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Causes of Contractor Cost Overrun in Construction Projects: The Case of Ethiopian Construction Sector

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Abstract: Completion of a construction project with budget is frequently seen as a major criterion of project success by clients, contractors, consultants and related stakeholders. It is here that project management becomes essential tool for the delivery of effective projects than the traditional functional management. However, the construction industry is faced with challenges to meet budget. This study is conducted to identify the top five cost over-run factors and survey is conducted on 140 respondents. The samples were drawn using convenient sampling approach. Primary data is collected using the self-administered questionnaires. While secondary data is collected through reviewing of related materials and the analysis is conducted using SPSS version 20. As per the contractor' response, the top five factors that causes cost overrun of construction projects were from medium to high. On the other hand, the top five factors as per the response of consultants and clients ranged between high to very high. The contractors outlined the top five factors that causes cost overrun in construction projects are poor planning, fluctuation of price of materials, poor productivity, inflationary pressure and project financing in descending order.

Keywords: Cost Overrun, Project Management, Project Control and Project Success

1. Introduction

Ethiopia is the fastest-growing, non-oil driven economy among African countries. The country has showed a remarkable growth over the past ten years. The average annual growth GDP is 10.9% (UNDP, 2014). This figure is double of the Sub Sahara Africa and triple of the world average growths indicating that Ethiopia is one of the fastest economic growths in the world (ibid). As a result the contribution of the industry against the GDP is only 3% and this is lower than the sub-Saharan African average which is 6%. The construction industry trend in the past 10 years shows a yearly growth rate of 12.43 and this shows a share of 5.3% of the country's GDP (ECIDP, 2014).

Though the construction sector is given high prominence, several defects are being noted in the sectors that need immediate action. One significant problem is the fact that current infrastructure and construction projects show significant cost variation (ECIDP, 2014). This is occurring in spite of the fact that the Ethiopian Government played significant role in assisting contractors by providing training, supplying machinery, and by developing supportive guidance (ECIDP, 2014).

The cost overrun on projects results in poor investment returns from the use of the project, delay in the utilization of the public facilities and extended inconvenience for the public. All of these problems exert a huge financial pressure on government, and they can hold back or impair planned economic development (Li-Yin, 2006). Hence, identification of the root causes of the challenges and pointing the possible way out in consultation with stakeholders are critical factor. In doing so, it intends to identify underlying causes for cost variation of construction projects. Moreover, it would serve as a basis for further research in the area. Such an understanding would further address the most pressing problems of human lives.

1.1. Ethiopian Construction Sector

The fast growth of the construction industry resulted in increasing number of contractors joining the industry. During the period 2000 up to 2008, the number of contractors increased by 1.912[1]. Consequently, there are 7259 numbers of

1www.mwud.gov.et accessed on March 2, 2014.

BC/RC/GC registered contractors for 2014/15 budget year, according to the Ministry of Urban Development, Housing and Construction of Industry Development and Regulatory Bureau. Where the numbers of larger contractors up to level three are: 263 BC1/RC1/GC1; 73 BC2/RC2/GC2; 163 BC3/RC3/GC3 (Table 1).

Table 1. *Number of Contractors and Their Trend*[2].

Category	Year of Registration		
	1994 E. C. (2001/02 G. C.)	2000 E. C. (2008 G. C.)	2006 E. C. (2014/15 G. C.)
(BC-1, GC-1, RC-1)	35	56	263
(BC-2, GC-2, RC-2)	3	3	73
(BC-3, GC-3, RC-3)	30	62	163
Total from Grade 1 to 3	68	121	499
Total from Grade 1 to 10	941	1799	7259

Where: BC = Building Contractor; GC = General Contractor and RC = Road Contractor

Considering the high role of the construction sector in the industry and the demand to participate more contractors in the sector, the former Ministry of Urban Development and Construction revised its guideline and developed the "Amended Directives for the registration of Construction Professionals and Contractors No. 23/2013". This directive is applied starting from July 8th, 2013. This directive allows the contractors to register in the same grade but with revised project cost up to 18 times of the old legislation (Table 1). Where, the legislation specifies that contractors of category 4 to 2 are not permitted to build above twelve floors including basement and similarly categories of 6 and 5 are not permitted to build above eight floors (Table 2).

Table 2. *Project Construction Cost Review and Contractors Categories "GC", "BC" and "RC".*

Category	Legislation	Grade	Construction cost (million Birr)		
			BC	RC	GC
(GC,BC,RC)	Old	1	Above 20	Above 20	Above 20
	New	1	Above 210	Above 300	Above 350
(GC,BC,RC)	Old	2	Up to 20	Up to 20	Up to 20
	New	2	Up to 210	Up to 300	Up to 350
(GC,BC,RC)	Old	3	Up to 15	Up to 15	Up to 15
	New	3	Up to 160	Up to 225	Up to 270

In addition to the private sector, authorities and government agencies are involved in construction of infrastructures by employing in-house advisors. As a result, a considerable number of expertises have been employed. Nevertheless, the construction work performance in building construction does not progress as it is supposed to be, for the last 50 years.

1.2. Hypothesis

Hypothesis 1:

H0= There is no association between the response of the contractors and consultants for cost overrun factors.

H1= There is an association between the response of the contractors and consultants for cost overrun factors.

Hypothesis 2:

H0= There is no association between the response of the contractors and clients for cost overrun factors.

H1= There is an association between the response of the contractors and clients for cost overrun factors.

Hypothesis 3:

H0= There is no association between the response of the consultants and clients for cost overrun factors.

H1= There is an association between the response of the consultants and clients for cost overrun factors.

2. Related Literatures

Completion of a construction project with intended budget is frequently seen as a major criterion of project success by clients, contractors, consultants and related stakeholders. It is here that project management becomes essential tool for the delivery of effective projects than the traditional functional management. The Project Management Institute Project Management Body of Knowledge (PMBoK) Guide defines a project as "a temporary endeavor undertaken to create a unique product or service" (PMI, 1996).

