Risk Management in Building Construction Projects: Contractors and Consultants Perspectives

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Abstract

This investigation aims at identifying the major risk factors that contribute to the possible occurrence of risk on building construction projects in Addis Ababa. Participants of the study, located in Addis Ababa, were grade one contractors and consultants. To achieve its objective, a mixed method research design approach was deployed in this study. It also implemented descriptive research design for the purpose of describing situations and facts to the research questions. Questionnaire survey was conducted for collecting data from a simple random sample of 100 people. The collected data was analyzed through Statistical Package for Social Science / IBM SPSS 24/ and the results are presented through statistical tools such as frequency tables, graphs, and charts, etc. The research findings indicated that 5 critical risk factors were identified based on an assessment of their probability of occurrence on building construction projects. These were "high inflation rate", "delayed payment by client", "poor resource management", "risk of corruption", and "economic instability" that have influence on project objectives. Financial factor was the most significant risk category recognized by participants. Hence, the two most critical possible risks identified were time overrun and cost overrun. It was also indicated that for effective risk alleviation risk transfer and reduction measures were the major strategies recognized by participants. Further investigation of opinions from the study revealed that there was lack of knowledge of risk management which needs to be improved. It was concluded that consultants and contractors as well as other stakeholders need to work in tandem to improve the environment of risk management in building construction industry.

Key words: *Risk; Risk Management; Construction Projects; Building Construction; Risk Factors.*

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1. Introduction

Construction projects are introduced in complex and dynamic environments resulting in conditions of high uncertainty and risk, which are compounded by challenging time constraints and cost overruns. It is an industry predominantly originated by private developers, government, and other institutions and is susceptible to technical and business risks from initiation up to close out of projects (Jayasudha and Vidivelli, 2016). "Due to the fact that each construction project is unique and dynamic, the construction operation involves numerous uncertainties, multiple intricacies, various techniques and divergent environments" (Jarkas and Haupt, 2015: p.166). Iqbal, Choudhry, Holschemacher, Ali & Tamošaitienė (2015) stated construction projects from PMI (2004) in general are apparent to have more inherent risks due to participation of many contracting parties, such as clients, consultants, contractors, subcontractors, suppliers, etc. Wiguna and Scott (2005) also noted that risk plays a major portion in decision making to construction projects, and may affect the performance of a project. It may result in cost overruns, time overruns, and even poor quality of deliverables if they are not dealt with properly.

Thus, detecting and handling the possible risk factors, which can considerably differ from project to project accountable on numerous circumstances, plays a decisive role in improving the performance and achieving the effective and efficient supply of the deliverables. Researchers in several publications sort out and identify major risk factors, which may possibly occur in building construction projects and classifying in diverse collections based on their sources and magnitude of influences, as vital contributions to the industry. In their study "Risk Management in Construction Projects' ' Serpella, Ferrada, & Howarda (2014) addressed the problem by means of a knowledge based approach and through a system perspective. On the other hand, Iqbal et.al. (2015) conducted an investigation to identify the attitude of construction practitioners towards different types of risks and respective responsibility as well as the most effective methods in averting/alleviating various types of risks.

According to Yimam (2011) described that projects function in extremely unstable, irregular, ill-resourced and uncertain/risky situations resulting in unfinished, uncontrolled, and unfitted to the original plan or goal of projects and suggested methods of improving project management practices with particular reference to contractors for identified areas of problems. Also, in his

study, "construction contract risk management practices in Ethiopian building construction projects" Mesfin (2014) identified the level of use of construction contract risk management techniques in building projects and stated the importance of identifying risks and deploying risk mitigation methods related with various types of contracts and assigning them to different stakeholders participated in the project to make the project successful. The role of risk management in building construction projects is an important element that should be combined with all functioning and managerial processes of the building construction projects. "Risk management is a formal and orderly process of systematically identifying, analyzing, and responding to risks throughout the life-cycle of a project to obtain the optimum degree of risk elimination, mitigation and/or control" (Wang *et al.*, 2004, p.238).

Santoso *et al.* (2015, p.43) stated that "The construction industry is subject to more risk and uncertainty than many other industries". The progression of building construction is featured by many unanticipated situations and goes through many unexpected changes during implementation. Consequently, effective risk management has turned out to be a main problematic area that challenges the building construction sector. For instance, usually risk is used to be taken care of with extra finances and time without a detailed and wide range of study which is able to impact a specific project, and that most of the time it is undoubtedly inadequate to protect the magnitudes of risks that come about in the course of project implementation. At that moment, in the majority of the circumstances projects completed beyond budget and schedule (Serpella *et.al*, 2014). In view of stakeholders who took part in Ethiopian building construction projects, most projects are not finalized in accordance with the initial plan (Mesfin, 2014). The risks originated all the way through the period of a construction project might be reasons for deviations in project objectives if they are not handled properly. From empirical evidence, Yimam (2011) found out that the risk management maturity level of Ethiopian construction projects is very low. "The very low level of reported maturity for risk management and the low importance given to it (risk management is ranked to be less important than all the other knowledge areas except safety management and communication management). This may indicate the low level of awareness about the importance of risk management in the construction industry of the country. As developing countries are characterized by a very volatile and uncertain environment, management of risk should have been a logical priority" (Yimam, 2011, p.148).

The above mentioned cases proved that managing risk in the construction industry in Ethiopia, are in a very early stage and it focuses only on few aspects of the project management process. For instance, Mesfin (2014) "construction contract risk management practices in Ethiopian building construction projects"; Chemir (2018) "Project Risk Management Practices of Selected Chinese Building Contractors in Ethiopia", Yimam (2011) "Project Management Maturity in The Construction Industry of Developing Countries (The Case of Ethiopian Contractors)" are among others. It can be said that risk management practice in Ethiopian construction sector is not well- known and by and large not investigated appropriately. Therefore, this study attempted to identify the major risk factors that contribute to the possible occurrence of risk on building construction projects in Addis Ababa. The research questions are:

1. What are the major risk factors on building construction projects?
2. What are the possible risks that may occur on building construction projects?
3. What are the effective response strategies for the identified critical risks?

2. Literature Review

2.1 Theoretical Literature Review

Steyn and Nicholas (2017, p.366) argued that "project management is risk management" in that it complements and is "part of other project management practices such as requirements and work definition, scheduling, budgeting, configuration management, change control, and performance tracking control. With all of these, managers identify and assess the risks so they can proactively reduce them or plan for the consequences". The above-mentioned concept of Steyn and Nicholas (2017) complemented by other scholars is that "all project management is risk management"; the reason behind this notion is that risk is inherent in all knowledge areas of project management and it is the fundamental job of project manager. In addition, "all project activities can be constructed as managing risk, but the risk management process is a specific set of activities you will consciously perform to identify and manage risks on the project" (Verzuh, 2016, p.139).

Effectiveness of risk management and its contribution is influenced by the degree to which the identification process affects the overall project management of any particular project (Chapman, 2001. Thus, a logical

methodology needs to be engaged to manage risks all the way through the progress of a project. In order to classify risk, the meaning of a project risk must be defined. “Risk is an uncertainty that matters; it can affect project objectives negatively or positively. Chapman and Ward (2003, p.6) cited the definition of Risk from PMI as “an uncertain event or condition that, if it occurs, has a positive or negative effect on a project objective”. They also cited from APM (Association for Project Management) as “an uncertain event or set of circumstances that, should it occur, will have an effect on the achievements of projects objective”. Besides the diverse meanings of risk, there are several approaches for classifying risk for varied objectives as well. Some of the following are listed as follows: In view of Cooper et al. (2005, p.3) risk is classified as business risks, project risks, operations and processing risks. Business risks include all those risks that might impact on the viability of the enterprise, including market, industry, technology, economic and financial factors, government and political influences. Project risk includes all those risks that might impact on the cost, schedule or quality of the project. Operational and processing risks include all those risks that might impact on the design, procurement, construction, commissioning, operations and maintenance activities, including major hazards and catastrophic events. According to Jayasudha & Vidivelli (2016) risks are either acceptable or unacceptable. An acceptable risk is one that negatively affects a task on the non-critical path. An unacceptable risk is one that negatively affects the critical path. Risks are either short or long term.

