Causes of Delays During Construction Phase of Road Projects due to The Failures of Contractor, Consultant, And Employer in Addis Ababa City Road Authority

Yosef Amare, Emer T. Quezon, Mamuye Busier

Abstract— Construction delay considered as one of the most recurring problems in the implementation of construction projects.It is widely known to have an adverse impact on project success in terms of time, quality and cost. The effect of construction delay is not only confined to the construction industry, but also its influence on the overall economy of a country like Ethiopia. This research was conducted to assess the causes of excessive delays in the completion of road project during the construction phase due to the failures of Employer, Consultant, and Contractor in Addis Ababa City Road Authority projects. Spearman rank correlation coefficient from the Relative Importance Index (RII) analysis was used to test the agreement between different groups of respondents participated in the questionnaire survey, and to rank the three construction parties according to their responsibility area and importance as perceived by the respondents which factor causing the delay of road projects. This research identified sixty-five (65) causes of delay. There were fifty-one (51) valid questionnaires which received back from Contractors, Consultants, and Employer (AACRA). Based on the results, the contractors have the highest percentage of responsibility area that causes the delay of about 40%. While the second was on the part of the Employer, which comprised of 26.15%, and the consultant which placed third of 23.08%. On the other hand, there were 10.77% of the respondents attested that the Shared groups (3-parties) have the responsibility area which causes project delay during the implementation phase. About this, the research study identified and ranked top ten factors causing delays of construction projects in Addis Ababa City Road Authority. Poor financial control of the project ranked 1st with Relative Importance Index (RII) of 0.905. Difficulties in financing project by contractor ranked 2nd with Relative Importance Index (RII) of 0.854. Type of project bidding and award (lowest bidder) ranked 3rd with RII of 0.850. A poor site management and supervision of contractor ranked 4th with RII of 0.839. Selecting inappropriate contractors ranked 5th with RII of 0.823. Lack of high-technology mechanical equipment ranked 6th with RII of 0.819. Inaccurate initial project scope estimate and Ineffective project scheduling ranked 7th and 8th with RII of 0.803. Weak control of the project progress ranked 9th with RII of 0.788. And the Contractor's staffis not adequately trained in professional construction management techniques ranked 10th with RII of 0.784. Therefore, it concluded that the main party Contractor did not perform properly his duties and obligations leading to the main contributory factor causing the failure of the project.

Index Terms— Construction delay factors, Contractor, Consultant, Employer, Responsibility area, Road projects, Relative Importance Index.

1 INTRODUCTION

A Well-Developed road transport sector in developing countries like Ethiopia is assumed to fuel up the growth process through a variety of activities of the development endeavors of a nation. Among these, a creation of market access opportunities for agricultural products is the major one. Moreover, road transport facilities play a role in both the production and consumption decisions of every household in their day-to-day activities. Besides, road transport services are essential for expanding education, health service provision, trade facilitation – within the country and the export market, and better public as well as individual service requirements.

Likewise, roads serve as critical infrastructural units, which provide linkages to other modes of transportation like railways, shipping, and airways. To administer the country's road network, Ethiopian Road Authority (ERA) established in 1967 by proclamation no 256/67 to provide for the control and regulation of travel and transport on the road. Since its commencement, ERA has been responsible for the use of all roads within Ethiopia, all vehicles using these roads, and for all matters relating to road transport activities of the country.

Even though the road transport in Ethiopia accounts for over 97% of the total domestic traffic carried out by motorized transport system, most of the connecting roads not properly maintained, which results in frequent accidents costing the life of many people and the loss of valuable resources every year.

In this connection, making improvement in the road sector of the country will have a significant impact on economic and social sectors as well. With this objective in mind, this research will assess the critical factors of project delay as well as other undesirable causes that delay road construction projects. Hence, the primary output of this investigation is to develop a suitable resolution way to mitigate the occurrence of delay on road projects and minimize the risks of project failures. Delay is the time overrun either beyond the completion date specified in the contract or beyond the time that the parties agreed upon for delivery of the project. A delay in a construction project may cause losses, or negatively affect some or all of the project parties.

Ethiopia prepared a Road, Sector Development Program (RSDP) in 1997 to execute within sixteen years by dividing the time into four RSDP phases. But there are many challenges to performing the strategic plan; among these, a delay is one of the challenges [1]. Therefore, this research study will seek to determine and evaluate the causes of delays due to the failures of Employer, Consultant, and Contractor in the completion of the road project during the construction phase.

1.1 Objective of the study

1.1.1 General Objective

The general purpose of the study is to assess the causes of excessive delays in completion of the road project during the construction phase due to the failures of Employer, Consultant, and Contractor in Addis Ababa City Road projects.

