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Non-Sustainability of Low-bid Infrastructure Procurement System: Lessons for Developing Countries

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Abstract*-The low-bid system, otherwise referred to as price based procurement system is a management oriented (inspecting, directing and controlling) procurement system. Ordinarily it is expected to deliver the best value to the client. It is to date in popular use by the clients most especially in Africa; despite the delay and corruption headlines, it has incurred for years since the 1960s. In this paper, deductive logic was used to trace the mechanism in which low-bid causes unsustainable consumption manifesting as or a combination of variables such as inflated contracts, delays, cost and time overruns, reworks, poor quality standard, litigation, and project abandonment caused either by or a combination of fraud, corruption, bribery, collusion, bid rigging or any other ethical violations in public project procurement. This was validated by the employing the relationship between performance and competition in procurement; the characteristics of low-bid environment; client's indirect motivation of the contractor to use inexperienced craftsmen; characteristics of the best value environment; performance information procurement system (PIPS); performance information risk management system (PIRMS).

***Index Terms*-Non-sustainability, low-bid procurement, infrastructure, developing countries.**

I. INTRODUCTION

Noticeable under-performance of the traditional procurement system (TPS) in terms of meeting clients' expectations of time, budget and quality on public project procurement most essentially construction works, has as far back as the early 1960s, given research impetus to date, to finding alternative system of project delivery. Efforts in this direction have led to proliferation of procurement systems such as construction management, management contracting, design-build, turnkey, partnering, alliancing, joint ventures (JV) and lately private finance initiatives (PFI) and public-private partnerships (PPP) with hybrids of concessions such as build-own-operate(BOT),build-operate-transfer (BOT), build-own-operate-transfer (BOOT),build-own-operate-service-transfer (BOOST), and asset procurement and operating partnership systems (APOPS).Each of these systems operates either within Quadrant 1, (the price based environment), or Quadrant 3 (the partnering solution) of the procurement industry structure [1]. Quadrant one has the characteristic of high competition but low performance [2], while the reverse is true for quadrant three. The defects inherent in these two quadrants will be expatiated later.

Over the years, much of research attentions on procurement problems have been concentrated on whether a procurement route is involved in time and cost overruns [3] and client satisfaction [4] from the perspective of the performance of the contractor with little or no consideration of the impact of the client's management and control mechanism. Since these problems have not abated with the continuous development of new procurement systems, procurement researchers in the construction industry have lately turned into manufacturing concepts such as just-in-time production, supply chain management, and lean production for solutions [5] **y**et no remarkable improvement has been achieved in procurement performance. Rather, there has been surge in disturbing procurement headlines from around the world which is diametrically opposed to the concept of sustainability described by [6] as human footprint on earth that meets the needs and aspirations of the present generation without compromising that of the future generation.

Non-sustainability in public project procurement manifest in part as inflated contracts, delays, cost and time overruns, reworks, poor quality standard, litigation, and project abandonment caused either by combination of fraud, corruption, bribery, collusion, bid rigging, ethical violations or part thereof. According to [7], procurement corruption involves the act of offering, giving, receiving or soliciting directly or indirectly of anything of value for the purpose of influencing the action of a public official during the stages of procurement. A sizeable proportion of these heinous acts are perpetrated in construction which is a project based industry as can be discerned from Figures1, 2 and 3 below.

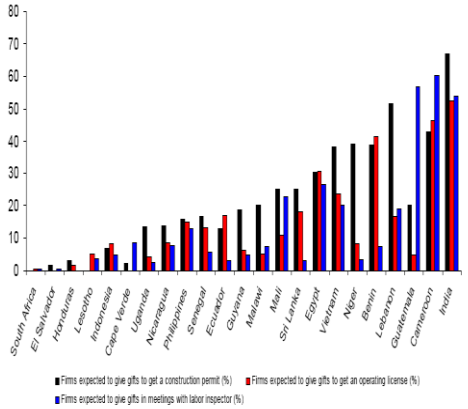

Fig. 1: Comparative level of corruption (gift) related to construction works in some selected countries (%).[8]

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This paper has the objective of inferring through deductive logic, and test results on best value procurement, that the low-bid or price-based environment accompanied by management and control mechanism of the client and his representatives are sources of unsustainable consumption in public procurement projects.