Managing risk is a central component of proper project management and vital to obtaining appropriate business and project results and the effective procurement of goods and services (Cooper et.al, 2005, p.2). Risk management is the method of classifying, evaluating, ranking diverse categories of risks, planning risk alleviation, employing alleviation strategy, and monitoring the risks. It is a step towards achieving the goal of thinking analytically about the probable risks, complications, or calamities earlier they occur and planning the method that will evade the risk, or decrease the influence, or deal with the effect (Rumane, 2018). In their research Smith, Merna, & Jobling (2006, p.2) revealed that risk management as “one of the most creative tasks of project management” and consist of four steps that are “to identify the risk sources, to quantify their effects (risk assessment and analysis), to develop management responses to risk and finally to provide for residual risk in the project estimates". “The language of project risk management explains this

phenomenon: Known unknowns represent identified potential problems, and unknown unknowns are the problems that arrive unexpectedly" (Verzuh, 2016, p.138). Project management body of knowledge defined project risk management as:

> *Project Risk Management includes the processes of conducting risk management planning, identification, analysis, response planning, response implementation, and monitoring risk on a project. The objectives of project risk management are to increase the probability and/or impact of positive risks and to decrease the probability and/or impact of negative risks, in order to optimize the chances of project success (PMBOK Guide 2017, p.395).*

According to Cooper *et al.* (2005) and Zavadskas *et al.* (2010) better business and project outcomes are facilitated by risk management. It ensures this by allowing understanding, awareness and assurance for improved judgment-creating. This results in better confidence and a decrease in overall risk response. Furthermore, risk management in a project according to Jayasudha and Vidivelli (2016) incorporates categorizing impacting aspects that might possibly undesirably influence a project's budget, timetable or standard starting position; measuring the related likely influence of the recognized risk; and carrying out processes to handle and alleviate the possible effect. Banaitiene and Banaitis (2012, p.443) claims that "Risk management in the construction project management context is a comprehensive and systematic way of identifying, analyzing and responding to risks to achieve the project objectives"). Therefore, by means of risk management, one can perform to enhance the likelihood and influence of chances on the project (constructive happenings), whereas reducing the likelihood and influence to cause damage to the project (destructive happenings) and this is the central reason for accomplishing risk management. Moreover, risk management delivers an outline that prevents unexpected events from happening and validates careful risk minimizing and alleviation procedures (Cooper *et al.*, 2005; Worku Asratie Wubet *et al.*, 2021).

Risk management process is planned to decrease or remove the risk of some categories of activities taking place or having an influence on the project (Osei-Asibey *et al.*, 2021; Rumane, 2018). Risk management processes of construction projects describe the work of all project life cycles. Project management body of knowledge described risk management processes, "plan risk management, perform qualitative risk analysis, perform quantitative risk analysis, plan risk responses, implement risk responses, and monitor risks"

(PMBOK Guide 2017, p.395). In view of Risk Management Task Group (2012) all methods to project risk management attempt to exhaust the possibilities of effectiveness and efficiency. Risk management has three important parts: identification, analysis, and action, even if the particulars of risk processes might vary contingent on the project.

Risk management process emphases on the requirements and the main concern of the customer and comprises approaches, systems and instruments particularly established for this goal. The procedure is frequently led by a risk chief or expert who is in charge of forming a system for digging out data from project main staff by means of risk identification and assessment (Smith *et al.*, 2006; Olcay Genc, 2021; Alvand *et al.*, 2021). The process is repetitive with circles in return to preceding phases that acquire confirmation and project group control. One of the very significant aspects in the risk management process is the assembly of crucial staff with a single aim only; to talk over, evaluate and if possible measure the risks that might influence the project's goals. According to Cooper et.al, (2005), the risk management process involves the systematic application of management policies, processes, and procedures to the tasks of establishing the context, identifying, and analyzing, assessing, treating, monitoring, and communicating risk and applies across all phases of the project. However, with particular reference in building construction sector, in view of Wang *et al.* (2004) risk management is a structured methodology that comprises of three central phases: a) risk identification; b) risk analysis and evaluation; and c) risk response. The risk management process instigates with the primary identification of the significant and prospective risks accompanying with the building project. It is of extensive significance as the progression of risk investigation and response management could only be accomplished on recognized prospective risks (Ezzeddine *et al.*, 2021).

Szymanski (2017, pp.176-177) classified risks into five major categories in a building project: "Preliminary design, tender, detailed design, construction works, and financing the investment". Santoso et.al. (2003) classified risks into nine groups: physical risk, personal risk, technical risk, safety-accident risk, construction design cause risk, political and regulation risk, financial risk, contractual risk, environmental regulations cause risk. Each personal risk and technical risk is divided into six sub-groups; i.e.; technical and labor, sub-contractor, staff/foreman, engineer, consultant, client; and material, equipment,

technique, construction process, construction site, and ground condition respectively. The outcomes indicated very evidently that the managerial and design factor is the main and most important problem in high rise construction projects both in terms of rate of incidence and magnitude of risk influence.

2.2 Empirical Literature Review

In their study, "Major Construction Risk Factors Considered by General Contractors in Qatar" Jarkas and Haupt (2015) conducted a structured questionnaire survey of 95 samples out of the total population of 126 participants, to classify, discover, rank the relative importance and determine the dominant distribution response tendencies of the most important construction risk factors taken into account by general contractors functioning in the State of Qatar. They further explained how critical it is to conduct a study to analytically identify, categorize and assess the possible risk factors which can undesirably influence the performance of projects although the sensibility to assess the possible positive risk factors to improve the effectiveness boundaries of construction deals. Moreover, Wiguna and Scot (2005) in their research "Nature of The Critical Risk Factors Affecting Project Performance in Indonesian Building Contracts", studied to conclude the risk factors initiating time and cost overruns in Indonesian building projects. To assess risk levels in terms of time and cost the study was mainly founded on interviews with project managers by means of a structured questionnaire. Twenty-two building projects were surveyed. The result found out the subsequent as most critical: high inflation of prices; defective design; design change by owner; delayed payments on contract; inclement weather; unforeseen site ground condition; poor cost control; defective construction work; delay in providing detail drawings; and problems with availability of labor, material and equipment. It also revealed the critical risks affecting both project time and cost apparent by the building contractors were related. In order to manage various risks and to effectively identify the vital ones, for overseas construction projects, "Risk management for overseas construction projects" were studied (Zhi, 1995). This was a case study conducted in northern China between a foreign company and a local government based company that agreed up on joint venture development. To identify the potential market and development risk, a survey was conducted.