1.1.2. Specific Objectives

To obtain the general aim, the following specific objectives are formulated:

a. To identify the cause of the delay of the failures of the employer, consultant, and contractor during the construction phase.
b. To measure the severity of the causes of delay causes
c. To assess the conformity on the ranking of the seriousness of the causes of delay with the contractor, employer, and consultant.
d. To suggest the best practice mitigate excessive delays in the construction project

2 RESEARCH METHODOLOGY

2.1 Study Design

The study is descriptive and explanatory research type in nature in which questionnaires are designed. In this research study, a case study research approach is used to collect relevant secondary data and primary data through review of documents, the survey of the respondents through questionnaires with the participation of key professionals in the study area.

2.2 Research Population and Sample Size

The research population was drawn from three parties, which participated in road construction. To get the required sample size, the purposive sampling approach is applied. Three samples of each selected project were considered. According to Addis Ababa City Road Authority (AACRA) lists, more than 15 projects are in progress with more than ten Contracting Companies and eight consulting firms. To get the required sample size of both consultants and contractors, the statistical principles of exploratory research are employed. This principle states that the sample size is calculated by the following equations (Darwish, 2005):

$n0 = (p*q) / V^2$ (1)

$n = n0 / [1+ (n0/N)]$ (2)

Where:

n0: First estimate of sample size.

p: The proportion of the characteristics being measured in the target population.

q: Complement pf 'p' or 1-p.

V: The maximum standard error allowed.

N: The population size.

n: the sample size

Since some of the contractors and consultants have more than one project in the region, the number of N is 10 and 12 for consultants and contractors respectively. To maximize n, p is set to 0.5 and to account for more error in qualitative answers; maximum, standard error V is set to 10% or 0.1 (Darwish, 2005). Substitutes these values in the above equations give the minimum sample size for consultant's are 20 respondents and for contractor 21 respondents. For the Owner, 20 respondents are requested which include project managers, engineers, team leaders, director and others technical supporting staffs.

2.3 Data Processing and Analysis

The collected data analyzed using Microsoft Excel and SPSS package to determine the occurrence of the causes of delay due to an employer, contractor, and consultant on road construction projects in Addis Ababa City Road Authority (AACRA). These data used to test whether there is agreement or disagreement among each pair of parties (the respondents). The ranking of causes based on importance index was calculated using the formula shown below. According to Kometa et al. 2011, relative importance index method can be used to determine the various causes of delays. The same method adopted for this study within various groups (i.e. Clients, consultants or contractors). The five -point scale ranged from 1 (not important) to 5 (extremely important) was adopted and transformed to relative importance indices (RII) for each factor.

The Relative Important Index method (RII) is used for analysis of the data. The relative important index is computed as;

$$RII = \sum \frac{W}{A * N} \quad (3)$$

Where:

RII= Relative Important Index

W= Weight is given to each factor by the respondent and ranges from 1 to 5

A= the highest weight 5

N= the total number of respondents

The RII was used to rank (R) the different causes. These rankings made it possible to cross-compare the relative

importance of the factors as perceived by the three groups of respondents (i.e. Clients, consultants, and contractors) [2]. Each cause's RII perceived by all respondents were used to assess the general and overall rankings to give an overall picture of the causes of construction delays in the Malaysian construction industry. The same procedure was adopted for ranking the effects. The indices (RII) were then used to determine the rank of each item. These rankings made it possible to cross compare the relative importance of the elements as perceived by the three groups of respondents. The weighted average for each item for the three groups of respondents is to be determined, and ranks (R) are assigned to each item representing the perception of the three groups.

Finally, Spearman's coefficient of rank correlation is used to test whether there is agreement or disagreement among each pair of parties (the respondents) in ranking the Cause of delays during the construction phase of road projects due to the failure of the employer, consultant, and contractor.

The pair of parties tested for agreement is employer versus consultants, employer versus contractors, and consultants versus contractors. Spearman's formula is given as (Salleh 2009):

$$\varrho = 1 - 6\Sigma 2\ (2-1) \qquad (2)$$

Where:
ϱ = Spearman coefficient
d = the difference between ranks
n= number of subjects or pairs of ranks

3 RESULTS AND DISCUSSION

3.1 General Information About The Respondent

Based on the research methodology, this part of the study targets to show the studies and results to meet the objective of the study, which was the analysis of the severity and responsibility of the identified causes to rank their Relative importance index (RII). To accomplish the objective, a questionnaire survey used.

This part includes:

□ Questionnaires Response Rate and Respondent Demographics

□ To identify the delay causes of failures of an employer, consultant, and contractor during the construction phase.

