Evaluation on the Performance of Lowest Responsive Bid Contract and the Quality of Materials Used on Governmental Building Projects in Jimma Town

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Abstract— Construction industry participants have started recognizing that accepting the least bid price does not guarantee maximum value. Continuous problems of inferior quality of constructing facilities, high incidence of claims and litigation, frequentcost overruns and use of poor quality of materials have become the main features of Ethiopian's public construction work contracts.This research was undertaken to evaluate the performance of public owned construction projects awarded on a lowest bid awarding system, to determine the effect of advance payment on the contractor's performance, compare lowest and average bid systems,and check the quality of local construction materials use by lowest price won contracts. A literature review was carried out to identifydifferent practices and floated questionnaire survey and laboratory test was conducted for selected and expected materials. Twoalternative bid evaluation methods were discussed and suggested the better one from performance point of view. The questionnairewas distributed to contractors, clients, consultants and other related professional. Additionally, interviews were conducted with them.A total of 88 questionnaires were distributed, including laboratory test results for selected and expected materials found in JimmaTown. The data were collected and 80 valid questionnaires were analyzed by using SPSS-20, Excel, and laboratory test resultsrequirement. The study identified that the causes of poor performance of contractors were won projects with lowest price; thereforemore of the respondents do not like the lowest bidding method. Advance payment is the main solution to support financial problemof contractors, but instead of paying in cash, purchasing the necessary construction materials is seen as an alternative to protectcontractors from using the money to other uses. Obviously known that in the current bid awarding method of Ethiopia, most of thetime, in order to be the winner of the bid price should be lesser. This leads the bidder not to get adequate profit, this pushes them touse poor quality of local construction materials. Finally, this work provides valuable information to the Ethiopian government, clients,consultants and contractors and other stakeholders who desire to improve bidding methods; usage of advance payment; ways toimprove performance of contractors and to protect the project from contractors using poor quality of construction materials.

Index Terms— Advance payment, Bid Award System, Contractor's performance, Government Building Projects, Jimma town, Least bid price, Quality of construction materials.

1 INTRODUCTION

Currently, in Ethiopia the government project bid awarding system is frequently based on the competitive lowest bidding system. However, the construction industry plays a vital role in the national economy, this bid system and procurement is a substantial and integral element of construction project performance; it should be the issue of attention in the construction world due to time, cost overrun and quality of work associated with the construction project. So many projects fail to accomplish planned targets and objectives.

The customary practice of awarding contracts to a lowest bidder was established to ensure the lowest cost of completing a project. In public construction works, this practice is almost universally accepted since it not only ensures a lower price, but also provides a way to avoid fraud and corruption (Irtishad, 1993).

Bid type has a significant contribution to the success of projects in the construction industry, it should be the process of inviting and evaluate depends on the type of project and financial capability. On the lowest price provides contractors with an incentive to concentrate on cutting bid prices to the maximum extent possible (instead of concentrating on quality enhancing measures), even when a higher cost product would be in the owner's best interest, which makes it less likely that contracts will be awarded to the best performing contractors who will deliver the highest quality projects. The main cause of contractors, which are evaluated and responsible through the lowest responsive bidder system, is the project cost which is much lesser with engineering estimation (reasonable estimation) and this causes financial problem. To support this financial problem advance payment should be paid as alternative mechanism, but some contractors do not use this payment for the intended purpose, so, instead of paying in a raw cash it should purchase the necessary construction materials to have better performance Bid and Procurement is a substantial and integral element of Construction project performance. It has been the issue of attention in the construction world.

Selection of the most appropriate bidder for a project is a crucial challenge faced by the construction industry (Alexanderson, 2006). It is more important to identify and use a suitable bid evaluation method that considers contractors' performance to ensure successful completion of projects, will have the best performance during and after construction. Moreover, the traditional low-bid approach tends to promote more adversarial relationships rather than cooperation or coordination between the contractor, the designer and the owner, and the owner generally faces increased exposure to contractor claims over design and constructability issues (Dowel, 1990).

In today's construction environment, public sector owners are finding themselves under increasing pressure to improve project performance, complete projects faster, and reduce the cost of administering their construction programs. In response to these pressures, the Ethiopian construction industry should come up with alternative procurement and contracting methods which incorporate factors other than just price into the selection process to improve project quality and enhance performance (Ahmed, 1993).

There is emerging acceptance to award of projects to Contractors who quote low rates with anticipation of getting jobs (Hardy, S.C., 2004). Evidence suggests that this approach accounts for delay in project completion, suspension of projects, poor performance, total cost of the projects increases.

The scope of the research was focused on constraints lowest responsive contract on building construction project sites. Almost all projects are performing poorly and under liquidated damages, using poor local construction material, delay, and failure, this is the reason of financial shortage of contractors. In Jimma town there are governmental building construction projects, which are constructed by different contractors, and owners within the supervision of consultants. The major causes of poor performance of projects are by itself the system evaluation method of awarding, poor scheduling and programming during construction, missed and change of design, inviting a number of projects at once particularly for lower grade contractors. And the major causes of poor performance of lowest responsive bidders are financial problem, lower grade contractors, inviting a number of projects once and lesser project estimation. These problems may lead to the failure of the project as well as difficult to keep the given time and quality in the construction industry.

The objectives of this research work were to answer the following questions: Does the low-bid awarding system affects the performance of contractors? Does an increasing percentage of advance payment help to improve the performance of lowest responsive contract projects? Which between the lowest and average responsive awarding system results to better work performance of contractors? And does the contractorto lowest responsive bid uses materials of poor quality?

2 LITERATURE REVIEW

In Ethiopia the major purchaser of construction is the federal government. And the most common procurement method is the competitive low-bid procedure in which contracts are awarded to a responsive contractor who offers the least price. The prequalification and bid evaluation processes require the development of necessary and sufficient criteria. The last two decades have witnessed a huge development in project complexity and clients need and this has led to an increasing use of alternative forms of project delivery systems. In contrast, the prequalification and bid evaluation process, quantifying and assessment of criteria is still in its original form.