"An Assessment of Risk Identification in Large Construction Projects" studied focusing on risk identification in Iran (Tadayon *et al.*, 2012). A questionnaire

survey from participants in large construction projects was conducted. In the study, government, consultants and contractors participated. The outcome of the study exposed that the most significant types of risk in construction projects are financial risks, construction risks, demand or product risks, and political risks were ranked from one up to fourth hierarchically (Tadayon *et al.*, 2012). Furthermore, Jayasudha & Vidivelli (2016) "Analysis of Major Risks in Construction Projects" examined the empirical Indian construction industry survey of two hundred companies on the awareness of professionals (Project Managers, Engineers, Site Engineer, Architect, Contractors, Sub-Contractors), who are observed as the major participants in the construction sector, whether they are using planning tools and techniques as a major tool for effective project implementation or not. The study disclosed that ranking of risk factors technical risk, time risk, construction risk, design risk, and legal risk were the most significant factors respectively. There was also low awareness on the application of practice of construction planning tools and ran and recommended that the use of the construction planning tools and techniques should be applied in all building projects and there should be regular adequate training of professionals on the effectiveness and improvement in Information Technology in the construction industry especially in project planning and execution.

Identification and Assessment of Risk Factors Affecting Construction Projects were studied by Rauzana (2016) to the implementation of construction projects in North Aceh, Indonesia. The empirical study was aimed to identify risk factors that influence the construction project and determine the most dominant risk factors that affect the performance of the project. Structured questionnaire survey was used on 47 companies. The outcome of the study revealed that material resource management was the most influential risk factor preceding the equipment and financial factors respectively. In addition, Odeyinka *et al.* (2006) in their study, examined "Assessing Risk Impacts on Construction Cost". Checklist of risk factor and questionnaire survey were used to carry out investigation in order to determine their relative importance. Construction practitioners in contracting organizations, consultancy firms and government organizations were among the participants. The survey result showed that the major risk factors inherent in construction were financial, political, physical, and construction respectively that have impact on construction cost.

Also in the study "Identification and assessment of risk factors affecting construction projects" to identify and assess risk factors during the construction phase of construction projects in the Gulf region focusing on two countries of the Gulf region – the State of Kuwait and Kingdom of Bahrain (Altoryman, 2014). Interview and questionnaire surveys were deployed in the study to contractors, consultants, and clients. The study showed that the perception of the risk factors on the categories level, both countries agreed on the finance category as the main factor threatening project completion. "An Evaluation of Risk Factors Impacting Construction Projects in Ghana" Chileshe (2012) studied the probability of occurrence and degree of impact of the risk factors on construction projects within the Ghanaian construction industry. Sample survey of randomly nominated respondents of 34 contractors, 46 consultants, and 23 clients or owners was participated. In their study, the result showed that there is inequality of the ranking of the degree of occurrence and impact in the midst of the participants. However, the results indicated that there was whole agreement between the three participants concerning the ranking of the financial risk factor of "delay in payment" comparative to the degree of risk impact. The result also revealed that "inflation" and "financial failure" were the second and third most ranked factors having an impact on project objectives. One of the main objectives of the construction industry policy is to improve the capacity and competitiveness of the local construction enterprises (contractors, consultants and informal sectors) (Ibid).

According to the report of the Construction Industry in Ethiopia (2018) the Ethiopian construction industry is characterized by a large number of micro-entrepreneurs, the majority of whom operate in the country's informal economy. Ethiopia's formal construction sector comprises endogenous and indigenized firms, as well as numerous foreign civil engineering and construction companies. Public and private expenditure on infrastructure and other construction works has served as a catalyst for Ethiopia's rapid economic development. The country has consistently invested more than 30% of GDP into Gross Fixed Capital Formation (GFCF) expenditure since 2010 (Ibid). Based on the Ministry of Urban Development and Construction (MUDC) construction industry policy (First Draft) July (2012) the percentage share of the construction sector to GDP at constant price has increased from 4.5% in 2000/01 to 5.8% by 2009/10. Similarly, the market value of the construction sector is currently estimated at more than US$7bn. According to the 2017 edition of African Economic Outlook report, construction activities in Ethiopia

accounted for 15.9% of GDP at current prices during the 2015/16 fiscal year. Regardless of this economic impact, project risk management practice maturity of the construction sector apparently seems to be at its very early stage. A small number of studies that were conducted displayed that risk management practices in Ethiopian construction projects are in general insufficient. For instance, in his study result, with a specific preference of Ethiopian contractors, Yimam (2011) indicated that generally the maturity of the development aspect of construction project management is identified at the causal development maturity stage. It is also described that risk and safety management are the least matured among project management knowledge areas. Essentially it can be reflected that these two knowledge areas are completely unfamiliar or experienced rarely in the construction sector. Based on the outcome of an empirical evidence of the study, about 2/3 of the contractors don't have risk management practice. Nearly 24% of contractors practiced risk management poorly.

3. Research Methods

The study used both primary and secondary sources of data. The primary sources of data were survey questionnaires. The researcher collected the primary data from contractors and consultants. Furthermore, published or unpublished particularly survey based secondary data that have already been collected and analyzed by other scholars or government institutions/ building construction policies, regulations, and reports, etc., were used in this study. This helped compliment on the primary data in order to answer the research question and attain the research objective. In this study, the populations involved are two types of participants. These were building contractors and design consultants who are the major operators in the construction industry located in Addis Ababa. It included grade one contractors (BC-1) (highest grade contractors) and Consultants (CAE-1) (highest level consultants) which are engaged in the construction industry. The reason why those participants were selected was in consideration of the fact that they have better financial, material, and human resources (professionals/ expertise, knowledge, and practice) than others. They usually design and carry out large building construction projects compared to the other lower grades of contractors and consultants.

Sample surveys of contractors and consultants were implemented in the study. "A sample design is a definite plan determined before any data are actually

collected for obtaining a sample from a given population" (Kothari, 2004, p.14). This assisted to determine the corresponding value of the population, with less cost and time. Therefore, the sampling frame of this research included a list of all contracting companies (69) and consulting firms (59) located in Addis Ababa. These firms are registered by MoWUD (Ministry of Works Urban Development) and by Addis Ababa City Construction Bureau respectively which functioned actively in license renewal of the year 2018/2019 (2011 E.C.). From the sampling frame sample size was determined by using Yamane formula:

$$n = N / (1 + Ne^2)$$

Where,

n= sample size

N= known population size

e= error level (5%)

Thus, the sample size for contractors and for consultants are 59 and 51 respectively.

Therefore, from the above result, the sample size for contractors was 59 and consultants were 51, which constituted a total of 110 samples. Simple random sampling was used since there was an accurate and easily accessible sampling frame that listed the target population of both contractors and consultants. In addition, due to the homogeneous nature of both building contractors and consulting firm's samples were selected using simple random sampling techniques. In this study, a questionnaire was, used in order to collect data from the sample and to describe or explain their knowledge, attitudes, and behavior on the major risk factors that contribute to the possible occurrence of risks. The questionnaire was divided into three main parts having a total of 64 questions. Part I solicited general (factual) information about respondents. Part II consisted of a total of 50 risk factors (attitude and opinion variables). These risk factors were categorized into five major groups. Ten risks were associated with preliminary and detailed design, six to tender, twenty to construction works, nine to finance and economic, and five associated to political and legal aspects. Respondents were requested to rate the probability of occurrence of these risk factors, possible risks and response strategies as Very Infrequent (VI), Infrequent (I), Neutral (N), Frequent (F), and Very Frequent (VF) respectively.

Part III included 2 open ended questions that asked respondents to state their opinion and challenges encountered about risk management briefly.