□ Ranking of the cases based on the responsibility of the causes of delay identifies with the contractor, employer, and consultant

□ Ranking of the causes of delay, based on the Relative Important Index

□ Ranking of the causes based on importance and discussion of the most important causes

□ Test of agreement between the respondents in ranking causes of Delay

3.2 Questionnaires Response Rate and Respondent Demographics

The sample population composed of professionals from Employer (AACRA), consulting firms, and contractors, who participated in the construction of AACRA road projects in Addis Ababa. These included project engineers, office engineers, construction, professional, construction managers', project team leaders, site project supervisor engineers and resident engineers. Questionnaire surveystructured was carried out by distributing a total of 62 sampling sets. It circulated to 20 employees, 21 contractor firms, and 21consultant firms. From these distributed questionnaires, 52 responses received back. However, one of the surveys not completed, which were considered as invalid and not used for further analysis as shown below in Table 3.1.

Table 3.1. Types of the respondent's organization, number, and percentage of distributed, received and valid responses to questionnaires.

Respondents Organization	Number of Questionnaires Distributed	Number of Questionnaires Received	The responsereceived (%)	Number of Valid Questionnaires	Valid Responses (%)
Employers	20	15	75.00	15	75.00
Consultant	21	19	90.48	19	90.48
Contractor	21	18	85.71	17	80.95
Total	62	52	83.87	51	82.26

The result showed that 29.41%Employer, 37.25% consultants, and 33.33% contractors replied valid questionnaire as shown intable 3.1.

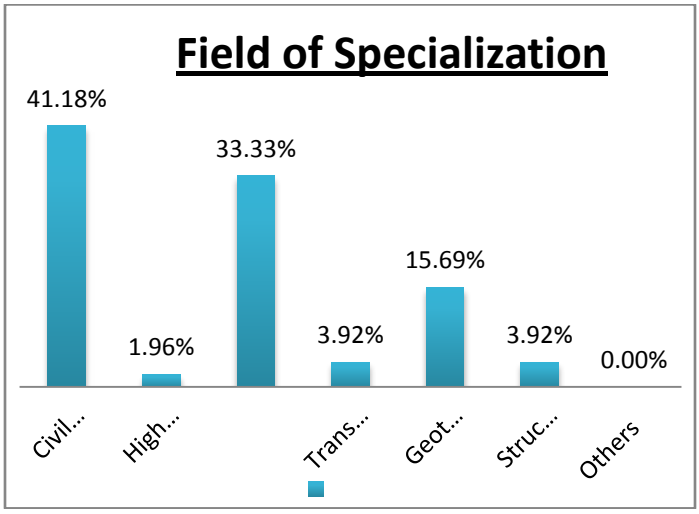

Figure 3.1: Educational field of specialization

Based on the response obtained from Figure 3.1, 41.18% of the respondents are Civil Engineers, 1.96% of the respondents are Highway Engineer, 33.33% are Construction Management Engineers, 3.92%are Transportation Engineers, 15.69% are Geotechnical Engineers, and 3.92%of the respondents are Structural Engineers, while 0% of the respondents fall on others. From the analysis above, the Civil Engineer had the highest percentage of the respondents, while the Construction Management has 33.33%.

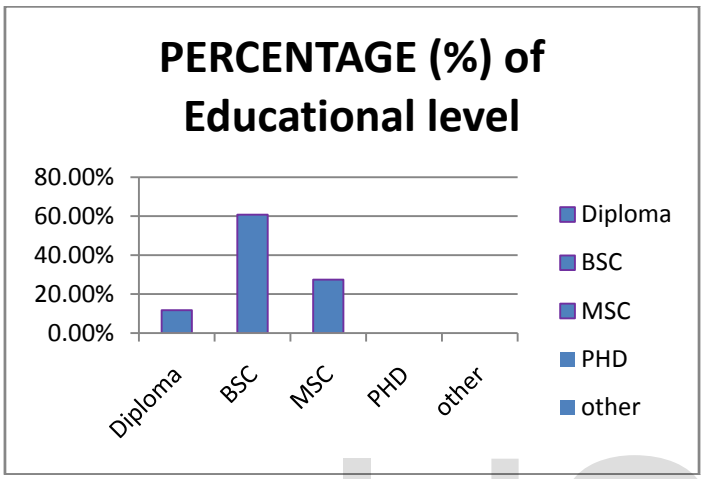

Figure 3.2: Educational level

Figure 3.2 revealed that 11.54% of the respondent had Diploma result, 59.62% of the respondents are BSc holders, 28.85% of the respondents are MSc holders, none of the respondents had PhDs, and 0% of the respondent had for others.

3.3 Delay related training

Table 3.2: Involvement in construction delay training

Delay related training	% of respondent
Yes	10
No	41

From the collected questioner on Table 3.2, most of the respondents have not taken delay training that has 80% (41) and the respondent taken delay training has 20% (10).