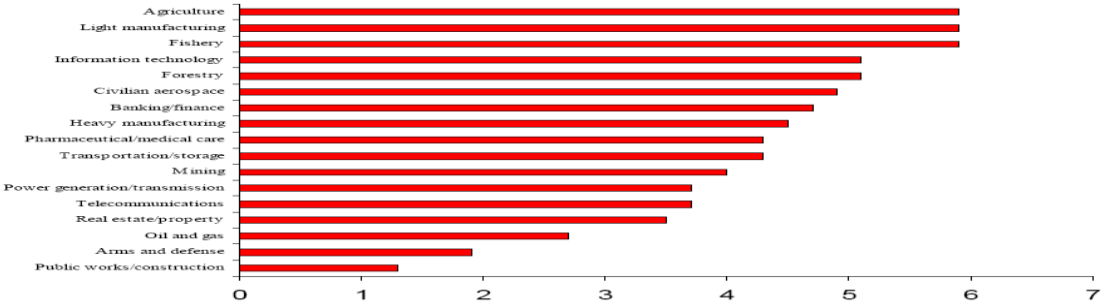

Fig. 2: Transparency International comparative perception of corruption among industries from zero (most corrupt) to ten (not corrupt) [8]

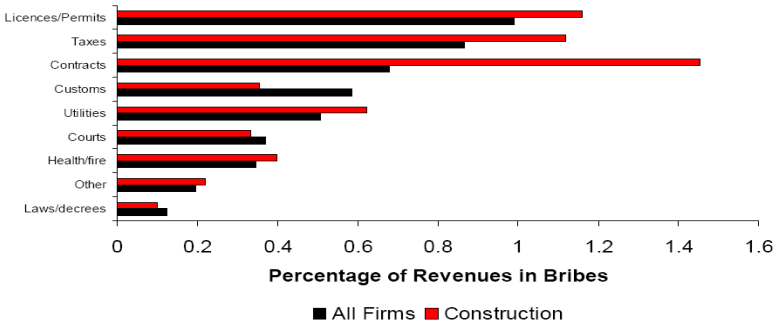

Fig. 3: Bribe related corruption among firms in Business Enterprise and Environment Project Surveys [8]

II. METHODOLOGY

In this paper, it is inferred that non-sustainability of public project procurement which manifest as fraud, corruption, collusion and lack of ethics (bad values) have roots in low-bid procurement system and that the best value procurement can reverse the situation. Through deductive logic the inference is validated qualitatively using:

1. The relationship between performance and competition in procurement.
2. Characteristics of low-bid environment.
3. Client's motivation of the contractor to use inexperienced craftsmen
4. Characteristics of the best value environment
5. Performance Information Procurement System (PIPS)
6. Performance Information Risk Management System (PIRMS)
7. Test results result in United States of America
8. Experience with the introduction of PIPS in Botswana.

The relationship between competition and performance in relation to procurement was established by [1] and referred to it as industry structure model (Figure 4). The industry structure is essentially a four quadrant chart that can be used to classify a procurement system in terms of level of competition and performance as follows:

1. Quadrant I - Low-Bid or Price-Based Sector: This sector is described by high competition and marginal performance.
2. Quadrant II - Best-Value Sector: This sector is described by high competition and performance.
3. Quadrant III - Negotiated-Bid Sector: This sector is described by high performance and low competition.
4. Quadrant IV – Unstable Sector: This sector is described by low performance and low competition.

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III. PERFORMANCE AND COMPETITION IN PROCUREMENT

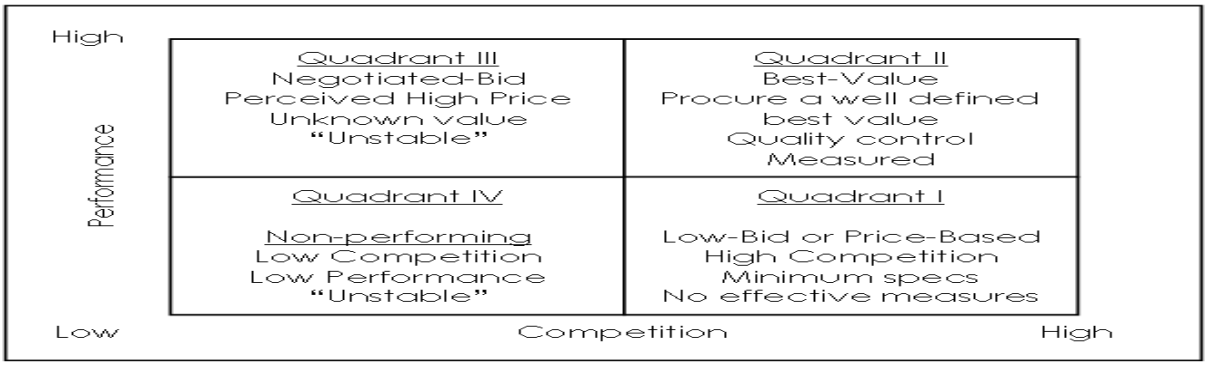

Fig. 4: The Construction Industry Structure (CIS) model [9]