There are definite benefits and drawbacks to the low-bid award system. Promoting competition amongst contractors is a clear benefit to the process. It compels the contractors to lower their costs, usually through innovation, to ensure they win bids and maintain their profit margins. In addition, the process is beneficial specifically to the public sector because of the transparency, an important criterion of public policy (Skitomer, 1997). However, allowing projects to be awarded based on the Least price has inherent flaws. Delays in meeting the contract duration, increment of the final project cost due to high variability, tendency to compromise quality, and the adversarial relationship among contracting parties are the major drawbacks associated with responsive low bid award procedure (Gezeta.F.G, 2004). Moreover, the low-bid award system encourages unqualified bidders in the competition and in contrary it discourages qualified contractors to participate.

The goal of evaluation, competitive lowest responsive projects is to understand the outcome result. According to (Kelley, 1991) the criteria used for bid evaluation should reflect the client's objectives. These are that bids are fully responsive to the contract and bidders are sufficiently well qualified to undertake the contract. The criteria for selecting the successful bidder are then that bid, which maximizes the return

on the client's investment. Thus he has proposed that bidders should submit a schedule of the payments they expect to fall due to them during the contract.

In a survey conducted in the Oromia Regional State, non-existence of real competition during the contractor selection; excessive time overruns; compromising quality; and escalation of the final project cost of the estimated cost were the major problems associated with the existing approach of delivering projects (Mosissa, L, 2006). Poor initial funding of the project by the contractor and lack of timely resources of materials, machineries and workforces is also the major factors identified as causes of delays during the construction phase in the Ethiopian construction industry (Kelley, M.N. 1991).

The construction process involves multi-organizational activity. Conflict and disputes can therefore exist at all levels in the contractual chain: between client and consultant, client and contractor, client and sub-contractor, and so on. Among the many causes of disagreements in the construction project, the project delivery system selected is one of the significant elements (Herbsman, Z. R, 1992).

2.1 Comparison, Issues and Concerns

Bidding procedures are basically of two types: competitive and negotiated. Most of the other procedures are either variation of, or somewhere between these two extreme types. In pure competitive method, the contract is awarded to the lowest-bidder, if the bidder is found to be responsive. In pure negotiated method the price is negotiated with a selected contractor. To minimize the shortcomings of these two extreme types, modifications have been proposed and tried in many countries. For the purpose of this research, the following contract-award procedures are considered:

1) Competitive Low Bidding
2) Competitive Average Bidding

2.1.1 Competitive Low Bidding (Price-based)

Low Bid Method in the procurement process, a standard practice for many organizations who are interested in using the competitive nature of bidding is to keep procurement costs low. The competitive bidding process for awarding construction contracts is typically based on the low bid method. According to this method, the construction firm submitting the lowest bid receives the right to the construction contract, i.e. the contract is awarded to the responsive and compliant bidder that is willing to fulfill the terms of the contract for the lowest value. Currently, the public sector procurement of construction is largely based on the lowest bid award system. The customary practice of awarding contracts to a lowest bidder was established to ensure the lowest cost of completing a project. In public construction works, this practice 126 Journal of the Institute of Engineering is almost universally accepted since it not only ensures a lower price, but also provides a way to avoid fraud and corruption (Irtishad, 1993). There are definite benefits and drawbacks to the low-bid award system. Promoting competition amongst contractors, compelling contractors to lower their costs, usually through innovation are clear benefits in the process. In addition, the process is beneficial specifically to the public sector because of the transparency, an important criterion of public policy. However, allowing projects to be awarded based on the Least price has inherent flaws. Delays in meeting the contract duration, increment of the final project cost due to high variability, tendency to compromise quality, and the adversarial relationship among contracting parties are the major drawbacks associated with low-bid award procedure. Lowest bid price as the sole award criterion encourages unqualified contractors to submit bids (Hatush and Skitmore, 1997) along with bidders that submit a very low bid with the intent of recovering their losses through change orders and claims, also known as predatory bidding (Nmez and Yanh, 1995). Therefore, the low bid is not necessarily the best value. The major drawback of the low-bid method is the possibility of awarding a construction contract to a contractor that submits either accidentally or deliberately, an unrealistically low bid price. Often, such an occurrence works to the owner's and contractor's detriment by promoting disputes, increased costs, and schedule delays (Photois, 1993).

2.1.2 Competitive Average Bidding (Price-based)

On the average-bid method, contract is awarded to the contractor whose price is closest to the average of all bids submitted. In general, the winner based on the average bid method is the contractor whose bid satisfies a certain relationship with the average of all bid prices. Different average bid methods use different procedures for calculating the average, or use different criteria for determining the winning bid. For example, some use an arithmetic average or a weighted average, while others use the average of the remaining bids after all bids that differ more than a certain percentage of the average of all other bids are eliminated. Similarly, the winner might be the contractor whose price is closest to the average, or the contractor whose bid is closest to, but less than the average.

A variation of the competitive low bid method of awarding contracts is based on the principle that the best bid is the bid which is closest to the average of all bids, and not the bid which is highest or lowest. Bids which fall too far below the mean are considered to be unrealistic underbid. Bids which are much higher than

the average are considered to be unrealistically overpriced. Methods based on this principle are very common and known, in general, as European Methods (Irtishad, 1993).

The basic philosophy behind the average bidding procedure is that the best bid is the one closest to ensure that the contractor is responsible, to avoid contractor-failure, and to reduce disputes and claims.

The underlying principle is that the contractors should get a reasonable and realistic price for their work. It is assumed that with a fair price they would conform to the quality requirements of the project, would complete on time, and would not have adversarial relationships with the consultant of the employer.

2.2 Advance Payment

FIDIC Sub Clause 14.2: For the Advance payment to be applied to a contract, one of the following must be established:Advance payment is an interest free mobilization loan from the Employer to the Contractor. Advance payment can either be paid in one installment or multiple installments to a Contractor. Where multiple installments are intended, it is mandatory to state it in the Appendix to Tender, and specifying the number of installments, and the time to pay the installment to the Contractor. Also the applicable currencies and proportions in the case of multiple currencies must be stated in the Appendix to Tender.