3.4 The respondents experience Involvement in the construction sector

Table 3.3: Respondents experience in road construction industry

Experience (in years)	Respondents experience (%)
0 to 3 years	**0**
3 to 5 years	**0**
5 to 10 years	**69**
Greater than ten years	**31**

From Table 3.3showedtheoverallexperienceoftherespondentsinroadconstructionprojects. The majoritytherespondents had 5-10 yearsof professional experience and comprised of 69.00%, while about 31.00 %had overten years of workexperiencein roadconstruction industry.

Table 3.4: Responsibility area of causes of delay

No.	Delays Causes	Responsible
1	Contractor experience	Contractor
2	Ineffective scheduling of project by contractor	Contractor
3	Delay in the preparation of contractor submissions	Contractor
4	Improper technical study by the contractor during the bidding stage	Contractor
5	Poor qualification of the contractors' technical staff	Contractor
6	Difficulties in financing project by contractor	Contractor
7	A poor site management and supervision of contractor	Contractor
8	Conflicts between contractor & other parties (consultant & Employer)	**Shared**
9	Frequent change of sub-contractors because of their inefficient work	Contractor
10	Ineffective control of the project progress of the contractor	Contractor
11	Late in resolving right of way issues	**Employer**
12	Delay in performing inspections by the consultant	**Consultant**
13	Poor communication by consultation with other construction parties	**Consultant**
14	Insufficient inspectors by consultant	**Consultant**
15	Delay in approval of work permit by consultant	**Consultant**
16	Improper construction method	**Contractor**

17	Incomplete drawings/specifications	**Consultant**
18	Design errors and omissions	**Consultant**
19	Excessive extra work orders	**Employer**
20	Inadequate design team experience	**Consultant**
21	Delays in producing design documents	**Consultant**
22	Rework due to wrong drawings	**Consultant**
23	Insufficient data collection and survey before design	**Consultant**
24	The longest period for approval of tests and inspections by consultant	**Consultant**
25	Unfamiliarity with or lack of knowledge by the consultant's supervision staff regarding new construction methods, materials, and techniques	**Consultant**
26	Lack of application of construction management tools and techniques by consultant's project and site staff	**Consultant**
27	Conflicts between drawings and specifications	**Consultant**
28	Frequent design changes requested by Employer during construction	**Employer**
29	Inaccurate initial project scope estimate	**Employer**
30	Unrealistic time estimation	**Employer**
31	Slow decision-making process by Employer departments	**Employer**
32	Inefficient flow of information from Employer departments	**Employer**
33	No or small time extensions associated with change orders initiated by the employer	**Employer**
34	Understaffed consultant's project and site personnel	**Consultant**
35	Poor communication and coordination by Employer and other parties	**Employer**
36	Delays in work approval of Employer	**Employer**
37	Employer-initiated variations	**Employer**
38	Poor qualifications and inadequate experience of contractor's supervisors	Contractor
39	Ineffective planning and scheduling of project	**Shared**
40	Equipment allocation problems	**Contractor**
41	Materials management problems	**Contractor**
42	Misinterpretation of drawings and specifications	**Shared**
43	Rework due to errors during construction	**Shared**
44	Delay in site mobilization	**Shared**
45	Late delivery of materials and equipment	**Contractor**
46	Poor procurement programming of materials	**Contractor**
47	Type of project bidding and award (lowest bidder)	**Employer**
48	Ineffective delay penalties	**Employer**
49	Legal disputes between/with various parties	**Shared**
50	No application of construction management procedures on the part of Employer contributes to late detection of construction problems	**Employer**
51	Unrealistic schedule program submitted by the contractor	**Contractor**
52	Contractor's staff not adequately trained in professional construction management techniques	**Contractor**
53	Poor judgment and inexperience in estimating procedures by the contractor	**Contractor**
54	Shortage of construction materials (bitumen, cement, and steel)	**Contractor**
55	Lack of technical personnel	**Employer**
56	Insufficient equipment	**Contractor**
57	Shortage of Labor	**Contractor**
58	Price escalation	**Employer**
59	Low level of equipment operators' skills	**Contractor**
60	Low productivity and efficiency of equipment	**Contractor**
61	Lack of high-technology mechanical equipment	**Contractor**
62	Unqualified workforce	**Contractor**
63	Low productivity of labor	**Contractor**
64	Selecting inappropriate contractors	**Employer**
65	Poor financial control of the project	**Shared**

From Figure 3.4 below, revealed the highest percentage of the causes of delay amongst the Employer, contractor, consultant and the Shared of three parties. The contractors have had the

largest proportion of the responsibility for the causes of delay, while the Employer placed the 2nd highest rate.