Table 1: Reliability Statistics of Respondents

Reliability Statistics	
Cronbach's Alpha	Number of Items
0.933	58

Source: Own Survey (2019)

In addition, reliability analysis (Cronbach's alpha) was conducted by Statistical Package for the Social Science /IBM SPSS Statistics 24/ software for all the valid samples to measure the internal consistency across the raters. The alpha coefficient ranges in value from 0 to 1, and used to describe reliability of factors extracted from ordinal rating scale questionnaires Jarkas & Haupt (2015).Therefore, the internal consistency of, 50 risk factors, 4 possible risks, and 4 response strategies which constitute a total of 58 variables of Likert Scale questions were verified by calculating "Cronbach's alpha" from the valid responses. The higher the alpha coefficient score, the more reliable the generated scale is. A value of 0.700 is an acceptable coefficient (Ibid). The result showed an alpha coefficient value of 0.933 very close to 1 that confirmed the reliability measures applied. Also "Relative Importance Index" (RII) method was applied to measure the response related to the rating and importance level of each variable based on the mean scores identified. This method was used to generate scores of the variables which were used to analyze and to find the hierarchical risk factors and measure the level of importance (significance) of each factor based on a five-point Likert scale Akadiri (2011). The RII value ranges from 0 (not inclusive) to 1, low ($0<RII\leq0.2$), medium-low ($0.2<RII\leq0.4$), medium ($0.4<RII\leq0.6$), high medium ($0.6<RII\leq 0.8$), and high level ($0.8< RII<1$). The RII was computed by the formula shown in equation below.

$$\textbf{RII} = \frac{5(n5) + 4(n4) + 3(n3) + 2(n2) + n1}{5(n1+n2+n3+n4+n5)}$$

Where n1, n2, n3, n4, and n5 are the number of respondents who selected 1, for Very Infrequent (VI), 2, for Infrequent (I), 3, for Neutral (N) 4, for Frequent (F), & 5, for Very Frequent (VF) correspondingly. Furthermore, content analysis was implemented which was the most common method of doing by code of written answers on an open-ended question (Dawson, 2009)? First the written answers were thoroughly looked through and grouped into possible categories that have different themes. Then each theme was given a code and assigned to each one of the responses. Common themes were identified from the number of responses that were applied. Afterwards their corresponding frequency count and percentage of response were calculated.

4. Results and Discussions

The perception of 50 risk factors considered by consultants and contractors were determined. The Relative Importance Indices (RII), ranks, and importance level of the factors surveyed were presented and discussed. Table 2 Illustrates the overall insight of respondents Mean, RII, Rank, Importance Level, and Occurrences for each risk factor.

Table 2: Descriptive Statistics & RII of Risk Factors with Frequency & Importance Level

Risk Factors	Mean	RII	Rank	Importance Level	Occurrences
High inflation rate	4.25	0.85	1	High	Frequent
Delayed payment by client	4.18	0.84	2	High	Frequent
Poor resource management	4.11	0.82	3	High	Frequent
Risk of corruption	4.01	0.80	4	High	Frequent
Economic instability	4.00	0.80	5	High	Frequent
Improper cost plan	3.98	0.80	6	High-Medium	Frequent
Design change by the client	3.95	0.79	7	High-Medium	Frequent
Financial failure of contractor	3.89	0.78	8	High-Medium	Frequent
Low labor and equipment productivity	3.88	0.78	9	High-Medium	Frequent
Unrealistic construction schedule	3.87	0.77	10	High-Medium	Frequent
Poor cost control	3.85	0.77	11	High-Medium	Frequent
Poor organization of work	3.83	0.77	12	High-Medium	Frequent

Poor construction materials quality	3.78	0.76	13	High-Medium	Frequent
Inadequate program	3.76	0.75	14	High-Medium	Frequent
Lack of competent & qualified Professionals	3.75	0.75	15	High-Medium	Frequent
Using predatory pricing by competitors	3.72	0.74	16	High-Medium	Frequent
Delays in solving contractual issues	3.72	0.74	17	High-Medium	Frequent
Poor employees' work performance	3.68	0.74	18	High-Medium	Frequent
Insufficient control of work	3.68	0.74	19	High-Medium	Frequent
Quoting bad estimation for the project	3.68	0.74	20	High-Medium	Frequent
Weak law compliance & enforcement	3.67	0.73	21	High-Medium	Frequent
Delays in material and shop drawing Approval	3.66	0.73	22	High-Medium	Frequent
High interest rate	3.64	0.73	23	High-Medium	Frequent
Underestimating the costs of the project	3.63	0.73	24	High-Medium	Frequent
Inadequate & ambiguous specification	3.59	0.72	25	High-Medium	Frequent
Lack of clients managerial capability	3.59	0.72	26	High-Medium	Frequent
Lack of skilled/unskilled labor	3.59	0.72	27	High-Medium	Frequent
Poor communication & coordination among staff	3.57	0.71	28	High-Medium	Frequent
Difficulty in obtaining permits and Ordinances	3.56	0.71	29	High-Medium	Frequent
Delays in approval of payment certificate by the consultant	3.55	0.71	30	High-Medium	Frequent
Political instability	3.53	0.71	31	High-Medium	Neutral
Extending scope of work	3.52	0.70	32	High-Medium	Neutral
High employee turnover	3.48	0.70	33	High-Medium	Neutral
Defective construction work	3.46	0.69	34	High-Medium	Neutral
Inappropriate change order by client	3.34	0.67	35	High-Medium	Neutral
Recession in the industry	3.33	0.67	36	High-Medium	Neutral
Risk of tender cancellation,	3.33	0.67	37	High-Medium	Neutral

Unforeseen site ground condition	3.31	0.66	38	High-Medium	Neutral
Poorly recognized competition	3.29	0.66	39	High-Medium	Neutral
Awarding design to unqualified design Consultant	3.28	0.66	40	High-Medium	Neutral
Producing defective design	3.27	0.65	41	High-Medium	Neutral
Employees' absence at work place	3.19	0.64	42	High-Medium	Neutral
Improper technology selection	3.18	0.64	43	High-Medium	Neutral
Improper design team selection	3.18	0.64	44	High-Medium	Neutral
Poorly recognized preferences of the Clients	3.15	0.63	45	High-Medium	Neutral
Accidents and injuries on project sites	3.13	0.63	46	High-Medium	Neutral
Burglary on site	3.04	0.61	47	High-Medium	Neutral
Changes in legislative regulations Contrarily	3.03	0.61	48	High-Medium	Neutral
Overestimating the costs of the project	2.69	0.54	49	Medium	Neutral
High project complexity	2.64	0.53	50	Medium	Neutral

Note: low ($0<RII\leq0.2$), medium-low ($0.2<RII\leq0.4$), medium ($0.4<RII\leq0.6$), high-medium ($0.6<RII\leq 0.8$), & high ($0.8< RII<1$)

Source: Own Survey (2019)

As indicated in Table 2 the examined risk factors result from the overall insight of respondents displayed that "high inflation rate", "delayed payment by client", "poor resource management", "risk of corruption", "economic instability", "improper cost plan", "design change by the client", "financial failure of contractor", "low labor and equipment productivity" and "unrealistic construction schedule" were the 10 major risk factors identified according to their hierarchy. Nevertheless, in this study those risk factors with high levels of importance and frequent probability of occurrence were discussed. These were the first 5 risk factors associated with financial and economic, tender, and construction work categories. "High inflation rate", with an RII of 0.850, was perceived and ranked overall as the first building construction projects risk factor measured by both consultants and contractors who were active in Addis Ababa (Table 2). However, both ranked it as the second risk factor

independently. The outcomes achieved from the study were in alignment with the findings of Wiguna and Scot 2005)and (Zhi, 1995) whose research studies have determined this factor among the most critical factors affecting both project time and cost in Indonesian building contracts and Chinese project developments respectively. However, with a little difference, Chileshe (2012), and Banaitiene and Banaitis (2012) in their study revealed that inflation was the second most ranked risk factor that had an impact on construction project objectives in the Ghanaian and Lithuanian construction company respectively. Hence, projects' high cost overrun and time overrun might be inevitable. "Delayed payment by a client" with an RII value of 0.836, was observed by participants as the second major critical risk factor among the factors examined (Table 2). This factor was also ranked first by contractors and sixth by the consultants as per their belief. The result was also in agreement with the results by Jarkas & Haupt (2015).but, it is not in line with some previous research (Iqbal et.al, 2015; Wiguna & Sco, 2005). With an overall RRI of 0.822, "poor resource management" was ranked as the third major critical risk factor equally both by consultants and contractors (Table 2). However, the result displayed a difference with Rauzana (2016) who ranked resource management as the most significant risk factor that has an effect on project objectives. The study also ranked "risk of corruption" as the fourth critical risk factor with similar perception of consultants and contractors with an overall RRI value of 0.802 on building construction projects (Table 2). This result is in agreement with (Zhi, 1995) that studied risk management on overseas construction projects in China and found out the risk of corruption ranked in fourth. As risk of corruption was under the category of tender, problems of corruption might be associated with this composite factor.