In the low-bid or price-based environment, the owner employs the traditional procurement system (TPS) or design-bid-build (DBB) process. The two processes award the contract to the lowest bidding construction contractor. These have always been the most common methods of awarding contracts worldwide. Quadrant I has the following characteristics [9]:

1. The process is managed or controlled by the owner's representative (design professional).
2. The design professional has stated to the owner in the case of construction that it is a commodity. The designer then directs the awarding of the contract to the lowest price, minimizing the risk of low quality by using their professional expertise.
3. The design professional uses minimum standards to specify the commodity. The minimum standards have very little correlation with performance.
4. Contractors are directed to bid the lowest possible price. The participants who can control performance and quality (construction contractors and subcontractors) are not quality controlling their work. The owner's design professional manages and inspects the work.
5. There is no construction performance information on products, systems, contractors, designers or individuals. With an absence of performance information, politics and marketing becomes a powerful force.

IV. IMPLICATIONS OF LOW-BID CHARACTERISTICS FOR NON-SUSTAINABILITY

The characteristics enunciated above will be expatiated through the following sub-headings [10] in order to bring to the fore, their implications for non-sustainability:

1. The impact of minimum standards.
2. The impact of the low-bid process.
3. The importance placed on management and control.

A. Minimum Standards

Minimum standards are made to ensure that a contractor/vendor performs to a minimum level of performance. Many owners, designers, engineers, and consultants feel that standards are necessary in order to prevent non-performance. The minimum standard means that the lowest or least level of performance is acceptable.

There is no documentation that shows minimum standards lead to higher performance. To the contrary, minimum standards offer low performing contractors, materials, and construction systems, the opportunity to compete against high performing alternatives, with a better chance of getting the bid due to their lower price.

Minimum standards provide the contractor who feels comfortable with minimal quality the advantage. When coupled with an award based on the lowest price, standards (which are always the lowest acceptable performance and quality) lead to lower performance and lower quality. Standards become useful only when procuring a true "commodity" (no risk, all alternatives are the same, can be bought in volume). In a construction environment, which is fraught with risk, standards should be used by contractors and manufacturers to ensure quality, and not by the owner/user's representative to ensure "equality" [9].

Many experts no longer have the necessary performance information to support their subjective decision-making. Instead they rely on their own personal experiences to attempt to define what performance is. The owner/user has no method to identify the delivered performance, but must trust in the design consultant's expertise. This has resulted in the following [10]:

1. Minimum standards set by the lowest common denominator (lowest number in each physical characteristic).

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2. Minimum standards on products set by individual testing procedures on different physical characteristics; the summation of which rarely has any correlation with the actual performance of any existing product or system.
3. A lack of actual performance information.
4. Contractors and manufacturers lowering their performance to meet the minimum standards.
5. A lack of liability for non-performance. Once the owner/user's professional sets the minimum standard (which has no correlation with performance), the user's professional must prove when a product does not meet the minimum standard and who is to blame. Due to the number of participants (designers, contractors, subcontractors, manufacturers, and material suppliers), this becomes a difficult task, and fosters an environment of no liability.
6. Standards and standard setting becoming more important than the performance of construction systems. Otherwise, performance information would be used instead of standards.
7. Standards causing risk, instead of minimizing risk. Other products of standards are low performance, minimum liability, and lower profits.

B. The low-bid process

In the low-bid system, the best performing contractor is not recognised, as lowest price is the client's ultimate target. This is based on the notion that any contractor can execute the work irrespective of expertise and skill. The implication of this notion is that contractors are treated as commodities that have no performance differential [9].The low-bid process especially for public projects follows the steps below [11]:

1. The project bid notice is published.
2. Prequalified contractors obtained the procurement documents. Deposits or non-refundable fees may be required.
3. Interested contractors review the procurement documents and, if applicable, attend a pre-bid conference.
4. Interested contractors inspect the site.
5. Interested contractors solicit and acquire bids from subcontractors, if applicable.
6. Interested contractors estimate costs.
7. Interested contractors prepare and submit sealed bids.
8. Bid amounts and contracts award may or may not be announced publicly. If announced publicly, the owner or owner's representatives will open the bids and announce the bid amounts at a specific time and location.
9. Barring irregularities, the contract is awarded based on the lowest responsible bid or total contract price.