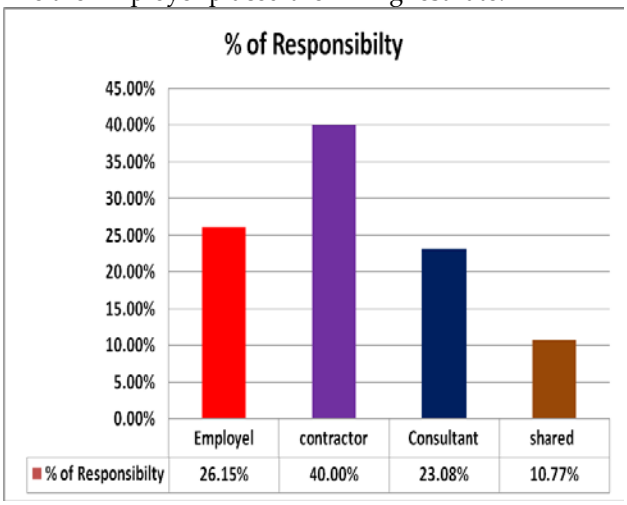

Figure 3.3: **The three parties' responsibility**

3.5 Relative important index values and ranking

The table as indicated below shows the calculated Relative important index values and rank for each cause of delay, based on their severity as the cause of delay from contractors, consultants, and Employer (AACRA) and overall respondent's viewpoints.

Table 3.5: Relative Important Index (RII) and ranking of Causesof delay

No.	Factors that Causes Delays Causes	Consultant		Contractor		Employer		OVER all of the three parties	
		RII	Rank	RII	Rank	RII	Rank	RII	Rank
1	Contractor experience	0.737	25	0.670	24	0.707	33	**0.705**	**30**
2	Ineffective scheduling of project by contractor	0.768	10	0.764	8	0.893	2	**0.803**	**7**
3	Delay in the preparation of contractor submissions	0.684	43	0.6	55	0.640	54	**0.643**	**50**
4	Improper technical study by the contractor during the bidding stage	0.716	35	0.741	11	0.760	20	**0.737**	**20**
5	Poor qualification of the contractors' technical staff	0.705	39	0.729	20	0.747	23	**0.725**	**23**
6	Difficulties in financing project by contractor	0.853	3	0.847	3	0.867	5	**0.854**	**2**
7	A poor site management and supervision of contractor	0.821	6	0.823	4	0.880	3	**0.839**	**4**
8	Conflicts between contractor & other parties (consultant & Employer)	0.653	48	0.658	28	0.640	54	**0.650**	**46**
9	Frequent change of sub-contractors because of their inefficient work	0.379	65	0.411	65	0.400	65	**0.396**	**65**
10	Ineffective control of the project progress of the contractor	0.747	13	0.788	5	0.840	6	**0.788**	**9**
11	Late in resolving right of way issues	0.726	27	0.623	44	0.587	59	**0.650**	**46**
12	Delay in performing inspections by the consultant	0.663	47	0.600	55	0.680	45	**0.647**	**49**
13	Poor communication by consultation with other construction parties	0.589	51	0.623	44	0.693	40	**0.631**	**51**
14	Insufficient inspectors by consultant	0.642	50	0.635	41	0.680	45	**0.650**	**46**
15	Delay in approval of work permit by consultant	0.726	27	0.588	59	0.680	45	**0.666**	**40**
16	Improper construction method	0.726	27	0.611	50	0.640	54	**0.662**	**43**
17	Incomplete drawings/specifications	0.684	43	0.635	41	0.653	50	**0.658**	**44**
18	Design errors and omissions	0.705	39	0.729	20	0.760	20	**0.729**	**22**
19	Excessive extra work orders	0.747	13	0.647	31	0.733	26	**0.710**	**27**
20	Inadequate design team experience	0.674	46	0.611	50	0.720	30	**0.666**	**40**
21	Delays in producing design documents	0.726	27	0.670	24	0.693	40	**0.698**	**33**
22	Rework due to wrong drawings	0.484	63	0.552	63	0.480	63	**0.505**	**64**
23	Insufficient data collection and survey before design	0.768	10	0.741	11	0.787	15	**0.764**	**14**
24	The longest period for approval of tests and inspections by consultant	0.653	48	0.647	31	0.707	33	**0.666**	**40**