Project Management Constraint 1: Cost Overrun and Mitigation Measures

Cost in a project comprises money and resources (people, equipment, and materials). The client usually wants the project to be finished with the possible lowest cost and timely. However, it is the project manager's responsibility to adopt or formulate a performance standard to track cost performance (Larry, 2002). Several factors that cause cost overruns in construction projects have been identified in various places and time. The basic reason for cost overrun is that most contractors quote price based on their projected estimates. Unfortunately, the price change so quickly that the initial budget become completely unrealistic (Azhar et al, 2008). According to Larry, (2002) project cost is influenced by the following factors: specifications of the end products (such as levels of performance, quality, and reliability); compliance with governmental, institutional, or internal standards; and technical requirements (such as a need to upgrade computer hardware) and administrative needs (such as a company's financial policies). Chabota et al., (2008) discussed that the major causes of cost escalation in Zambia's road construction are bad or inclement weather due to heavy rains and floods, scope changes, environmental protection and mitigation costs, schedule delay, strikes, technical challenges, inflation and local government pressures. In his survey, among 60 participants, (73%) indicated that the causes of cost escalation

2www.MoUDHC.gov.etaccessed on March , 2015.

are bad weather, (63%) indicated the cause as scope changes, (61%) indicated the cause as environmental protection and mitigation cost, (54%) indicated the cause as schedule delay, (52%) indicated the cause as strikes and the remaining 50% indicated that the causes of cost escalation are local government pressures, technical challenges and inflation.

Similar study by Luka, (2014) conducted in Nigeria with fifty eight (58) respondents who are all construction professionals, revealed that the average impact of cost related risks with standard deviation are associated with the following five factors: incomplete or inaccurate cost estimate (0.5886±0.2948), inadequate program planning (0.5257±0.1821), variation by client (0.4914±0.2077), design variation (0.4743±0.2063), and price inflation (0.4514±0.2241). The average impacts of these factors represent the degree of potential loss on construction project cost in the construction industry. Another study conducted in Malaysia by Ali and Kamaruzzaman, (2010) on 30 respondents from construction firms, shows that cost overrun becomes critical issue in Malaysia construction and ranked 13 factors contributed to cost overrun. These 13 factors in descending order are the following: inaccurate/ poor estimation of original cost, construction cost underestimation, improper planning, poor project management, lack of experience, poor contract management, inflation of project costs, high cost of machineries, fluctuation in price of raw materials, unforeseen site conditions, insufficient fund, obsolete / unsuitable construction equipment and methods, and mistake in design.

Based on their findings, Ali and Kamaruzzaman, (2010) ranked the following 11 measures in descending order to control construction cost: proper project costing and financing, proper cost control competent personnel, efficient management, risk management during project execution, realistic cost estimation, appropriate scope definition, appropriate contractual framework, establish training programs, increase supply of materials, and establish a system in design. A study made among 26 consultants using questionnaire in Palestinian building construction projects by Ibrahim and Nabil, (2013), revealed a 100% cost overrun. The responses indicated average cost overrun between 10% and 30% of the project's estimated cost. The study identified 41 cost overrun factors, of which 26 are critical ones. The top five factors prioritized by the consultants affecting cost overrun in building construction projects are: political situation, fluctuation of materials price, level of competitors, currency exchange, and economic instability. The researchers suggested the following mitigation measures for the above discussed cost overrun factors: Training courses and workshops, provision of updated Material price and labor rates, provision of sufficient time for tender submission, on time payment, communication and coordination among project staffs and top management reaction to political and environmental issues. Similar study conducted in Palestine by Mahamid and Amund, (2012) among a sample of 169 road construction projects, 100% of the projects suffer from cost deviation: 76% of the projects are under-estimated cost while the rest 24% of the projects are over- estimated.

Olawale and Sun, (2010) performed a study on 150 construction companies, 100 consultants on construction project organizations in the UK, which was also followed by face-to-face interviews with 15 experienced practitioners. In the study, a list of 20 factors were used for identifying project cost and time control inhibiting factors: inflation of prices, fluctuation of currency/exchange rate, unstable government policies, weak regulation and control, unpredictable weather conditions, dependency on imported materials, low skilled manpower, risk and uncertainty associated with projects, unstable interest rate, lack of proper training and experience of pm, lack of appropriate software, inaccurate evaluation of projects time/duration, non-performance of subcontractors and nominated suppliers, project fraud and corruption, design changes, financing and payment for completed works, complexity of works, discrepancies in contract documentation, contract and specification interpretation disagreement and conflict between project parties. Accordingly, the top five factors identified in inhibiting effective project cost control in descending order are: Design changes, Risk and uncertainty associated with projects, inaccurate evaluation of projects time/duration, Nonperformance of subcontractors and nominated suppliers and complexity of works. The first factor of design change is very critical and needs carful management. These top five factors were considered for suggesting mitigating measure and accordingly 90 mitigating measures of preventive, predictive, corrective and organizational natures were derived by making intensive literature review and face to face discussion with 15 participants (Olawale and Sun, 2010).

In Ethiopia, a study conducted by Nega, (2008) on predominant factors for cost overrun in public building construction projects in Ethiopia are identified the following major cost overrun factors. These are inflation or increase in the cost of construction materials, poor planning and coordination, change orders due to enhancement required by clients, and excess quantity during construction.

A study made on project management maturity in the Ethiopian construction industry by Abadir, (2011) found out that 22%, 22%, 22% and 28% of the contractors cost management process maturity is incomplete, perform informally, perform formally and managed well, respectively. Whereas, the cost management practice maturity is 10%, 48%, 38% and 5% apply no practice, incomplete, basic and intermediate, respectively. His study pointed out that 90% of the contractors prepare detailed estimate of cost of labor, material and machinery. However, only 75% prepare detailed budget, about 70% track cost of labor, material and machinery separately, and 67% collect and use company's historical data for preparation of cost estimate. His study further indicate that only 1/3 of the contractors use computer tools for cost estimate preparation and about 2/3 update their budget regularly at least once in a month. The contractors perform formal financial management process.