The potential causes might be being unethical in the profession, preparation of incomplete design and inadequate bill of quantity and specifications before contracting or tendering stage might be among others. This might again lead to excess in quantity and price escalation for the new item of work after the project might have been commenced. As a result, the project quality might be compromised, and the project might not be completed on time and cost more than the planned. The fifth ranked risk variable in this study, perceived by the respondents, with 0.801 RIII overall value was "economic instability" (Table 2). This factor was ranked third by contractors, whereas, consultants contrarily ranked it eleventh. The possible reason for the outcome of this factor might be unstable economic policy, unstable political situation, higher rate of

unemployment, government debt crisis; volatile inflation rate, change in interest rates, global factors like price of oil etc. could be some of them.

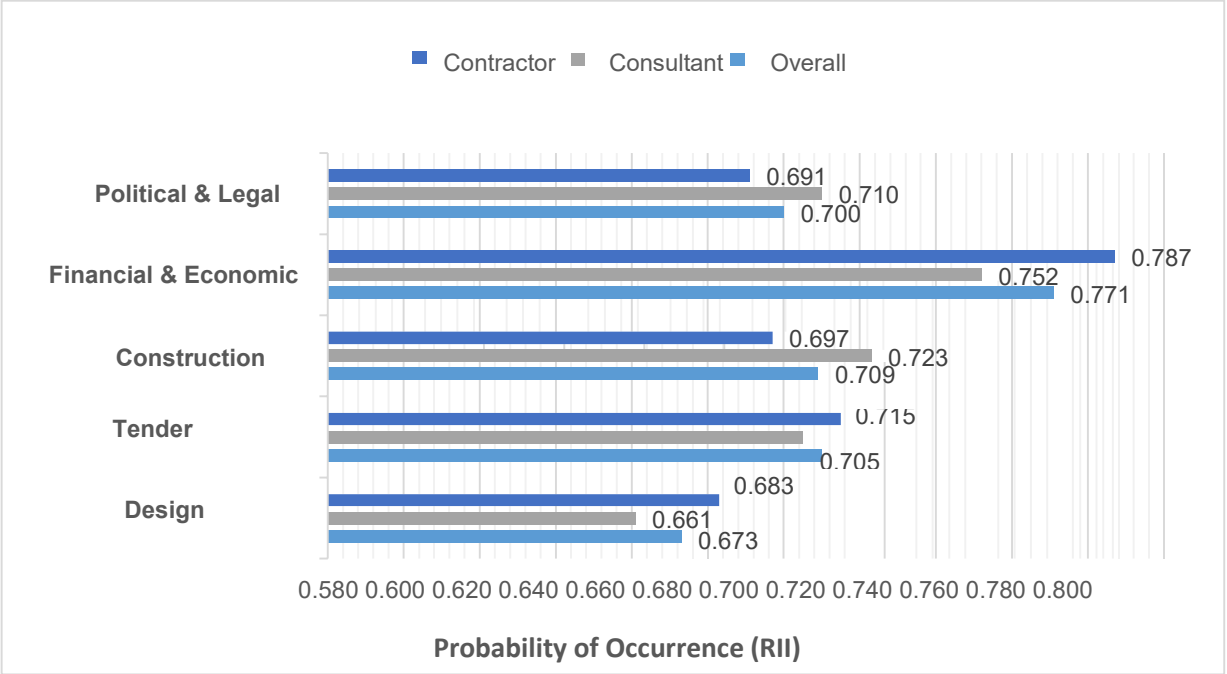


Figure 1: Probability of occurrence (RII) of composite risk factors by participants

The study result indicated in Figure 1 that there was a complete agreement up on their perception between the participants to the financial and economic composite risk factor. Both consultants and contractors ranked it first, with an overall RII value of 0.771. This factor occurred frequently with high-medium importance level. The outcome was in agreement with the findings of Iqbal et.al. (2015), Odeyinka *et al.* (2006) and Altoryman (2014) which revealed that financial issues for projects was the most significant risk factor affecting most of the construction projects in Pakistan, Nigeria, Kuwait and Bahrain respectively. Furthermore, this composite risk factor was also consistent with the results of (Hlaing, 2016) and (Tadayon *et al.*, 2012) that discovered the financial aspect of the project was considered most important by construction contractors in Singapore and Iran respectively. Due to the fact that out of the five major risk factors identified, i.e., "high inflation rate", "delayed payment by the client", and "economic instability" were under financial and economic risk categories ranked first, second, and fifth respectively. The potential cause

for the outcome could be the accumulation effects of components of this composite risk factor.