For the Advance payment to be applied to a contract, one of the following must be established:
1. The Employer must have received a guarantee covering the Advance payment from the Contractor, i.e. an APG (Advance Payment Guarantee) must be provided by the Contractor.
2. The total Advance payment sum must be stated in the Appendix to Tender.

Advance payment recovery can only commence when the addition of all certified interim payments exceeds Ten percent (10%) of the Accepted Contract Amount (initial contract sum) less Provisional sums. The certified interim payments to be added together must be exclusive of the Advance payment, deductions and retention sums.

The rate of recovery or amortization of Advance payment shall be 25% of each payment certificate sum less retention, deduction and Advance payment sums. The amortization must be applicable currencies or proportions (in case of multiple currencies) and continued to be carried out until the advance payment has been fully repaid. Advance payment recovery or amortization is exclusive of retentions, statutory deductions and the Advance payment; hence they must be adjusted in valuations. It is important to note that the Contractor may gradually reduce the amount of APG as he repays the advance payment to the Employer, but must ensure that the APG is valid and enforceable until full repayment of the advance payment is carried out. There is no specific percentage or amount to be given to a Contractor as advance payment, but it is good practice not to give more than 40% of the contract sum.

In Nigeria the Federal Government through the BPP Act allows a maximum of 15% of the contract sum as the amount to be given as advance payment on construction contracts.Federal Public Procurement Directives regulate on Articles 28(1)-(4), some extent, the modality of advance payments. It provides, for example, that the advance payment in the procurement of government contracts may not exceed 30% of the contract price; so that contractors and suppliers should submit an Advance Payment Bond by way of C.P.O.

2.2.1 Interim Payments

Interim payments are made at a prescribed stage or at intervals during the progress of a project. The interim payments may have an element of prepayment and so public sector organizations should consider them carefully before agreeing to them. However, if they are genuinely linked to work completed or physical progress satisfactorily achieved, preferably as defined under a contract, they may represent an acceptable value of public funds. The following points should be considered before agreeing to interim payment arrangements:

- Whether the contractor's reduced need for working capital should be reflected in reduced prices;
- Contracts might describe interim payments as payments on account towards the total price rather than a final payment for the part of the work done - this will make them subject to review and recoverable if necessary; and
- Interim payments should be related to value received and delivery of tangible outputs, including transfer of ownership of assets, rather than simply the passage of time.

2.3 Standard Specification for Building Materials

2.3.1. Fine Aggregate (Sand)

Fine aggregate shall consist of natural sand, manufactured sand or combination of both.

2.3.1.1. Grading Requirement

Fine aggregate shall fulfill the grading requirement given below.

Table 2. 1 Sieve requirements

Sieve size (mm)	ASTM C-33-02a (% passing)
9.50	100

4.75 (No. 4)	95-100
2.36 (No. 8)	80-100
1.18 (No. 16)	50-85
0.60 (No. 30)	25-60
0.30 (No. 50)	5-30
0.15 (No. 100)	0-10

2.3.1.2 General Requirement

Fine aggregate shall full fill the following requirements when tested by the following methods

Table 2.2 General requirement of Fine Aggregate

Item No.	Types of test	Method	Allowable limits
1	Organic impurity content	ASTM C 40	Max plate No. 3 (ASTM C 33)
2	Silt and clay content a) For concrete subjected to abrasion b) All concrete	ASTM C 117 "	 Max 3% (ASTM C 33) Max 6% (ASTM C 33
3	Clay lumps and friable particles	ASTM C 142	Max 3% (ASTM C 33)
5	Finesses modules a) Fine sand b) Medium sand c) Coarse sand		 2.20-2.60 2.60-2.90 2.90-3.20
6	Chloride content (max)	BS 812	600 mg/liter
7	Sulfate content	BS 812	1000 mg/liter

2.3.2 Coarse Aggregate

Coarse aggregate shall consist of gravel, crushed stone. It shall confirm the following grading requirement as shown in Table 2.3 for (ASTM C 33).

2.3.2.1 General Requirement

Coarse aggregate having test results exceeding the limiting value in the table below. It should fulfill the following requirements when tested by the method adopted.

Table 2. 3 General Requirement of Coarse Aggregate

Item No.	Types of test	Test method	Allowable limits
1	Coal and lignite content	ASTM C 142	1% (ASTM C 33)
2	Clay limps and fibber particle content	ASTM C 142	1% (ASTM C 33)
3	Dust content	ASTM C 117	1% (ASTM C 33)
4	a) Soundness test by Sodium sulfate (Na_2 so4) b) Soundness test by Magnesium sulfate (Mg so4)	ASTM C 117 ASTM C 117	Max 12% (ASTM C 33 Max 12% (ASTM C 33
5.	Los Angeles Abrasion (%) wears a) For aggregate to be used in concrete for wear surfaces b) For aggregate to be used in all other concrete work	ASTM 131 "	 Max 30 (ASTM C 33) Max 50 (ASTM C 33)
6	Aggregate crushing value		
7	Flakiness index	BS 812	Max 30% (BS 812)
8	Aggregate impact value a) For concrete subjected to wearing surfaces b) For other concrete	 BS 812 BS 812	 Max 30 % Max 45 %
9	Chloride content (max)	BS 812	600 mg/lit (BS 812)
10	Sulfate content	BS 812	600 mg/lit (BS 812)

2.3.3 Specific Gravities

Specific gravity of cause aggregate is the ratio of density of saturated surface dry of the aggregate to the distilled water at a stated temperature.

In the computation of quality for concrete mixes, it is the specific gravity of saturated surface dry aggregates that always used. The specific gravities of the few types of rocks are given below.

Table 2. 4Bulk specific Gravity Requirement

Rock group	Bulk specific gravity	
	Average	Range
Basalt	2.75	2.70 - 2.90
Granite	2.65	2.60 – 2.70
Limestone	2.65	2.60 – 2.70
Sandstone	2.50	2.0 – 2.60

2.3.4. Water Absorption

The absorption capacity is a measure of the porosity of an aggregate. Approximate values of absorption capacity of some types of aggregate are given below.