Harold, (2009) stated that in the 1980s the failure of a project was largely a quantitative failure due to ineffective planning, scheduling, estimating, and cost control. As a result

project objectives had become a moving object. In effective project management in small organizations (1 to 30 million dollar projects), manual may be acceptable rather than computerized cost control.

Cost management is among the very important dimension of project management. The Earned Value Analysis (EVA) is a cost management tool that is used to evaluate cost performance of different types of projects.

3. Research Design and Methodology

3.1. Description of the Study Area

Ethiopia is located in the horn of Africa. It covers an area of about 1.13 million square kilometers and the topography of the country is rugged ranging with an altitude from 125m below sea level to 4,620m above sea level. The country has an elevated central plateau varying between 2,000 and 3,000 meters above sea level (Figure 1).

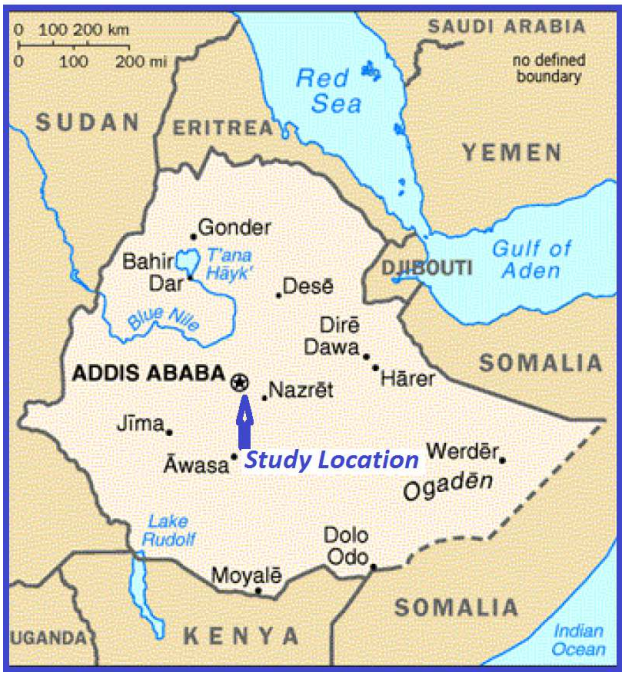

Figure 1. *Map of Ethiopia.*

3.2. Sampling Methods and Sample Size

Considering the homogeneity of the construction sector from grade one to three in terms of formulation and category, convenient sampling was adopted for preliminary and final questionnaire distribution. Convenient sampling was used due to the fact that the sensitivity of the question types and needs some follow-up and further push to get reliable response and to have high number of return of the questioners.

Among the most important element of the research, the sample size is the one which addresses the characteristics of the whole file series with confidence. To stick with good statistical validity, the study made use of a representative sample size. For this study maximum care is given to get the highest sample size (OSP, 2005). For the study the numbers of grade one to three contractors are 499 and accordingly the sample size determined based on Table 3 and found out the sample size of 80.

The consultant and contractors who had worked with the selected contractors were asked to respond to similar questioners using quota sampling.

According to the formula used to determine the sample size by Yamane (1967),

$$n_0 = \frac{z^2 p(1-p) N}{z^2 p(1-p) + Ne^2}$$

Where:

no = sample size

z = confidence interval corresponding to a level of confidence

p = population proportion

N = population size

e = precision or error limit

Taking the value of N= 499, which is the total size of the population (Grade one to three contractor), Z=1.96 (95% Confidence Interval), p=0.5 and level precession e=10%, the required sample size found were 80.

Again, taking Yamane (1967) formula for determining the required response rate for the amount of sample size determined, the researcher used the below method of determination.

$$r = \frac{n}{1+ne^2}$$

Where:

n = sample size

r= required responses

e^2= error limit or the level of precision) 10%

Accordingly, by assuming response rate of 56% the sample size to be distributed was identified as 130 for the contractors and finally able to achieve 75.4% of response rate.

Table 3. *Sample size determination.*

Population [1]	Sample Size [2]		
	Low	Medium	High
51-90	5	13	20
91-150	8	20	32
151-280	13	32	50
281-500	20	50	80
501-1,200	32	80	125
1,201-3,200	50	125	200
3,201-10,000	80	200	315
10,001-35,000	125	315	500
35,001-150,000	200	500	800

Source: J Carvalho, "Archival application of mathematical sampling techniques", *Records Management Quarterly* 18:63 (1984) as cited on OSPO, 2005.

3.3. Validity and Reliability

Reliability and validity in quantitative research reveal two strands: Firstly with regards to reliability, whether the result is

replicable and with regards to validity, whether the means of measurement are accurate and whether they are actually measuring what they are intended to measure (Nahid, 2003).

Kirk and Miller (cited in Nahid, 2003) identify three types of reliability referred to in quantitative research, which relate to: 1) the degree to which a measurement, given repeatedly, remains the same, 2) the stability of a measurement over time, 3) the similarity of measurements within a given time period.

The questionnaire was reliable in that it used the same questions to all respondents and was answered in similar ways. The questions were adopted from previously done studies which were subject to critics and the content validity was addressed in that all questions clearly represented all the variables intended to measure for the desired objective of showing the impacts of the independent variables on the dependent variable.

3.4. Data type, Sources, and Methods of Data Collection

Both quantitative and qualitative methods were used: in step one qualitative analysis were done for identifying factors from literature and checked on selected respondents; in step two quantitative data were collected using questionnaire (Figure 2). This study involved largely the use of primary data for the purpose of empirical analysis. The primary data were obtained with the use of structured questionnaires and selected interviews. Secondary data were used for preparation of the questioner and to discuss the findings of the research.