25	Unfamiliarity with or lack of knowledge by the consultant's supervision staff regarding new construction methods, materials, and techniques	0.684	43	0.623	44	0.667	48	**0.658**	**44**
26	Lack of application of construction management tools and techniques by consultant's project and site staff	0.747	13	0.741	11	0.800	12	**0.760**	**15**
27	Conflicts between drawings and specifications	0.716	35	0.600	55	0.693	40	**0.670**	**39**
28	Frequent design changes requested by Employer during construction	0.705	39	0.623	44	0.707	33	**0.678**	**38**
29	Inaccurate initial project scope estimate	0.800	7	0.776	6	0.840	6	**0.803**	**7**
30	Unrealistic time estimation	0.737	25	0.741	11	0.787	15	**0.752**	**17**
31	Slow decision-making process by Employer departments	0.547	60	0.658	28	0.693	40	**0.627**	**53**
32	Inefficient flow of information from Employer departments	0.589	51	0.623	44	0.667	48	**0.623**	**54**
33	No or small time extensions associated with change orders initiated by the employer	0.747	13	0.741	11	0.787	15	**0.756**	**16**
34	Understaffed consultant's project and site personnel	0.726	27	0.670	24	0.707	33	**0.701**	**31**
35	Poor communication and coordination by Employer and other parties	0.558	58	0.588	59	0.653	50	**0.596**	**58**
36	Delays in work approval of Employer	0.568	56	0.611	50	0.653	50	**0.607**	**57**
37	Employer-initiated variations	0.589	51	0.611	50	0.640	54	**0.611**	**55**
38	Poor qualifications and inadequate experience of contractor's supervisors	0.579	55	0.611	50	0.653	50	**0.611**	**55**
39	Ineffective planning and scheduling of project	0.716	35	0.647	31	0.707	33	**0.690**	**36**
40	Equipment allocation problems	0.747	13	0.647	31	0.733	26	**0.709**	**27**
41	Materials management problems	0.747	13	0.647	31	0.733	26	**0.709**	**27**
42	Misinterpretation of drawings and specifications	0.568	56	0.541	64	0.640	54	**0.580**	**59**
43	Rework due to errors during construction	0.474	64	0.588	59	0.480	63	**0.513**	**63**
44	Delay in site mobilization	0.747	13	0.647	31	0.707	33	**0.701**	**31**
45	Late delivery of materials and equipment	0.758	12	0.752	10	0.840	6	**0.780**	**11**
46	Poor procurement programming of materials	0.716	35	0.729	20	0.760	20	**0.733**	**21**
47	Type of project bidding and award (lowest bidder)	0.842	5	0.870	2	0.840	6	**0.850**	**3**
48	Ineffective delay penalties	0.747	13	0.670	24	0.747	23	**0.72**	**24**
49	Legal disputes between/with various parties	0.558	58	0.564	62	0.520	61	**0.549**	**62**
50	No application of construction management procedures on the part of Employer contributes to late detection of construction problems	0.747	13	0.647	31	0.773	19	**0.721**	**24**
51	Unrealistic schedule program submitted by the contractor	0.726	27	0.635	41	0.720	30	**0.694**	**35**
52	Contractor's staff is not adequately trained in professional construction management techniques	0.747	13	0.741	11	0.880	3	**0.784**	**10**
53	Poor judgment and inexperience in estimating procedures by the contractor	0.547	60	0.6	55	0.547	60	**0.564**	**60**
54	Shortage of construction materials (bitumen, cement, and steel)	0.726	27	0.729	20	0.787	15	**0.745**	**18**
55	Lack of technical personnel	0.705	39	0.647	31	0.707	33	**0.686**	**37**
56	Insufficient equipment	0.747	13	0.741	11	0.747	23	**0.745**	**18**

57	Shortage of labor	0.589	51	0.623	44	0.693	40	**0.631**	**51**
58	Price escalation	0.779	8	0.741	11	0.800	12	**0.772**	**12**
59	Low level of equipment operators' skills	0.516	62	0.647	31	0.507	62	**0.556**	**61**
60	Low productivity and efficiency of equipment	0.747	13	0.658	28	0.733	26	**0.713**	**26**
61	Lack of high-technology mechanical equipment	0.853	3	0.776	6	0.827	10	**0.819**	**6**
62	Unqualified workforce	0.726	27	0.647	31	0.720	30	**0.698**	**33**
63	Low productivity of labor	0.779	8	0.741	11	0.800	12	**0.772**	**12**
64	Selecting inappropriate contractors	0.874	2	0.764	8	0.827	10	**0.823**	**5**
65	Poor financial control of the project	0.895	1	0.882	1	0.947	1	**0.905**	**1**

From the analysis based on overall respondents results, it showed that the severity of causes of delay could be categorized into four classes. Firstly, thecauses with extreme to very severe Cause of delay with RII value liesbetween 0.800 and 1.000. Based on this, the top eight causes of the identified 65 causes of delays position in this group, which account only 12.31% of the causes of the listed 65 causes.