Table 2.5 Water Absorption Requirement

Material	Absorption capacity % by weight.
Band	0-2
Gravel	0.5 – 1
Basalt	0 – 0.5
Granite	0 – 0.5
Sandstone	2 - 7

2.3.5 Unit weight

Table 2.6 Unit weight Requirement

Material	Unit weight (kg/m³)
Sand (dry)	1320 – 1680

Gravel	1280 – 1440
Crushed stone	1250 - 1460

3RESEARCH METHODOLOGY

The study was conducted in Jimma Town which is one of the 17 zones in the Oromia Regional State, Ethiopia. The research was conducted on Governmental Building projects which are under construction and evaluated by lowest responsive bid contract. In this reserach, participating respondents (contractors, consultants, clients and other civil engineer professionals) were included by different mechanisms like questionnaire, interview, site observation and laboratory tests were conducted.

The study adopted purposive sampling technique to select the contractors, consultants, clients and other civil engineer professionals. This was preferred because purposive sampling allows the researcher to select respondents who have good knowledge about the subject in question. Besides, looking at the nature of building construction industry, the study seeks to solicit information from a section of the population of contractors, consultants, clients and other professionals who have experience in building construction in Jimma town to know the efficiency and performance of the construction sites, their effective understanding about lowest responsive bid evaluation depending with performance and the effect of advance payment for their operations. This resulted in the selection of all 18 governmental ongoing building construction project sites in Jimma town, which was constructed from different grade of contractors and supervised by different consultants and owners.Therefore, the respondents to the questionnaires were targeted professionals and managerial level personnel such as managing directors, project managers, site and office engineers, resident engineers, quantity surveyors, foremen, and project owners who are working on building construction projects in Jimma town.

3.1 The Questionnaire

The first section which is the "General Information" dealt with the demographics with respect to firms, professional background of respondents, and years of experience in building construction, organizational categories, positions of the respondents and general views on the lowest responsive contract system. This aspect was deemed necessary in order to ascertain the reliability and credibility of the data and as a result, be used to correlate performance and satisfaction with the test system among different groups of users.

The second section, "Major activities on the performance impact of lowest responsive contract projects on building construction sites" asked more specific questions in relation to objective of this study. This aspect covered activities to the causes of poor performing on building construction project sites. It employed the five point type Likert ordinal scale to measure the level of usage by responding firms from "Strongly Disagree" to "Strongly Agree" that is, 1= Strongly Disagree, 2= Disagree, 3= Neutral, 4= Agree, 5= Strongly Agree.

The third section, "Effects of advance payment to contractor performance'' inquires about to solve financial problem. This is in relation to financial problem is one of the major cause for poor performing, and methods of payment and the percentage assist in better performance. It employed the two point scale to measure the level of usage by responding firms from "Yes" or "No" that is, 1= Yes, 2= No.

The fourth section is "Comparison of lowest and average competitive bidding system". The average competitive bidding was the previous bidding system in Ethiopia, but lowest competitive bidding is the current method used, so, this is to compare both awarding systems for better contractor performance. It employed the three point scale to measure the level of usage by responding firms from "Yes" or "No" that is, 1= Yes, 2= Sometimes, 3= No.

The fifth and the final section, "Comparison Evaluation of quality of construction materials" even though, the bill of quantity and the design order the quality of material, with the reason of shortage of finance and other issues the contractor may try to use cheaper materials. This is to check used materials with laboratory test as well as this questionnaire. It employed the scale "Never" to "Strongly Agree Always" that is, 1= Never, 2= Not Always, 3= Average, 4= Quite Always, 5= Strongly Agree Always.

3.2 Data Processing and Analysis

Data collected from the questionnaires were analyzed using the methods of descriptive and inferential statistics. These include Frequency Analysis, Mean/average Index Score and laboratory test were conducted for selected construction materials. In order to generate the result, this research study had been used Microsoft Excel and SPSS20.

3.2.1. Frequency Analysis

Under frequency analysis, descriptive statistical methods such as tables and charts were used to analyze the responses from the questionnaire.

3.2.2. Mean Index Score

The mean index score was used to rank the variables of interest based on the scores assigned by the respondents. According to (Egbu and Botterill, 2002; McCaffer and Edum-Fotwe, 2001), the formula is very popular with researchers in the construction management practice. The factors are then ranked according to the formula below using Excel.

The mean score is calculated as follows:

$$\text{Mean Score (I)} = I = \frac{\sum a_i x_i}{\sum x_i} \quad (1)$$

Where I=Mean Score; a=Rank of event, i; and x=frequency of event i. With this formula, the events measured here include: Major Activities on performance related to cause advance payment, bid type and quality of construction materials on building construction project sites.

3.3. Reliability of data

The reliability of an instrument is the degree of consistency (Polit& Hunger 1985) as cited on (Hammad 2013). In data sources. The methods used in this study were from different sources and one data supports the other data. For questionnaire it is essential to check the internal reliability of data (Creswell 2003).

The less variation, an instrument produces in repeated measurements of an attribute, the higher its reliability (Hammad 2013). Cronbach's Coefficient Alpha can be used to check the reliability of the questionnaire in order to have accurate finding. The normal range of Cronbach's coefficient alpha value between 0.0 and + 1.0, and the higher values reflects a higher degree of internal consistency (Hammad 2013). The equation used to analyze Cronbach's Coefficient Alpha is

$$\alpha = \frac{Kr}{1+(K-1)r} \quad (2)$$

Where K is items (variables) in the scale; and r is the average of the inter-item correlations.

For major activities on construction materials managements and ICT level of usage, the value of Cronbach's Coefficient Alpha analyzed using SPSS20 shows the questionnaire is reliable and most are highly reliable.

4 RESULTS AND DISCUSSION

The data obtained from the field survey were analyzed through a five-point Likert-type scale to measure a range of opinions from ''strongly disagree'' to ''strongly agree'', from "Never" to "Always" and from "Very weak" to "Very strong" as used in the other studied areas.