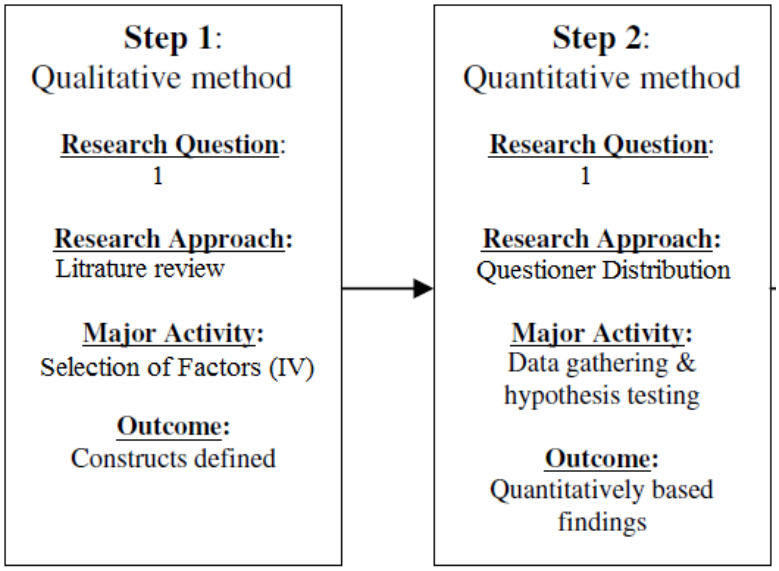

Figure 2. *The two step approach for this research.*

Part one: Questionnaire Survey

For the survey, pretested questionnaire was developed to assess factors for cost overrun perception. Preliminary questionnaires were sent to 10 professionals for their comment and adjustment. Their comments and inputs were incorporated in development of the final questionnaire that was distributed and collected.

The list of contractors was first obtained from online archive. Online search was further conducted to identify their contact address and detail. The questionnaires were sent to different organizations via their email. Moreover, personal contacts with senior professionals in the field were used to gather data and also to link to other potential respondents. When linked to professionals through personal contacts, the name of the construction company was recorded and appropriate follow up was done to make sure that the questionnaire was filled by the appropriate professional and to ensure a good questionnaire response rate.

Respondents of the questionnaire consists of Grade one to three Building contractor (BC)/ General contractor (GC), road contractors (RC) of governmental as well non-governmental bodies; consultants and clients. The survey enabled the respondents to identify the challenge in the construction field regarding cost. The model in the questionnaire cost overrun factor was identified by conducting detailed literature review (Luka, 2014; Ibrahim and Nabil, 2013; Mahamid and Amund, 2012; Abadir, 2011; Ali and Kamaruzzaman, 2010; Olawale and Sun, 2010; Azhar et al, 2008; Chabota et al., 2008 and Nega, 2008). Accordingly, different factors were tabulated in to a questionnaire (Table 3).

The questions were structured in such a way as to provide pertinent information on the extent of cost variation on projects. These questions were made simple and straight forward in order to ensure maximum responses from the respondents. For the questionnaire, Likert scale of "1= very little; 2= little; 3=moderate; 4=high and 5= very high" were used.

The questionnaire distributed had two sections:

- Section I gathers basic background information about the particular respondent. It includes questions asking the type of organization, position, salary, educational level, year of experience etc.
- Section II consists of 41 cost overrun factors whereby respondents were expected to rate based on their importance. The causes of cost overrun of contractors study was made by classifying 41 factors in to five broad

categories (cost estimation factor, construction items, project participants, environmental and financial) for mutual exclusivity.

The questionnaires, along with the cover letter, were distributed to the concerned company employee either in hard or soft copies whichever was convenient. Physical visits and/or intensive telephone conversations were made to all the respondents. The purpose of the communication was to clarify some of the points found vague to the respondents in the questionnaires, to follow up the responses, and to collect filled ones. Respondents were assured that their responses would be kept confidential.

3.5. Data Analysis

The data collected through pre-tested structured questionnaire were categorized and analyzed. Content analysis was further employed in the presentation of the results. The data were tabulated, analyzed and interpreted using SPSS (version 20). The five-point scale was converted to a Relative Importance Index (RII) for each individual factor using the following formula(Luka, 2014; Ibrahim and Nabil, 2013; Mahamid and Amund, 2012; Abadir, 2011; Olawale and Sun, 2010; Azhar et al, 2008; Chabota et al., 2008 and Nega, 2008):

Relative importance index (RII) = $\Sigma w \div (H \times N)$

Where w is the total weight given to each factor by the respondents, which ranges from 1 to 5 and is calculated by an addition of the various weightings given to a factor by the entire respondent, H is the highest ranking available (i.e. 5 in this case) and N is the total number of respondents that have answered the question.

Finally, an statistical test was conducted on cost control ranking agreement or disagreement of the respondents (contractor, consultant and client) with the help of spearman rank correlation coefficient. Where, the Spearman's rank correlation is a non-parametric test correlation varies between +1 and -1, where +1 signifies perfect positive correlation and -1 show a perfect negative correlation or disagreement. Correlation coefficient value of ± 1 is said to be a perfect correlation. In this study, we assume that a value lying between ± 0.5 and ± 1 reflects a high degree of correlation, a value lying between ± 0.3 and ± 0.5 reflects a moderate degree of correlation, while a value lying between ± 0.1 and ± 0.3 reflects a low degree of correlation. It is possible to reject the null hypothesis, when the absolute value of the obtained ρ is larger than the critical ρ (.254 for P.01) for N=98.

A correlation coefficient value lying around zero means that there is no correlation.

Spearman rank correlation formula:

$$r_s = 1 - (6\Sigma d_i{}^2/(N^3 - N)).$$

Where, r_s is the Spearman rank correlation coefficient, d_i represents the difference between ranks for each case and N is the number of subjects or pairs of ranks (Weinberg and Abromowitz, 2008; Cohen, 1988).