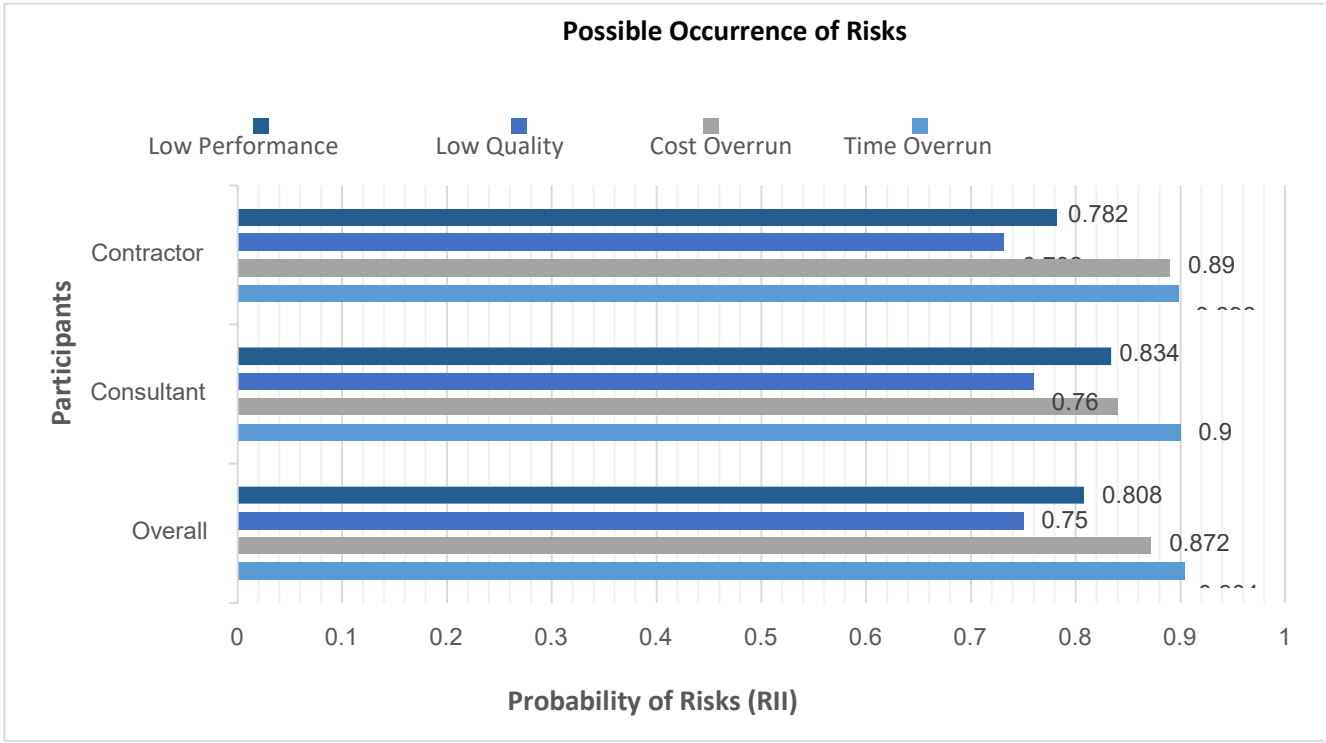
The second ranked composite risk factor, as indicated in Figure 1 was tender with an RII value of 0.710. The study exposed frequent probability of occurrence with high-medium level of importance to this factor. Contrary to perception of the financial and economic risk factor, tender was observed differently by consultants and ranked fourth. The possible reason for the result of this risk category might be ethical issues and integrity related to institutions/clients/ in tender preparation, bidders, and other stakeholders participated in the process. In addition, offering a very low price that might not be appropriate and sufficient to execute projects, just for the sake of winning/securing/ and owning works only, could be one of the reasons. Likewise, inappropriate bidding criteria that might be set by the client or consultant that could favor/accommodate/ certain groups of bidders only, might be another reason. Oftentimes, there were tendering committees, particularly in government institutions. They might not have the knowledge and skill to perform the task and sometimes might not be familiar with the public procurement directives. They might consider it as an extra duty and don't give much attention and time. As a result, they could make mistakes in the process and delays and controversies could arise that might take longer time to correct, to the extent of canceling the tender. Therefore, the overall effect of the tendering process at the end might bring huge implications on project cost and schedule. The third category risk factor with a slight difference to tender, with an overall RII value of 0.709, was construction works (Figure 1). However, consultants ranked it fourth. The study uncovered this factor, frequent probability of occurrence with high-medium level of importance as perceived by respondents. The study result was in alignment with Jayasudha & Vidivelli (2016) who ranked construction risk as the third most important factor. The results have shown a difference with (Tadayon *et al*, 2012) and Odeyinka *et al.* (2006) findings that construction risk was the second and fourth most critical risk category respectively.

Construction projects by their nature would be unique and risks might have risen from a number of sources. If those risks were not managed properly throughout the life cycle of the project it would have an impact on the project's performance, in terms of quality, time and cost. The fourth was political and legal factors, with an RRI value of 0.700, consultants, though, ranked it third

(Figure 1). As observed by participants, the study exposed neutral probability of occurrence with high-medium level of importance to this variable. This result is consistent with the findings of (Tadayon *et al.*, 2012) that discovered the political and legal aspect of the project was ranked the fourth important factor by participants in Iran. However, the result exposed dissimilarity with that of Odeyinka *et al.* (2006) and Jayasudha & Vidivelli (2016) who ranked it as the second and fifth most important risk category respectively.

The expected cause for this factor might be political instability, weak law enforcement, conflict and violence, contract risk, dispute risk, and regulatory risks could be some of the components. In these situations it might not be possible to get the necessary resources in order to implement projects. The inclusive effects of these possible causes of risk factors could create civil unrest and instability among the society. Business relationships and reputation might be damaged, and might cost the construction industry operator much time and valuable resources. The fifth was preliminary & detail design, equally ranked by both consultants and contractors, with a 0.673 RII value (Figure 1). The study exposed neutral probability of occurrence with high- medium level of importance to this risk factor from observant. The findings of the study have showed a difference with the outcome of (Santoso et.al. 2003), (Altoryman, 2014), (Karim, 2012), and Jayasudha & Vidivelli (2016) which displayed risks associated to design factor were the first, second, third, and fourth most important factors respectively both in terms of occurrence and degree of impact.

This study identified, “high inflation rate”, “delayed payment by client”, “poor resource management”, “risk of corruption”, and “economic instability”, as the major risk factors (Table 2). Similarly, among the category risk factors, in descending order, the financial and economic, tender, construction works, and political and legal factors were the most significant factors identified with an overall RII value $\geq$ 0.700. All the categorical and sub-categorical risk factors contributed to the possible occurrence of risks that could have an effect on project objectives in terms of time, cost, performance, and quality on building construction projects in Addis Ababa.

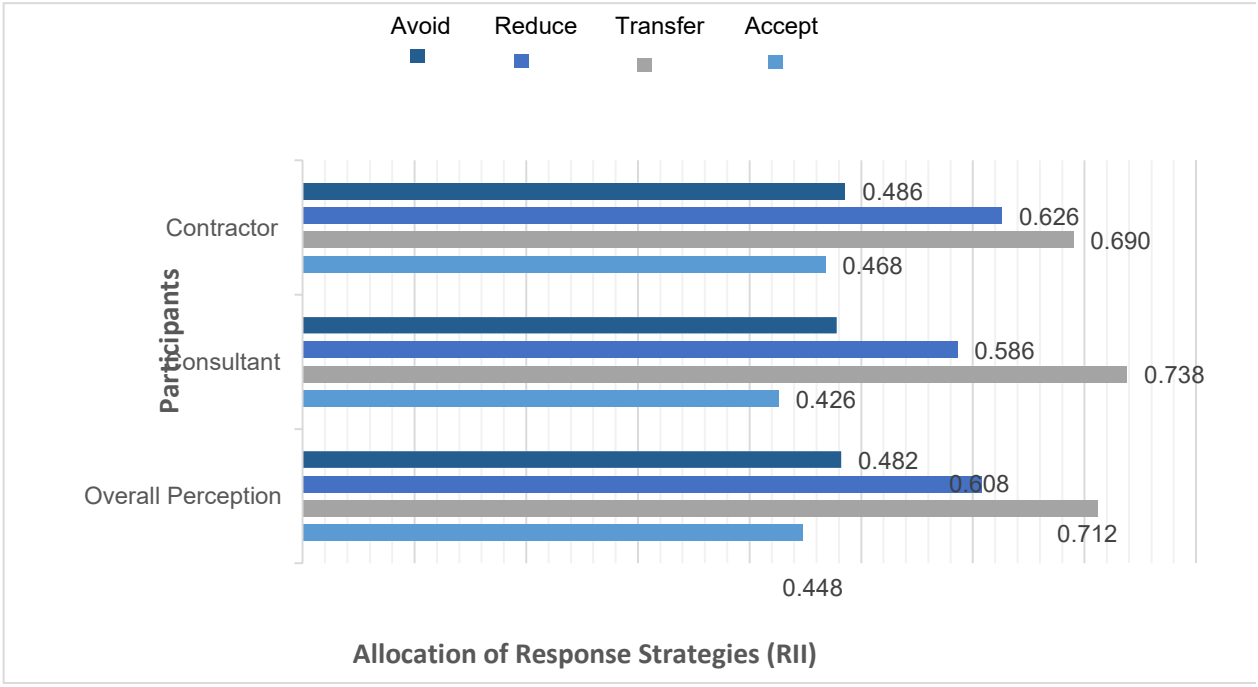


Note: low (0<RII≤0.2), medium-low (0.2<RII≤0.4), medium (0.4<RII ≤0.6), high-medium (0.6 <RII≤ 0.8), & high (0.8< RII<1)