Table 4.1Detail of Questionnaires administered and returned

Respondents	No of questionnaires sent to respondents.	No of questionnaires returned.	Response rate (%)
Total	88	80	91%

4.1 Main Questionnaire Administration

4.1.1 Academic Qualification of Respondents

Concerning professional backgrounds of the respondents, the academic qualifications comprised diploma (10%), bachelors degree (62.5%), and masters degree (27.5%) and there were no qualifications below diploma or above masters degree.

4.1.2 Experience of respondents

Regarding the work experience of the respondents surveyed, the majority of the respondents (about 32.50%) had worked in the construction industry with less than 5 years, 47.50% between 6-10 years, and 16.25% between 11-15 years. Only 3.75% of the respondents indicated professional experience of over 16 years.

4.1.3 Position of respondents in the organization

Considering the current positions in their construction industry, 2.5% were managing directors, 7.5% project managers, 21.25% office engineers, 15% Site Engineers, 35% resident engineers, 2.5% quantity surveyors, and 16.25% others like Foremen, supervisors, project inspectors. The high representation of resident engineers, office engineers, site engineers and project managers was inevitable as these are the very key professionals usually engaged in the construction industry in Jimma Town.

4.1.4 Classification of Firms in the construction Business

Concerning organizations' classification of respondents, it shows that the majority were a corporation (47%), governmental/public organization (33%), private (16.1%) and the minorities were other firms (3.9%).

4.2 Reliability Check - Cronbach's Alpha

SPSS 20 was used to run the value of Cronbach's Alpha and the results for performance, advance payment, bid type and quality are shown in Table 4.2. The computed values are greater than 0.5 which revealed that the questionnaires are highly reliable.

Table 4.2 Cronbach's Alpha for Questionnaires

No	Factors to be evaluated	*Cronbach's Alpha*
1	Performance	0.761
2	Advance Payment	0.927
3	Bid Type	0.786
4	Quality	0.919

4.3 Causes of Poor Performance in Building

This part examined the problems associated with building construction project sites. The statistical

analysis employed in this situation was the Mean index score.

Table 4.3 Identified causes of poor performance in building construction project sites

Causes of Poor Performance	Mean	Std.	Ranking
Financial shortage of contractors	4.62	0.609	1
Unreasonable (less) estimation of project cost	4.28	0.698	2
Awarding a number of projects at a time	4.16	0.689	3
System of awarding by lowest responsive contract	4.11	0.769	4
Lack of initiative between staffs	4.10	0.879	5
Unfair estimation of project contract period	3.94	1.045	6
Poor scheduling during construction	3.92	0.754	7
Missed and change of design	3.92	1.091	8
Unreasonable estimation for variation works	3.91	0.976	9
Financial shortage of client	3.89	0.850	10
Lack or shortage of cooperation from client	3.86	0.863	11
Inefficient utilization of construction material	3.79	0.836	12
Lack of proper work planning and scheduling	3.74	0.883	13
Selection of lower grade of contractor	3.73	0.808	14
Lack of creative on site	3.72	0.844	15
Delay in material supply to sites	3.66	1.072	16
Rework due to improper quality and mistakes	3.64	0.954	17
Poor relation between client, consultant and contractor	3.64	1.136	18
Unfair supervision, influence on site	3.62	0.897	19
Poor security on site (thief, …)	3.59	0.941	20
Inadequate supervision in usage of materials and equipments	3.52	0.769	21
Variance between bill of quantity and design	3.43	0.933	22
Frequency of varied works	3.43	1.229	23
Lack of claim engineer	3.36	0.873	24
Poor performing of sub-contractors	3.30	0.903	25
Shortage of hard currency	3.29	0.890	26
Lack of safety controller on sites	3.21	0.978	27
Usage of poor quality of material	3.16	0.973	28
Existing unnecessary construction materials and equipment on site	3.14	0.794	29
Nationwide construction material shortage	3.07	0.872	30
Communication habit on verbal (without written)	2.98	0.911	31
Bad weather condition	2.93	0.914	32
Average mean	**3.65**		

Based on the results of survey, the most well-known activities identified and highly occurred causes associated with building construction project sites in the respondents' organizations are financial shortage of contractors (with mean=4.62), Unreasonable (less) estimation of project cost (4.28), Awarding a number of projects at a time (4.16), System of awarding by lowest responsive contract (4.11), Lack of initiative between staffs (4.10), Unfair estimation of project contract period (3.94), Poor scheduling during construction (3.92), Missed and change of design (3.92), Unreasonable estimation for variation works (3.91), Financial shortage of client (3.89), Lack or shortage of cooperation from client (3.86), Inefficient utilization of construction material (3.79), Lack of proper work planning and scheduling (3.74), Selection of lower grade of contractor (3.73), Lack of creative on site (3.72), Delay in material supply to sites (3.66). Generally, the findings from the questionnaire survey showed that almost all Standard Deviation values are less than 1. This indicates which causes of poor performance most respondents agreed on it, particularly above the average mean value (3.65) highly affect the performance of contractors in building projects which are evaluated by lowest responsive bidding.

4.4. Analysis to determine the effect of advance payment on contractors' performance.

The measures for the effect of advance payment on lowest responsive contract building construction project sites in the town was analyzed using Microsoft excel software. The measures of effectiveness were also calculated based on a scale of 1-2 ("Yes" and "No").

The following are the questions for this objective. For each question there are indications with the Figures in some. Based on Figure 4.1 below, even though there are a lot of causes for the poor performance of the contractors, from the total 80 respondents 77 (more than 96%) have a positive response, this shows financial shortage is the main and major cause for poor performing contractors, that won the project by lesser cost. Because in order to be the winner the cost must be lesser with other bidders; this will be the challenge for contractors during execution of the project.