For N > 30, the critical value from Spearman's (N=30, p = .05) = .363 "close enough"

Table 4. *List of cost overrun factors.*

S.N.	Cost Overrun Factors	1	2	3	4	5	Cited by
1) Cost estimating factor							
1	Cost of labor						A, H
2	Cost of machinery						A, D, H
3	Transportation cost						A
4	High machinery maintenance cost						A
5	High interest rates by bankers						A
6	Wrong estimation method						A,C,D, E, F
7	Cost of insurance						A
8	Fluctuation of prices of materials						A, D
9	Bureaucracy in tendering method						A
10	Waste on site						A,B
11	Long period between design and time of tendering						A
2) Factors related to construction item							
12	Fraudulent practices and kickbacks						A
13	Contract management						A, D, I
14	Additional work						A, B, G
15	Duration of contract period						A, I
16	Contractual procedure						A
17	Frequent changes in design						A, B, C, D, I
18	Lack of adequate manpower or technical staff						A, B, D, I
3) Factors related to project participant							
19	Disputes on site						A, B
20	Lack of coordination between construction parties						A, G, I
21	Poor financial control on site						A
22	Poor planning						A,C, D, G, H
23	Previous experience of contract						A, D
24	Relationship between managers and labors						A
4) Environmental factors							
25	Level of competitors						A
26	Manipulation of suppliers						A, I
27	Absence of construction-cost data						A
28	Economic instability						A
29	Effects of weather						A, B, I
30	Government policies						A, B, I
31	Inadequate local production of raw materials						A, I
32	Monopoly by suppliers						A
33	Number of competitors						A
34	Number of projects going at the same time						A
35	Political situation						A
36	Poor productivity						A
37	Project location						A
38	Social and cultural impacts						A
5) Financing factors							
39	Currency exchange						A, I
40	Inflationary pressure						A, B, C, D, G, I
41	Project financing						A, D, I

1= very little; 2= little; 3=moderate; 4=high and 5= very high

A (Ibrahim and Nabil, 2013); B (Chabota et al., 2008); C (Luka, 2014); D (Ali and Kamaruzzaman, 2010); E (Azhar et al, 2008); F (Mahamid and Amund, 2012); G (Nega, 2008); H (Abadir, 2011); I (Olawale and Sun, 2010);

4. Result and Discussion

4.1. Demographic

The structured questionnaire survey is designed to determine the major causes of cost variation in construction projects in Ethiopia. 140 participants were questioned in the survey. The respondents are categorized into three groups, namely contractors, consultants and clients which, of course, are implementing agencies and financiers. The response rate for the questionnaire survey for the above mentioned contractors, consultants and clients are 75.4%, 43.3% and 40.0%, respectively (Table 5). According to Sekaran (2001), a response rate of 30% is acceptable for most studies; therefore, as the response rate of this study is more than what is referred as adequate by Sekaran (2001), the response rate is measured as adequate for the study.

Table 5. *Response Rate for the Structured Questioner.*

Group	Distributed	Returned	Valid	Valid among distributed in percentage
Contractors	130	104	98	75.4
Consultants	60	33	26	43.3
Clients	40	24	16	40.0

Profile of questionnaire respondents

The academic qualifications of the respondents were assessed. Accordingly, out of 140 participants 18, 78 and 44 of the respondents have diploma, bachelor and Masters Degree in engineering, respectively. The education qualifications of the respondents suggest sufficient educational qualification to make the information acquired reliable (Figure 3).