Furthermore, the causes with very to moderate Severe Causes of delay, with Value lie between 0.600 and 0.800. Thecriteria established to show 48 Causes ranked in the table from 9th to 57th replaced under this category. These 49 causes positioned in this group accounts for about 75.38% of the causes. And also, the causes with moderate to slightly severe causes of delay, with RII value lies between 0.600 and 0.400. Based on this criterion 7 causes ranked in the table from 58thto 64th were classified in this category. These 7 Causes account 10.77% of the overall listed 65 causes. Finally, the causes with slightly to none severe causes of delay, with RII value laying between0.400 and 0.000. Based on this criterion one reason ranked in the table that is 65th was classified in this category. Only thelast Causethatranked65outofthe65Causespositionsinthis group, anditaccountsonly 1.54%.ThefigurebelowshowstheRelative Important Indexrangesofthe65 identified causesand their respectivepercentage.

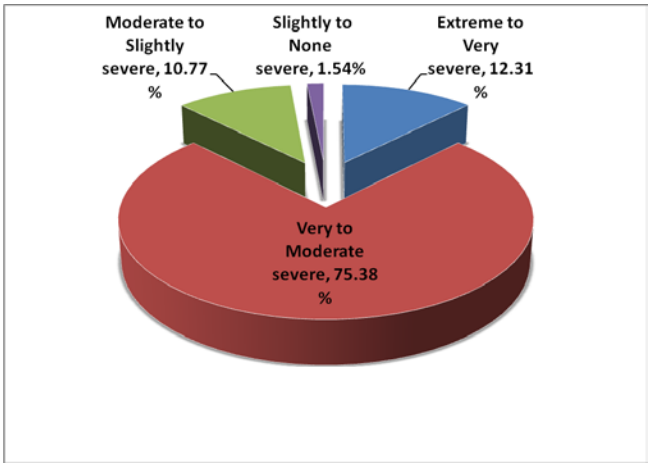

Figure 3.4: Categories ofthe causes ofDelay based onseverity

Asshown in the table belowthetopten mostseverecausesofDelay werelisted in descendingorder of rank with their relative important index(RII) values.

Table 3.6: Top 10 Severe Causes of Delay

No.	Factors that Causes Delays Causes	Employer		Contractor		Consultant		Total of the three parties	
		RII	Rank	RII	Rank	RII	Rank	RII	Rank
65	Poor financial control of the project	0.947	1	0.882	1	0.895	1	0.906	1
6	Difficulties in financing project by contractor	0.867	5	0.847	3	0.853	3	0.855	2
47	Type of project bidding and award (lowest bidder)	0.840	6	0.871	2	0.842	5	0.851	3
7	A poor site management and supervision of contractor	0.880	3	0.824	4	0.821	6	0.839	4
64	Selecting inappropriate contractors	0.827	9	0.765	8	0.874	2	0.824	5

61	Lack of high-technology mechanical equipment	0.827	9	0.776	6	0.853	3	0.820	6
2	Ineffective scheduling of project by contractor	0.893	2	0.765	8	0.768	8	0.804	7
29	Inaccurate initial project scope estimate	0.840	6	0.776	6	0.8	7	0.804	7
10	Weak control of the project progress of the contractor	0.840	6	0.788	5	0.747	9	0.788	9
52	Contractor's staff is not properly trained in professional construction management techniques	0.880	3	0.741	10	0.747	9	0.784	10

According to from all respondents,Poor financial control of the project was the most severe Cause of Delay as it has the first rank among all Causes with RII value of 0.906.Difficulties in financing project by the contractor have been rankedby the overall of the three partyrespondentsinthesecondposition with RIIvalue equal to0.855, and Type of project bidding and award (lowest bidder) was ranked as the third significant cause with RII value equal to 0.851. A poor site management and supervision of contractors has been ranked by the overall of the three party respondents in the fourth position with RII value equal to 0.839, and Selecting inappropriate contractors was ranked as the fifth significant cause with RII value equal to 0.824. Lack of high-technology mechanical equipment has been ranked by the overall of the three party respondents in the sixth position with RII value equal to 0.820 and both Ineffective scheduling of the project by the contractor, and Inaccurate initial project scope estimate was ranked as the seventh significant cause with RII value equal to 0.804. Weak control of the project progress of the contractor has been ranked by the overall of the three party respondents in the ninth position with RII value equal to 0.788 and Contractor's staff are not adequately trained in professional construction management techniques was ranked as the tenth significant cause with RII value equal to 0.784.

3.6 Causes of Delay due to the Employer, Contractor, and consultant.

The inferential statistical method was practiced to the survey results in the above section the Employer, Contractor and Consultant different results are presented. Essential statistical tests were used to verify some basic elements in the structure of the questionnaire. These tests are described below.

3.6.1 Correlation Analysis

The strength of associations of pairs of variables under study was determined by correlation relationships. The commonly used methods for ascertaining the strength of association between two variables is the Spearman rank correlation method.