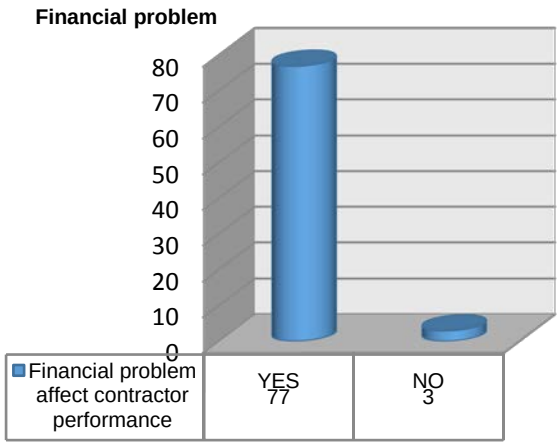

Figure 4.1 Financial problem affecting contractors' performance

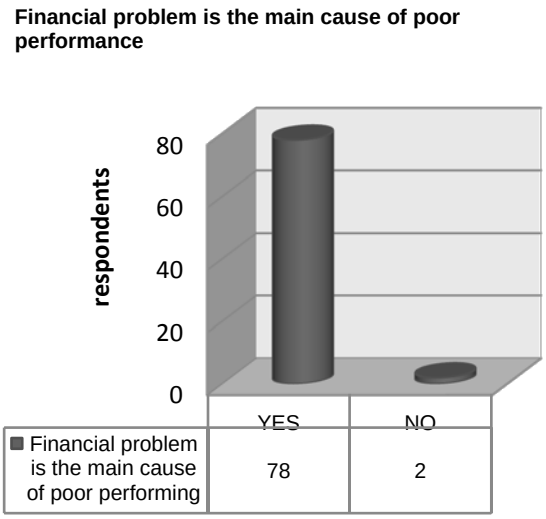

Figure 4.2 Financial problem as main cause

Based on Figure 4.2 above, from the total 80 respondents 78 have a positive response, it indicates that almost all agreed that financial problem is the main cause why contractors are performing poorly.

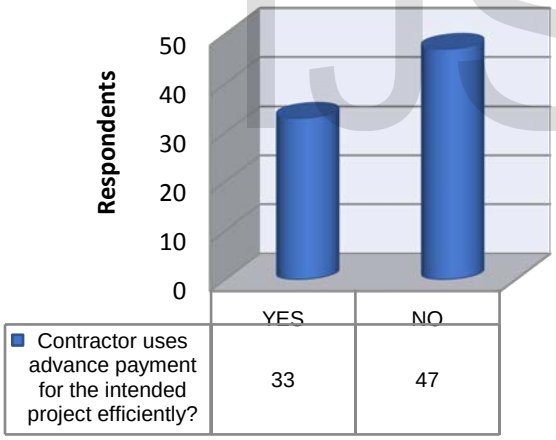

Figure 4.3 Contractor uses advance payment for the intended project

Based on Figure 4.3, the response shows that, more than half of the respondents agreed that the contractors do not use advance payment for exacting project efficiently. This lead to understanding that even advance payment is necessary, but for better performance of contractors, payment method should be systematic.

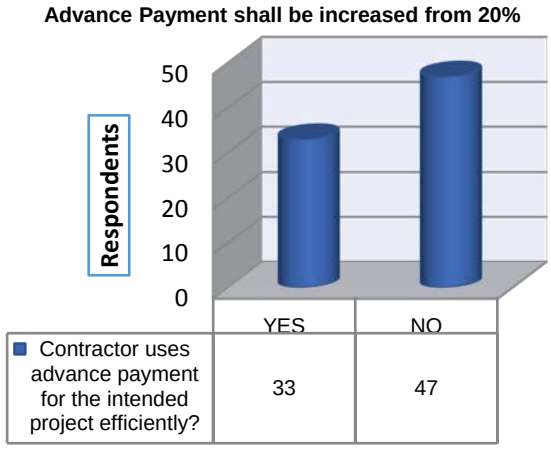

Figure 4.4 Advance payment

Based on Figure 4.4, although the procurement in Ethiopia the maximum limit of advance payment allowed is up to 30% in most projects but the client pays not more than 20%. Even though, the contractors are not using advance payment, particularly for the project intended, most respondents believed increasing percentage of the advance payment or paying the maximum limited percentage helps to improve the performance of the contractor.

For the succeeding questions (Figures not shown) the number of responses and analysis were provided:

Is paying the total amount of the advance payment at one time help the contractors' performance? For this question, 15 (18.75%) answered Yes and 65 (81.25%) answered No. Advance payment and increasing the percentage from usual percentage of 20% are useful for better performance, but most respondents did not assent with pay all amounts at once. Because, as mentioned above, those contractors who may not use the money for the target project. Paying the total amount of cash advance at once will be risky for the client if the project is terminated.

Does step by step payment of the advance payment, useful for clients as well as contractors' performance? For this question, 62 (77.5%) answered Yes and 18 (22.5%) answered No. Based on the response, unlike in the immediately preceding question, instead of paying all amounts at once, step by step payment is a better method of paying advance payment depending on the executed activities. This is useful to the client as well as to the contractors' performance.

Is raw cash advance payment good to be used to purchase construction materials for better contractors' performance? For this question, 79 (98.75%) answered Yes and 1 (1.25%) answered No. Most respondents

agreed on paying advance payment, but, there is different idea because the contractors mostly do not use the payment for the intended project. So, instead of paying in cash it is useful to purchase the materials which will be utilized for the project. It is a mechanism to control the contractor from using the advance payment for other purpose(s).

Is the percentage of advance payment shall not be more than 10% of reduce risk of client? For this question, 27 (33.75%) answered Yes and 53 (66.25%) answered No. Most respondents disagreed on decreasing the percentage of the advance payment below 10% even if it makes the client safer during the occurrence of termination of the project.

Is the maximum percentage of advance payment shall not be more than 30% for better performance? For this question, 66 (82.5) answered Yes and 14 (17.5) answered No. According to the respondents advance payment helps in better performance, but there should be limits on the percentage- should not be lesser than 10% nor higher than 30% for differing issues. In this question response shows increasing the percentage to higher than 30% is not useful.

Is advance payment accepted to start release after half of the project has been executed?For this question, 76 (95%) answered Yes and 4 (5%) answered No. This response shows that advance payment improves the performance because most of the time the cause of poor performing contractor is financial shortage, most contractors have no financial problem upon starting. The problem happens after some project life, because of this the payment shall be paid after executing half of the activity of the project.