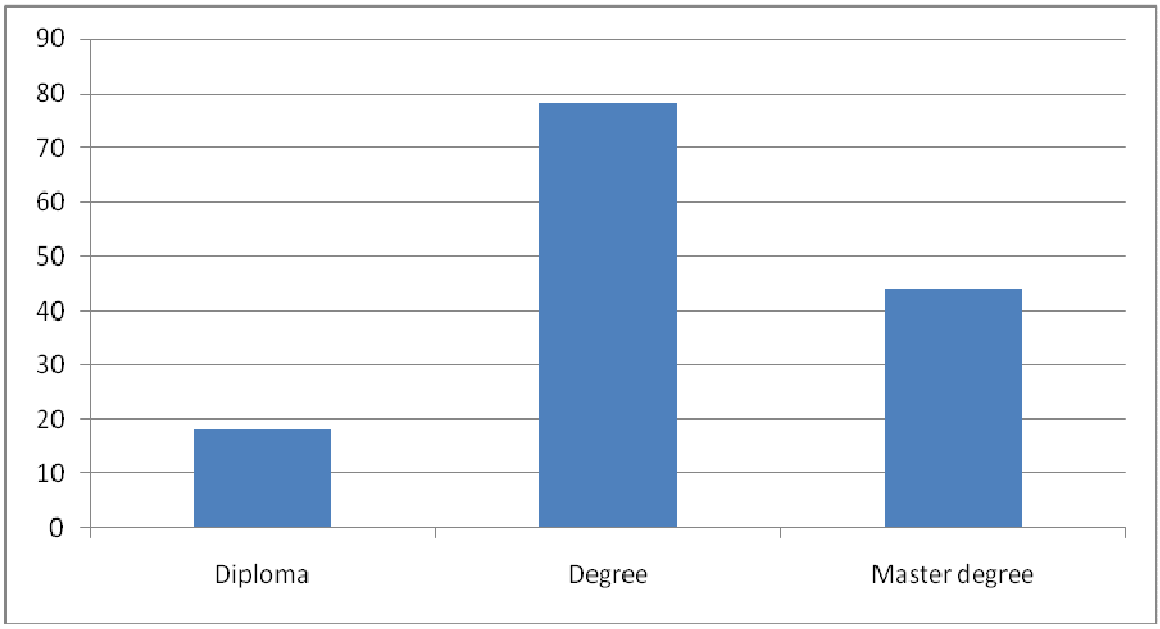

Figure 3. *Academic Qualifications of Total Respondents.*

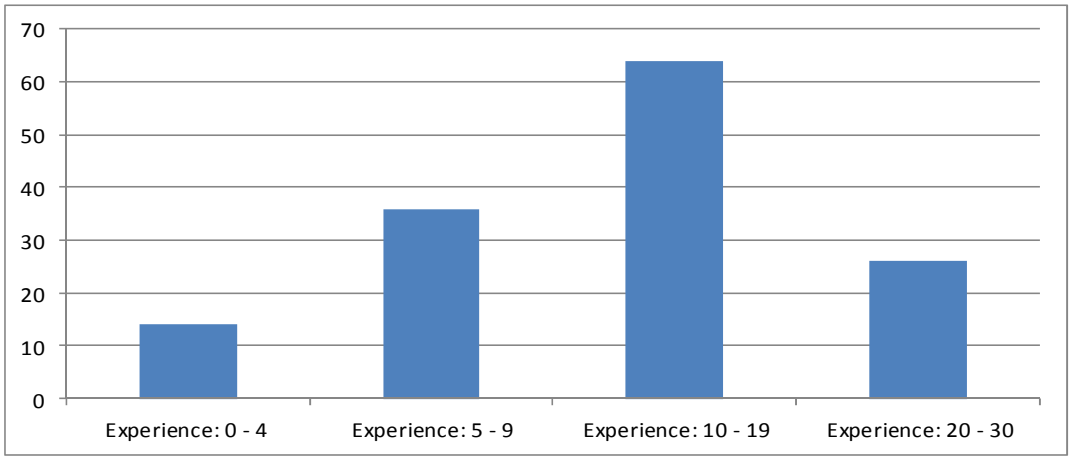

Figure 4. *Working Experience of the Total Respondents.*

As per the survey, out of the total 140 respondents 60, 46, 26 and 6 of the respondents have experience in their current company from 0 to 4, 5 to 9, 10 to 19 and 20 to 30, respectively (Figure 4).

Table 6. *Contractors Response for Cost Overrun Factors.*

No.	Contractors Response of Cost Overrun Factors	Mean
1	Poor planning	3.918
2	Fluctuation of prices of materials	3.918
3	Poor productivity	3.714
4	Inflationary pressure	3.673
5	Project financing	3.612
6	Duration of contract period	3.571
7	Poor financial control on site	3.551
8	Monopoly by suppliers	3.469
9	Contract management	3.469
10	Cost of machinery	3.408
11	Inadequate local production of raw materials	3.408
12	Bureaucracy in tendering method	3.388
13	Currency exchange	3.347
14	High machinery maintenance cost	3.327
15	Lack of adequate manpower or technical staff	3.327
16	Number of projects going at the same time	3.306
17	Wrong estimation method	3.306
18	Number of competitors	3.265
19	High interest rates by bankers	3.224
20	Absence of construction-cost data	3.204
21	Transportation cost	3.163
22	Previous experience of contract	3.163
23	Manipulation of suppliers	3.143
24	Cost of labor	3.122
25	Lack of coordination between construction parties	3.102
26	Economic instability	3.102
27	Contractual procedure	3.082
28	Fraudulent practices and kickbacks	3.082
29	Waste on site	3.061
30	Project location	3.041
31	Frequent changes in design	3.020
32	Long period between design and time of tendering	3.000
33	Additional work	2.959
34	Government policies	2.959
35	Relationship between managers and labors	2.837
36	Effects of weather	2.796
37	Level of competitors	2.735
38	Social and cultural impacts	2.653
39	Disputes on site	2.531
40	Cost of insurance	2.531
41	Political situation	2.122

Then again, out of the total 140 respondents, 14, 36, 64 and 26 of the respondents have the following total experience in the construction industry from 0 to 4, 5 to 9, 10 to 19 and 20 to 30, respectively. The profile and experience of the respondents suggest sufficient exposure to make the information acquired reliable.

4.2. Cost Overrun Factors

After identifying from literature different factors that result in cost overrun of construction projects, questioner was prepared, incorporating 41 factors and the responses are ranked in Table 6. As per the contractors' response top five factors that causes cost overrun of construction projects are identified. These factors are poor planning (3.918), fluctuation of prices of materials (3.918), poor productivity (3.714), inflationary pressure (3.673) and project financing (3.612) (Figure 5). All the factors are ranked from medium to high; this could be linked to lower acceptances of the fact and/or high debate on the factors. On the other hand, the top 5 factors as per the response of consultants and clients are ranged between high to very high (Annex-A, Table 8).

Poor Planning

The contractors claimed that out of 41 factors, poor or inappropriate planning is the first factor which contributes to cost overrun of projects. The response of the consultants and the clients ranked as 1st level with mean value of 4.231 and 4.500, respectively. This shows the need for improving the planning; this can be improved with the application of training, techniques and software. In line with this, Luka, (2014) investigated the construction cost overrun in Nigeria due to inadequate planning which is ranked as 2nd. Olawale and Sun, (2010) also showed construction projects in the UK and found out that out of 20 factors the 4th ranked factor is inaccurate evaluation of projects duration. Ali and Kamaruzzaman, (2010) as well showed Malaysian construction projects cost overrun due to poor planning which is ranked as 2nd. Nega (2008) also showed the cost overrun in public construction projects in Ethiopia as mainly due to poor planning.

