- More than half of the companies did not practice risk management techniques in their projects. The barriers to practicing risk management were found to be a lack of knowledge, lack of budget, and the complex nature of risk management process techniques.
- In terms of probability of occurrence, the most important risk factors in the SRS construction projects were determined as design errors, top management changes, lack of staff experience, and delays in payments. The most negatively affecting risks to the projects were found as delays in payment, design errors, changes in scope of work and design, and supply of defective materials and equipment.
- The risk management techniques applied in projects were highly dependent on judgments and expertise.
- Risk reduction and risk avoidance were frequently used risk response techniques of construction projects in the region.
- State-owned construction companies in the region were taking any possible risks because of their confidence in the government's help when the company lost money.

Based on the research findings, the following improvements are recommended to enhance the current condition of risk management practices in the Somali region:

- Since most of the parties involved in construction projects did not have enough knowledge to practice risk management techniques, regular training on this subject needs to be given to the stakeholders.
- Technical, material, financial/economic, contractual, and managerial risk categories need to be given significant consideration since they are the most substantial risks in the SRS construction projects.

- Since there were no risk management experts in the area, establishing a specialized risk management team is highly recommended for the SRS construction projects.
- In dealing with risk-taking responsibility or risk allocation, relevant clauses defining the risks to the parties must be included in the construction contracts.
- Further research including case studies on the most influential risk types in the region is also recommended to strengthen the findings.

7. Conclusions

This study contributes to the body of knowledge on risk management in SRS construction. The results of the study will be helpful to a wide range of stakeholders in Ethiopia's construction industry. Findings from this study can help construction managers, engineers, architects, contractors, owners, designers, and local governments to better understand the risk factors influencing construction projects in the Somali region in the context of improving project performance. By considering the major risk factors, the risks in SRS construction projects can be minimized and more successful projects can be carried out.

The main limitation of this study is the relatively small sample size. This study's results represent the opinions of 55 participants. Future studies in the SRS involving more participants than this study can strengthen the findings. Although the sample size is limited, it is believed that the participants' experience profile has added quality to the study findings.

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