Figure 2: Probability of Occurrence of Possible Risks by Participants

As indicated in Figure 2 there was a complete agreement among the participant's perception for the occurrence of all possible risks. The study discovered frequent probability of occurrence for all possible risks, high importance level for the first and second risks, and high- medium level of importance to the third and fourth risks respectively. Time overrun (RII, 0.904), cost overrun (RII, 0.872), low performance (RII, 0.808), and low quality (RII, 0.75) were rated from first to fourth correspondingly. The high level importance risk findings were in alignment with the results of Serpella *et al.* (2014), Hlaing (2016), Wiguna & Scott (2005), Chapman (2001), and Jayasudha and Vidivelli, (2016) etc., that revealed in majority of the situations projects completed beyond schedule and budget. The allocation and preference of appropriate strategies by respondents to the overall risks to attain project success was presented. In this study, similar to occurrence of risks, the overall perception of risk response strategies by respondents were in complete

agreement as indicated on Figure 3. It was preferred in the order of transfer (RII, 0.712), reduce (RII, 0.608), avoid (RII, 0.482), and accept (RII, 0.448).



Note: low (0<RII≤0.2), medium-low (0.2<RII≤0.4), medium (0.4<RII ≤0.6), high-medium (0.6 <RII≤ 0.8), & high (0.8< RII<1)

Figure 3: Preferences of Risk Response Strategies by Participants

The first and second strategies were rated with high-medium importance level, whereas the third and forth with medium importance level. Their frequency of occurrence was found to be frequent, for the first, neutral for the second; and infrequent, for third and fourth correspondingly. Risk transfer is shifting risk from one party to another through the form of insurance, sub-contracting, or involving other parties and sharing the risk and other methods could be the possible reason for this strategy. The result, risk transfer, both by consultants and contractors being the most significant strategy might be due to the risk averse nature of the respondents could be the other reason. This finding was in alignment with the result of (Haupt, 2015) which indicated that the “transfer” option is the contractors’ predominant response to “client” and “consultant "-related risks. However, Hlaing (2016) in his study, ranked risk transfer as the second strategy.

The second strategy in this study was risk reduction. Conversely, Hlaing (2016) in his study also ranked it first. Whereas, risk avoidance and acceptance/retention/ were ranked by his study third and fourth which was in alignment with this study. The likely reason for this strategy could be reducing unexpected events, saves time, cost, effort, greater productivity, improved success and guides decision making might be among others. To implement response strategies and procedures risk management should be common knowledge to both consultants and contractors. Other stakeholders should also have this knowledge that played an important role on building construction projects in Addis Ababa. It includes, systematically identifying risks, analyzing and responding to risks to achieve project objectives. Consequently, participants might have got experience and practice for the purpose of planning activities that reduce the probability of occurring risks and mitigate the impacts of risks that might occur throughout all phases of the project. This in return, could enable the project to be successful.

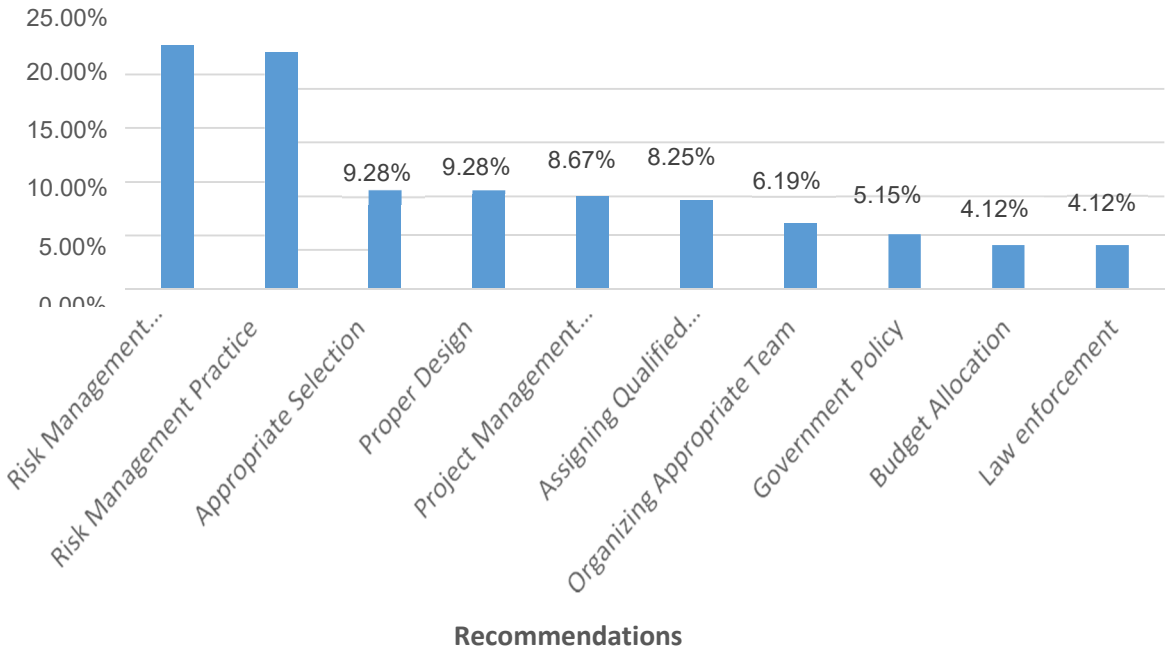


Figure 4: Respondents'' Recommendation for Improved

The first question asked was to suggest or compliment respondents' opinions about risk management associated with building construction projects in Addis Ababa. From the total response 22.68% suggested that the major operators in the industry should have knowledge of risk management as indicated on Figure 4. This could be done through workshops, training and continued development of professionals through formal education in order to build the capacity of stakeholders. Hence, from the participants' point of view creating awareness on risk management was the most significant component for the appropriate implementations of projects to achieve objectives. The second almost equivalently ranked recommendation was practicing the knowledge (22.06%) of risk management accordingly. In view of respondents, this was a valuable suggestion given that acquiring risk management knowledge is very important, but without exercising, it doesn't make projects successful alone. Because most of the construction works were performed in the traditional way with very less output consuming much time and cost.

The third most important recommendations given by participants were appropriate selection of implementers and proper design with an equal percentage of 9.28%. There should be a clear guide line or selecting criteria for both contractors and consultants based on their performance, competence, experience, capacity and organizational merits. The bidding process should be appropriate and transparent in order to select qualified contractors and consultants. The other important factor was preparation of proper, complete and detailed design including working drawings and with its respective bill of quantity and specifications. According to participants, project management knowledge and practice (8.67%) in terms of planning, organizing, executing, monitoring and evaluation was the fourth aspect which needs to be considered. Assigning qualified professionals (8.25%), organizing appropriate teams (6.19%) for identifying risk factors, analyzing and allocation of strategies were the fifth and six aspects of recommendation in managing risk respectively. Government policy (5.15%) in reducing the price escalation/inflation/ of construction materials was one of the characteristics given attention by respondents. Respondents also suggested that clients should secure and allocate enough budgets (4.12%) for their projects before commencing. Lastly, regulatory and law enforcement mechanisms (4.12%) should be deployed by the respective implementing body.