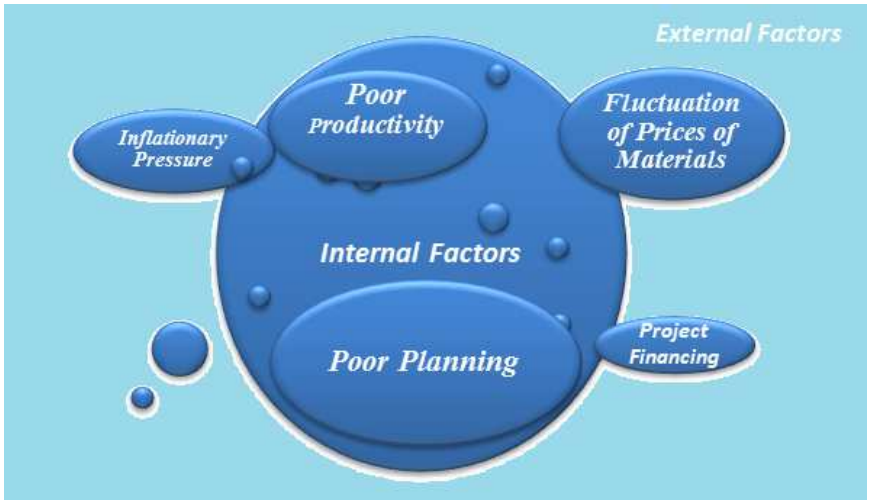

Figure 5. *Top Five Internal and External Factors Affecting Cost Overrun in Ethiopian Construction Sector.*

Price Fluctuation of Materials

The contractors' rank of price fluctuation of materials (3.918) during construction as the 1st problem is comparable with the responses by the consultants and clients (Annex-A, Table 1). Where, the consultants and clients ranked it as 2nd and 3rd factor for the cause of cost overrun with a mean of 4.154 and 4.000, respectively. Improvement in planning can also results in a better understanding level of material price fluctuation regardless of the fact that the situation is partially external and difficult to manage. This could be due to the booming constructions and contractors number in the country. One way to resolve this could be by increasing supply of materials.

In agreement with this, Ali and Kamaruzzaman, (2010) showed Malaysian construction projects cost overrun due to price fluctuation of raw materials which is ranked as 9th out of 13 cost overrun factors and recommends increasing materials supply. Ibrahim and Nabil, (2013) who study in Palestine building construction, also showed that price fluctuation of materials is the 2nd out of 41 cost overrun factors. The basic reason of cost overruns as quoted by most contractors is prices based estimates, and unfortunately, the price change so quickly that the initial budget figure becomes completely unrealistic (Azhar *et al,* 2008). Nega (2008) has also showed that the cost overrun in public construction projects in Ethiopia is primarily due to increase in cost of construction materials.

Poor Productivity

The contractors ranked the poor productivity as a 3rd factor which results in cost overrun. This is comparable with the responses of the consultants and clients which are 4th (4.000) and 2nd (4.125) out of 41 cost overrun factors, respectively. This could be improved by the adoption of proper planning techniques and methods for project evaluation and monitoring.

Inflationary Pressure

The contractors' ranked inflation as a 4th factor which results in cost overrun. The consultants and clients also ranked inflation as 9th (3.846) and 25th (3.25) which shows the clients difference; instead, the clients pointed out other factors such as lack of adequate manpower or educated staffs, project location etc as a primary cost overrun factor. It is witnessed that the aggressive move of the country towards the achievement of its target to become a middle income country by the year 2025 could be realized at the expense of inflation[3], and the response of the contractors is the same as the above mentioned statement. The result of inflation could be the main reason for the materials price fluctuation.

In line with this finding, Chabota *et al.,* (2008) stated that among the major causes of cost escalation in Zambia's road construction, the 5th ranked factor is local government pressures, technical challenges and inflation which all scored 50%. Luka, (2014) also investigated the construction cost overrun in Nigeria, and find out that price inflation is ranked as the 5th factor. Ali and Kamaruzzaman, (2010) also showed Malaysian construction projects cost overrun caused by inflation is ranked as 7th out of 13 cost overrun factors. Ibrahim and Nabil, (2013) study in Palestine building construction showed that currency exchange and economic instability are the 4th and 5th cost overrun factors out of 41 factors. Nega (2008) as well showed the cost overrun in public construction projects in Ethiopia is primarily due to inflationary pressure.

Project Financing

The contractors ranked project financing as a 5th cost overrun factor. This is unlike the responses of the consultants and clients ~~as~~ who ranked 25th (3.462) and 36th (2.500), respectively. It is a fact that one way or the other when cases like delay in payment happens the contractors incur additional costs and/or results in delay of project which in return result cost overrun. Hence, the provision of alternative mechanisms such as availability of working capital and others can be a way out. In line with this, Ali and Kamaruzzaman, (2010) showed Malaysian construction projects cost overrun caused by insufficient fund is ranked as 11th out of 13 cost overrun factors. Ali and Kamaruzzaman, (2010) recommend out of the 11 factors the arrangement of proper project costing and financing should be the 1st for success of project.

The selected top five cost overrun factors can be categorized as internal and external as shown in Figure 5. According to PMBOK, project can be finalized within approved budget if project cost management incorporating the three steps of estimating, budgeting and controlling costs is managed well. Accordingly, the implementation of effective project cost management can eliminate or reduce poor planning as well poor productivity (Harold, 2009).

However, the effect of price fluctuation of materials and project financing can be managed by both the contractor and the support from the stakeholders. The contractor can minimize price fluctuation of materials by holding stock. The client or government can increase supply and/or consider some price adjustment. The inflationary pressure is out of the contractor's control; and, it should be considered by the regulatory body to have some room for compensation.

4.3. Hypotheses Testing Results for Cost Overrun Factors

For the assessment of correlation between contractors, consultants and clients of cost overrun ranked factors, the hypotheses checkup is as follow:

Table 7. *Cost Overrun Factors Response Correlations between Contractors, Consultants and Clients (Spearman rank correlation, r).*

	Contractors	Consultants	Clients
Contractors	1	0.674	0.466
Consultants	0.674	1	0.573
Clients	0.466	0.573	1

[3]www.foreignaffairs.com/ethiopia-sponsored-section

Hypothesis 1:

H0= There is no association between the responses of the contractors and consultants for cost overrun factors.

H1= There is an association between the responses of the contractors and consultants for cost overrun factors.