4.5 Analysis comparison of competitive average and lowest bidding system for better Performance in Building Construction Project Sites.

This part examined and compared both bid types associated with building construction project sites. The statistical analysis employed in this situation was the Mean index score.

Table 4.4 Comparison which two bid types (Lowest Responsive Bidding or Competitive Average Bidding) are better

Questions	Mean	Standard Deviation	Ranking
Competitive average bidding winner price is closer to a reasonable price, and helps in better performance	4.94	0.269	1
The lowest responsive contract doesn't help for client finish the project with good quality	4.90	0.387	2
Project cost of, which evaluated by the lowest bidding method is under reasonable price	4.89	0.372	3
Do you prefer Competitive average bidding evaluation system rather than Competitive lowest bidding evaluation system?	4.87	0.436	4
The final project cost of lowest bid is higher than evaluating through average bid	4.87	0.414	5
The lowest responsive method doesn't help client finish the project with lesser price	4.86	0.465	6
The lowest responsive method doesn't help client finish the project within given contract time	4.86	0.590	7
Both client and contractor are not benefitting by lowest responsive contract as planned.	4.85	0.492	8
Projects responsive by lowest bid method mostly the delay is twice of the given contract time	4.79	0.567	9
Lowest bid evaluated projects have always disputed between contractor and any of the parties	4.77	0.559	10
Most lesser price projects incur dispute, claim and termination on project duration	4.76	0.596	11
In competitive lowest bid most unqualified bidders may attend	4.04	1.098	12
Are you satisfied with Competitive lowest bidding evaluation system?	1.76	0.899	13
Or, both should be changed with another better alternative?	1.71	0.952	14
Average mean	**4.35**		

Based on the above criteria in Table 4.4, there are 14 questions used to compare both competitive average and lowest bidding systems concerning with improvement to the performance of responsive contractors, and the mean index score of the respondents' level of responses. Mean ratings on the identified "the better" were calculated based on a scale of 1-5 (from "Never" to "Strongly agree always") on the average, a mean deployment index of 4.35 from 14 questions, 11 questions help to compare and understand which bid type is useful for better performance during construction, particularly in building projects.

The Competitive average bidding winner price is closer to reasonable price, and helps for better performance has mean value of (4.94), Lowest responsive contract doesn't help client finish the project with good quality (4.90), Project cost of, which evaluated by lowest bidding method is under reasonable price (4.89), Do you prefer Competitive average bidding evaluation system rather than Competitive lowest bidding evaluation system (4.87), Lowest responsive method doesn't help client finish the project with lesser price (4.86), Lowest responsive method doesn't help client finish the project within given contract time (4.86), Both client and contractor are not beneficiting by lowest responsive contract as

planned (4.85), Projects responsive by lowest bid method mostly the delay is twice of the given contract time (4.79), Lowest bid evaluated projects has always dispute between contractor and any of the parties (4.77), Most lesser price projects incur dispute, claim and termination on project duration (4.76). According to those responses, it can be decided which bid type is the better alternative for contractors performing better during project execution, even though the remaining responses were the least identified causes, and the findings from the questionnaire survey identified almost all Standard Deviation values are less than 1. This indicates that competitive lowest responsive bidding are the cause of poor contractors' performance. And also based on the interview almost all lowest responsive contractors won the bid with unreasonable price, because of this it highly influenced the performance of contractors.

4.6 Analysis to check the quality of construction materials with bill of quantity of lowest responsive bidder's project.

Table 4.5 Evaluation of the Quality of Construction Materials

Questions	Mean	Standard Deviation	Ranking
Use poor quality of sand?	4.53	0.721	1
The reasons of using local construction materials because of smaller price?	4.48	0.722	2
Use poor quality of electrical fittings?	4.48	0.735	3
Use poor quality of sanitary fittings?	4.35	0.866	4
Use poor quality of cement?	4.34	0.818	5
Use poor quality of rebar?	4.30	0.748	6
Use poor quality of Metal work (LTZ) thickness?	4.28	0.766	7
What do you think, the contractor tries to use poor quality manufactured material?	4.26	0.797	8
If yes, Hollow concrete block (HCB)?	4.26	0.785	9
Financial problem because of use of poor construction material?	4.24	0.791	10
Use poor quality of Water?	4.10	0.976	11
Use poor quality of Corrugated iron sheet (CIS)?	3.82	0.918	12
Use poor quality of Mechanical fittings?	3.78	1.000	13
A contractor uses those construction materials?	3.68	1.189	14
Any crisis has been happened with cause of usage of those materials?	3.42	1.199	15
Use poor quality of Aggregate?	3.25	1.574	16
How do you think, some construction materials Like; sand, aggregate, brick are capable the quality standard?	3.15	1.460	17
If yes, because of lack of supervision?	1.50	1.119	18
Average mean	**3.90**		

Based on the above criteria on Table 4.5, there are 18 questions used to evaluate the usage of construction materials of lowest responsive contractors, and the mean index score of the respondents' level of responses. Mean ratings on the identified "the better" were calculated based on a scale of 1-5 (from "Strongly agree always" to "Never") on the average, a mean deployment index of 3.90. From 18 questions 11 questions help to evaluate and understand the quality of selected construction materials, which are evaluated and responsive through lowest bidding in Jimma town governmental building projects.

According to the values of mean index, Use poor quality of sand (4.53), The reasons of using local construction materials because of smaller price (4.58), Use poor quality of electrical fittings (4.48), Use poor quality of sanitary fittings (4.35), Use poor quality of cement (4.34), Use poor quality of rebar (4.30), Use poor quality of Metal work (LTZ) thickness (4.28), What do you think, the contractor try to use poor quality manufactured material (4.26), If yes, Hollow concrete block (HCB) (4.26), Financial problem because of use of poor construction material (4.24), Use poor quality of Water (4.10). Those listed above are the main causes or the direct effect of why building contractors, which are evaluated by lowest responsive bidding type in Jimma town, have poor performance. However the remaining with listed average, mean value of less than of 3.90 are the least identified causes. And the findings from the questionnaire survey identified almost Standard Deviation values are less than 1. This indicates that most contractors evaluated by lowest responsive bidding system is using poor quality of construction materials which are found locally as well as manufactured and the price are the lowest and poor in quality.