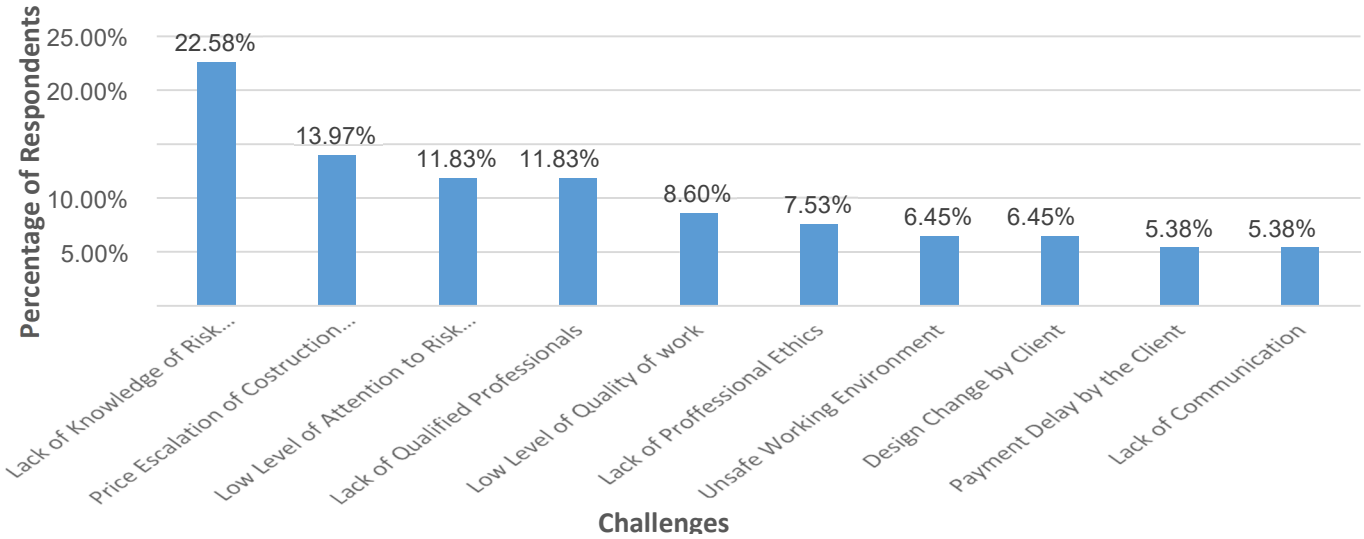


Figure 5: Challenges Encountered by Participants in Managing Risk

The second question asked was respondents' opinion about the challenges they faced in managing risk associated with building construction projects in Addis Ababa. From the total valuable response, as indicated on Figure 5 the most significant challenge faced was lack of knowledge of risk management (22.58%) by consultants and contractors. This could be the reason why in the above discussion the most important recommendation given by the respondents was to create awareness and knowledge of risk management in the building construction projects. This challenge faced by participants was in agreement with the findings of Yimam (2011), Mesfin (2014), and Chemir (2018) who stated that risk is the least matured among project management knowledge areas. This is because risk cannot be identified, assessed, and allocated without the knowledge and understanding of managing it. Participants agreed that the second most important challenge faced was price escalation (13.97%) of construction materials on building construction projects. This result was also in agreement with the findings of the most significant risk factor "high inflation rate" identified by participants. For instance, due to shortage of foreign currency, some construction materials like iron bar prices have escalated, as a result some construction projects were discontinued for a significant period of

time. Therefore, projects had difficulty achieving their objective on the planned schedule and cost.

The third most important challenges confronted as viewed by participants were low level of attention given to risk management and lack of qualified professionals in the sector with an equal value of 11.83%. Had there been enough attention given to risk management by the major operators of the sector, there would have not been a shortage of qualified professionals. Either training or educational development might be arranged or practitioners could be engaged with the knowledge and experience acquired. In addition, from the general profile of respondents those who specialized in project management were only 5.1%, the rest were with other fields of specialization engineering being the dominant constituted almost 59%. This might prove the low level of attention that was given by the major operators. Hence, these two challenges were interrelated and this might be the reason why they got similar value by respondents.

5. Conclusions and Recommendations

Due to unexpected nature and changes that occur during implementation of building construction projects, risk became a prevalent phenomenon. In this study, with the objective of identifying and ranking the major risk factors on building construction projects, 50 risk factors were identified from review of related literature and considered by consultants and building contractors in Addis Ababa. From the overall perception of participants, the result shows that 5 risk factors are with high levels of importance and frequent probability of occurrence. High inflation rate is the most significant factor that has an effect on building construction projects. For the achievement of project objectives, this factor should draw extraordinary consideration from government bodies and other institutions responsible for preparation of policies and its implementation.

Following inflation, delayed payment by a client was observed by participants as the second most critical risk factor among the factors examined. This factor needs special attention by financial institutions that are in charge of fixing collateral requirements to issue guarantees for project financing. Financial institutions need to require collateral with the reality of the existing situation and with appropriate time in the process of financing projects. As a result, projects could get adequate finance on due time that can facilitate availability of resources on specified schedules. This also increases efficiency of project

operation that enables us to achieve objectives. Poor resource management, associated with construction work categories, was rated as the third major critical risk factor by participants that have an effect on project objectives. This factor should get attention by contractors for appropriate resource management who are responsible for executing projects on site. Managers should acquire the required knowledge and give special consideration in managing resources.

The fourth factor which needs to be considered by all stakeholders was risk of corruption, which are involved and have significant roles in the construction industry. It requires professional ethics in preparing design, specification, tendering and implementation of projects. Moreover, the necessary controlling mechanism should be developed by all responsible bodies in order to decrease possibilities of corruption. Hence, projects can be completed with lesser cost, better quality, on schedule and become successful. The fifth dominant risk factor is economic instability as perceived by participants which has a significant effect on project objectives. This factor also requires due attention particularly by the government who is responsible for formulating economic policies and creating a politically stable environment, etc. The government should also promote and expand the construction sector in order to create employment opportunities.

Participant's perception of building construction project risk category, the most significant factor considered, is the financial and economic composite risk, with high frequency of occurrence and high-medium importance level. The results from the study display that risk factors namely, "high inflation rate", "delayed payment by the client", and "economic instability" are under the financial risk category that have effect on project objectives. The policies and strategies that should be employed in the individual risk factors will also have a combined effect on this composite risk category. The study revealed that time overrun and cost overruns are the two most critical possible risks with frequent probability of occurrence and high importance level respectively. Based on the findings of the study it is recommended that consultants, contractors, and other stakeholders consider the following areas of improvement in managing risk on building construction projects.

- Practitioners of both consultants and contractors should have knowledge, skill, and practice of risk management in order to minimize building construction risks early.
- Both consultants and contractors need to give attention to risk management and embrace risk as their essential part of their project

management and meet project objectives.

- Critical risk factors, as revealed in this study, should be properly handled by their respective companies/government/institutions accordingly in managing risk to achieve a successful result of construction projects.
- Consultants and contractors including other stakeholders should work together as a team on projects to systematically identify major risk factors, analyze and respond to risks with appropriate strategy to achieve objectives.
- Well organized construction policy should be formulated by government in order to implement and improve the capacity and competitiveness of local construction enterprises which facilitates the economic stability of the country.
- Identified risk factors can be used as a check list to contribute for risk management process on account of building construction projects in Addis Ababa.

6. Limitations and Further Studies

All research – regardless of how well conducted or constructed – encounters certain drawbacks. As a result this research acknowledges some limitations. The primary limitation with the research is related to scope of agents involved as source of data. The research relies on data only from contractors and consultants. However, the study is able to use available data with different treatment techniques to analyze project risk management specific to construction projects. Similar study can be done including clients, suppliers, and sub-contractors besides consultants and contractors to evaluate the associated risk factors reflection. The risk factors identified in this study can be further researched to the allocation of their corresponding risk response strategy.

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