3.6.2 Spearman's Correlation

The correlation coefficient ϱ (Spearman coefficient) ranges from -1.0 to +1.0. The closer ϱ is to +1 or -1, the closer the two variables are related. The value of ϱ close to 1 implies there is the strong positive linear relationship between the two variables while the value of ϱ close to -1 shows a strong negative linear relationship between the two variables (Daud, Ahmad, &Yusof, 2009) cited in (Karim, et al., 2013).

Ideally, the correlation coefficient value of ± 1 is said to be a perfect correlation. If the correlation coefficient value lies between ± 0.5 and ± 1, it is said to have a high degree of correlation. For correlation coefficient value between ± 0.3 and ± 0.5, the degree of correlation is moderate. The small degree of correlation occurs when the correlation coefficient lies between ± 0.1 and ± 0.3. Meanwhile, zero coefficient value represents no correlation at all (Cohen, 1998).

Table 3.7: Validity test results by Spearman's rho

No.	Category	Spearman's rho
1	Contractor	0.411
2	Consultant	0.379
3	Employer	0.400

The significance of both category values were less than 0.05 or 0.01, so the correlation coefficients of both areas are significant at $\alpha = 0.01$ or $\alpha = 0.05$. It can be said that the areas are valid to measure what it was set to achieve the primary aim of the study.

3.6.3 Cronbach's Alpha

Coefficient Alpha or (Cronbach's Alpha) method is one of the most widely used methods for measuring reliability, and it supports correlation for all possible ways of dividing the measure into two halves (Polit and Hungler, 1978) cited by (Abdalaziz, 2009). As shown in Table 3.8, the summary of the

reliability coefficient of the scale was established by Cronbach's Alfa using the SPSS package, which reflected Alfa coefficient to be in the range from 0.882 to 0.947. This is considerably higher than the modest reliability in the range 0.50 - 0.60 as cited by (Akintoye&Fitzegerald, 2000). The result ensures that the questionnaire is reliable.

Table 3.8: Reliability test results by Cronbach's Alpha

No.	Category of data /Factors	Cronbach's Alpha
1	Contractor	0.882
2	Consultant	0.895
3	Employer	0.947

4 CONCLUSION

The outcome of the analysis from this study can be said to be of high relevance to the construction industry. The majority of the respondents is fully involved in the construction industry with at least five years of construction experience, meaning that the respondents have a wealth of knowledge and could supply the necessary information on the question sent out in the questionnaires according to this research study.

In this study, 65 different causes of delays were identified and ranked based on their relative important index (RII). Based on the data gathered from the questioner and analysis, 40.00% of the respondent from the contractors have the highest percentage of the responsibility for the causes of delay, while the second was the Employer that have 26.15%. The third was the consultant of 23.08% of the respondents, and lastly, 10.77% of the respondents attested that the Shared from three parties had the responsibility for the Causes of delay. The top ten most important causes of delay in Addis Ababa City Road Authority Road Projects ranked so that the party involved would have to examine their weaknesses to adjust in project implementation.

RECOMMENDATIONS

Based on the results of the study, the following recommendations are forwarded to minimize the problem associated with Delay.

□ Establish a system forfinancial control of the project and also upgrading on the financial capacity building of the construction sector.

□ Establishing centralized project information database that helps all stakeholders by giving all relevant information about the project area's status is required and the contractor work repetition.

□ Improving performance of professionals and firms through capacity building program in the construction industry like ERA Master program for professionals in road sectors. This good beginning should continue to further levels.

□ It is better to establish a system to share experience and knowledge between firms and firms as well as between contractors and contractors.

□ Capacity building of construction managers by Short term and long term training program on the spot of the project shall be practiced.

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□ Mr. Yosef Amare has earned her master's degree in Civil Engineering at the Jimma Institute of Technology, Jimma University, Jimma, Ethiopia. Email address: yosefamare139@yahoo.com

□ Prof. Emer T. Quezon is currently the Chair Holder of Construction Engineering & Management Stream at Jimma Institute of Technology, Jimma University, Jimma, Ethiopia, and he was the assistant professor at the University of Saint Louis, Tuguegarao City, Cagayan, Philippines. Also, he worked for more than 20 years at the Department of Public Works and Highways; an active regular member of the Transportation Science Society of the Philippines (TSSP), and 2nd Vice President, Philippine Institute of Civil Engineers (PICE-Cagayan Chapter, 2009-2015). Email address: quezonet09@yahoo.com

□ Mr. Mamuye Busier is currently a senior lecturer and Dean, School of Civil and Environmental Engineering at Jimma Institute of Technology, Jimma University, Jimma City, Ethiopia. Email address: mamuyebusier@yahoo.com

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