4.3.5. Laboratory Test Results

Table 4.6 Silt Content Test Result for Sand

Source of material	Type of test conducted	Test result value	Allowable limits (ASTM C33)	Evaluation
Sand from Teji	Silt content	6.54	Max 5%	Reject
Sand from Asendabo	Silt content	7.56	Max 5%	Reject
Sand from Achamo	Silt content	2.44	Max 5%	Fit

Table 4.7 Sieve analysis test for different types of sand

Source of material		Sieve Size (mm)	% pass	Allowable limits (ASTM C33) /D3.201,% pass)	Evaluation
Achamo	3/8''	9.50	100	100	
	No 4	4.75	99	95-100	
	No 10	2.36	95	80-100	
	No 16	1.18	87	50-85	
	No 30	0.60	63	25-60	
	No 50	0.30	32	10-30	
	No 100	0.15	14	2-10	
Teji	3/8''	9.50	98	100	
	No 4	4.75	98	95-100	
	No 10	2.36	81	80-100	
	No 16	1.18	65	50-85	
	No 30	0.60	29	25-60	
	No 50	0.30	10	10-30	
	No 100	0.15	6	2-10	
Asendabo	3/8''	9.50	97	100	
	No 4	4.75	94	95-100	
	No 10	2.36	86	80-100	
	No 16	1.18	72	50-85	
	No 30	0.60	34	25-60	
	No 50	0.30	12	10-30	
	No 100	0.15	3	2-10	

Table 4.8 Flakiness Index Test for Crushed Aggregate

Source	Test type	Lab. Result	Allowable limits	Evaluation
Crushed Aggregate	Flakiness index	38	Max.30%	Reject

Table 4.9 Water absorption Test for Solid Brick

Source	Dimension L*W*H (M)	Initial weight (gm)	Final weight (gm)	Difference (gm)	Absorption (%)
Jimma town	0.06*0.12*.024	1541	2142	601	39.00
		1767	2449	682	38.60
		1795	2490	695	38.70
		1798	2440	642	35.70
		2717	3150	433	15.90
Average					**33.60**
Allowable Limits					**Max 8%**

Table 4.10 Compressive Strength Laboratory test results for HCB

Class	Sample	Weight (Kg)	Compressive Strength	Evaluation
			(MPa)	
B	1	13.45	3.19	Individually not fit
	2	13.84	3.15	Individually not fit
	3	13.21	3.76	Individually fit
	4	14.12	3.12	Individually not fit
	5	13.94	3.43	Individually not fit
	6	13.86	3.77	Individually fit
Average Result			**3.41**	
Average Requirement			**3.50**	Reject
Individual Requirement			**3.20**	Most not fit
C	1	12.85	2.09	Individually not fit
	2	13.02	2.13	Individually not fit
	3	13.21	2.24	Individually fit
	4	13.56	2.08	Individually not fit
	5	12.94	2.16	Individually not fit
	6	13.15	2.11	Individually not fit
Average Result			**2.14**	
Average Requirement			**2.20**	Reject
Individual Requirement			**1.80**	Almost all not fit

For electrical and sanitary fittings, most of the time it is difficult to conduct on site, but it shall be checked in the specified brand on BOQ. For cement, contractors were trying to use PPC cement type instead of OPC cement type of structural concrete. This practice is not allowed in the structural design requirements.

5 CONCLUSION

This research investigated evaluation on lowest responsive contract on governmental building construction project sites. The following were concluded from the conducted research:

- Financial shortage of contractors, Unreasonable (less) estimation of project cost, Awarding a number of projects at a time for lower grade contractors, mismatching BOQ and design, system of awarding by lowest responsive contract, Lack of initiative between the employees were highly identified problems in building construction

project sites; while Financial problem is the main cause of contractor's poor performance but, increasing percentage of the advance payment to more than 20% (but not exceeding 30%) has a role to improve the performance.

- The competitive lowest bid system has the most highly identified causes of contractors' poor performance because of initial low project cost which eventually needs for additional money for operations. This creates dispute, the quality of the project is compromised, and causes delays and failure of the project.
- Most contractors in Jimma town, which won the project by lesser price have used poor quality of local construction materials like sand, HCB, brick, aged cement. Teji and Asendabo source sand do not satisfy the silt content requirement. But, an Achamo sand source achieve the requirement of silt however, it does not satisfy for the result of the sieve analysis laboratory test, it's too fine below the requirement. For crushed aggregate also doesn't satisfy the requirement of flakiness index. In Jimma town locally manufactured brick is not properly following the standard during manufacturing (not burned on the required temperature). As shown in the laboratory result allowable absorption limit for individual tiles shall not exceed 8%, but the result is too higher than the requirement. In addition they try to use cheap electrical and sanitary fixtures, lesser thickness LTZ materials.

6 RECOMMENDATION

On the basis of findings and conclusions drawn from the study, the following recommendations are proposed:

- The main problems or causes of poor performing contractors, awarded by competitive lowest responsive bid system, is the shortage of finances and demand for an increase of the percentage of advance payment. But instead of paying cash advance in raw cash, purchase of construction materials to be utilized in the project is seen as an alternative and the main method to support them.
- Since few years competitive lowest awarding system has been applied to minimize the cost of projects, but now the Ethiopian government shall get back using Competitive Average Awarding system nationwide, because projects initially of lesser cost would lead the project with poor quality, create time and cost overrun. If the cost of the winner evaluated by the lowest responsive bid system is too less with reasonable (engineering estimation) the bid offer shall be rejected.
- The strong and experienced supervisor should be assigned on site as well as to approve samples for electrical and sanitary fixtures. Give attention on the quality of some, but frequent use construction materials like; sand, brick, aggregate, HCB and the thickness of metals shall be checked with a calliper carefully, because there is too much difference in cost. Sand is an important construction materials and in using this it should be washed, remove larger (over sieved) parts of the sand above sieve 9.5mm and mix to come up with the requirement.

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