Results displayed in table 7 above, r = 0.674, showed the response correlation between contractors and consultants. As Weinberg and Abromowitz, (2008) explained, the correlation coefficient is a number between -1 and 1 that determines whether two paired sets of data are related and the closer to 1, the more confident we are of a positive linear correlation and the closer to -1, the more confident we are of a negative linear correlation. From the above stated facts, it can be seen that the null hypothesis is rejected and H1 is accepted by showing high correlation.

Hypothesis 2:

H0= There is no association between the responses of the contractors and clients for cost overrun factors.

H1= There is an association between the responses of the contractors and clients for cost overrun factors.

From the result displayed in table 7 above, where r =0.466, which shows the existence of positive linear correlation. As a result, the null hypothesis is rejected and H1 is accepted by showing medium correlation.

Hypothesis 3:

H0= There is no association between the responses of the consultants and clients for cost overrun factors.

H1= There is an association between the responses of the consultants and clients for cost overrun factors.

As displayed in table 7 above, where r =0.573, which shows the existence of positive linear correlation. As a result, the null hypothesis is rejected and H1 is accepted by showing high correlation.

The result of spearman coefficient between contractors and clients, clients and consultants, and contractors and consultants are 0.47, 0.57, and 0.67, respectively. The result of spearman rank correlation coefficient for cost overrun shows a higher correlation between contractors and consultants since they are the ones who have a direct burden of the day to day routine work. The medium correlation between the contractors and clients could be due to conflict of interest on cost overrun. The result shows that the consultants impartial view on the differences among the clients and contractors. Within the construction administration, the consultants might be seen as more favorable towards the clients; however, the result of this finding shows that the consultants have no interest of taking side.

5. Summary, Conclusion and Recommendations

This chapter deals with the summary of findings, conclusions and recommendations. As per the contractor' response, the top five factors that causes cost overrun of construction projects were from medium to high. On the other hand, the top 5 factors as per the response of consultants and clients ranged between high to very high. The contractors outlined the top five factors that causes in cost overrun of construction projects are poor planning, fluctuation of price of materials, poor productivity, inflationary pressure and project financing in descending order.

Similarly, the top five cost overrun can be monitored by cooperation among project stakeholders to create efficient project success. The results of spearman coefficient for cost overrun factor ranking of construction project between contractors and clients, clients and consultants, and contractors and consultants are 0.47, 0.57, and 0.67 respectively showing very good correlation.

The study bases the current environment of the construction industry, however the construction industry changes so fast. Thus, in the future, the investigation of factors result in cost overrun may be maintained constantly with their mitigation measures. To conduct research in different countries in order to grasp a more global view of cost overrun factors in construction companies in practice may be determined. Applying the same study criteria to other countries could be examined. One could use some of this study's ideas but focus specifically on projects that experienced significant cost overrun. Further study of ranking the survey responses by profession and by sector would result interesting findings. Study based on project size and duration would result interesting findings.

Annex A

Table 8. *Response of Cost Overrun Factors by Consultants and Clients.*

No.	Consultant reply of Cost Overrun	Mean	Client reply of Cost Overrun Factors	Mean
1	Poor planning	4.231	Poor planning	4.500
2	Fluctuation of prices of materials	4.154	Poor productivity	4.125
3	Inadequate local production of raw materials	4.077	Fluctuation of prices of materials	4.000
4	Poor productivity	4.000	Lack of adequate manpower or technical staff	4.000
5	Lack of adequate manpower or technical staff	4.000	Project location	4.000
6	Poor financial control on site	3.923	Monopoly by suppliers	3.750
7	Economic instability	3.846	Poor financial control on site	3.625
8	Monopoly by suppliers	3.846	Cost of machinery	3.625
9	Inflationary pressure	3.846	Transportation cost	3.625
10	Cost of machinery	3.769	Long period between design and time of tendering	3.625

No.	Consultant reply of Cost Overrun	Mean	Client reply of Cost Overrun Factors	Mean
11	Waste on site	3.769	Frequent changes in design	3.625
12	Contract management	3.769	Lack of coordination between construction parties	3.625
13	Currency exchange	3.769	Inadequate local production of raw materials	3.625
14	Long period between design and time of tendering	3.692	Currency exchange	3.625
15	Additional work	3.692	Cost of labor	3.500
16	Number of projects going at the same time	3.692	Duration of contract period	3.500
17	Absence of construction-cost data	3.692	Social and cultural impacts	3.500
18	Manipulation of suppliers	3.615	Contract management	3.375
19	Transportation cost	3.615	Additional work	3.375
20	Duration of contract period	3.615	Number of competitors	3.375
21	Lack of coordination between construction parties	3.538	Contractual procedure	3.250
22	Bureaucracy in tendering method	3.538	Manipulation of suppliers	3.250
23	Wrong estimation method	3.462	Absence of construction-cost data	3.250
24	Contractual procedure	3.462	Economic instability	3.250
25	Project financing	3.462	Inflationary pressure	3.250
26	Fraudulent practices and kickbacks	3.462	Number of projects going at the same time	3.250
27	Government policies	3.385	Wrong estimation method	3.125
28	Level of competitors	3.385	Previous experience of contract	3.000
29	Relationship between managers and labors	3.308	Relationship between managers and labors	3.000
30	Disputes on site	3.308	Level of competitors	3.000
31	High machinery maintenance cost	3.154	Bureaucracy in tendering method	2.875
32	Previous experience of contract	3.154	Fraudulent practices and kickbacks	2.875
33	Frequent changes in design	3.154	Waste on site	2.750
34	High interest rates by bankers	3.077	Disputes on site	2.750
35	Cost of labor	3.077	Effects of weather	2.750
36	Number of competitors	3.000	Project financing	2.500
37	Political situation	3.000	Cost of insurance	2.500
38	Project location	2.923	High machinery maintenance cost	2.500
39	Social and cultural impacts	2.615	Political situation	2.375
40	Effects of weather	2.615	High interest rates by bankers	2.375
41	Cost of insurance	2.385	Government policies	2.375

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