The essence of this procedure is to introduce transparency and fairness to public procurement by allowing on one hand, tax payers to know how their money is being spent; and on the other hand, to open the process to all qualified bidders. It is however designed such that the owner bears almost all the risks as the control mechanism allows the contractors not to operate outside the specifications even where he (contractor) has better ideas that could constitute value added to the project [9]. It is pertinent to notice that there is nowhere in the bid process where contractors are interviewed.

Characteristically, the low bid process has often ended up being involved in project cost and time overruns, adversarial relationship, change order, and low quality end product. In the short and long runs, the lowest-bid usually turns out to be the costliest-bid.

C. The importance placed on management and control

According to Reed Construction Data, a strategic partner with American Institute Architects[12], from the perspective of the client, one of the major advantages of low-bid is that it gives the client the latitude to manage and control in all the phases of the project. This is myopic in that clients do not usually realise that the reason for such high degree of management and control is that they have intuitively assigned to themselves, all the risks (technical and non-technical) inherent in the project. These two general class of risks are supposed to be apportioned 50/50 and in order of technical risks to the contractor and non technical risk to the client. Technical risks are risks that the contractor can control because they relate to issues within the ambit of his professional expertise. Non-technical risks on the other hand, are risks that the contractor cannot control because they relate to resource logistics and perhaps *force majeure*[9]. These are client related issues. The client's style of controlling technical risks is through the representative's management and control mechanism (usually the designer, construction manager, or quantity surveyor) which may result in adversarial relationship.

V. DEDUCTIVE LOGIC AND MANIFESTATIONS OF NON-SUSTAINABILITY IN LOW-BID ENVIRONMENT

In the fore-goings, the problems of low-bid procurement have been shown to manifest as overt emphasis on minimum standard, lowest price, and client's representative management and control mechanism. Using deductive logic it will be brought to the fore that these manifestations are causes of corruption, collusion and bad values in traditional design-bid-build procurement still in major use worldwide and especially in Africa.

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Corruption in public procurement manifests as dishonest and illegal behaviour among parties to a procurement process. Adapting United Nation Development Programme definition [13], it takes the process of giving, offering, soliciting or receiving directly or indirectly anything of value to influence the action of personnel in the procurement process. Similarly, collusion represents an arrangement by a group of people or cartels (usually bidders) to create artificial prices in an attempt to either eliminate competition or reduce it to the barest minimum. Other terms associated with corruption and collusion are:

1. Fraud – Intentional false representation or concealment of material facts for the purpose for the purpose of inducing other parties to act on it at their own detriment.
2. Coercion – Harming or threatening to harm directly or indirectly, other parties to wild certain power or influence in the procurement process.

Deductive logic has shown that, by design, low-bid process is a conducive environment for these problems. For example in public procurement, large numbers of bidders are attracted to bid for the work and this facilitates keen competition. But since the contractors understand quite well that the lowest bidder will win the contract they go to extremes to induce, bribe or lobby corrupt government officials for favour during the bid process. Such favour often involves releasing details of other contractors' bid figures. It is usually a two-way traffic in that it could be the government official demanding gratification to release these figures. The greatest procurement frauds that are making headlines at international level have to do bidders bribing corrupt officials or government official demanding bribe from the bidders. The nature of low-bid process, devoid of transparency and effectiveness, makes detection of corrupt practices very difficult. Deductive logic has also shows that collusion among bidders to eliminate competition is only possible in the low bid environment. Bidders' form of collusion falls into three categories:

1. Price-fixing

This is an agreement among bidders or suppliers to escalate fix or maintain current price. The Antitrust Division of the United States Department of Justice gave the following eight examples of price fixing [14]:

1. Establish or adhere to price discounts;
2. Hold prices firm;
3. Eliminate or reduce discounts;
4. Adopt a standard formula for computing prices;
5. Maintain certain price differentials between different types, sizes, or quantities of products;
6. Adhere to a minimum fee or price schedule;
7. Fix credit terms; or
8. Not advertise prices.

9. *Biding rigging*

This is a situation where the conspiring bidders agree in advance who will submit the winning bid which had already been inflated. This is usually practiced in three forms:

1. Bid suppression whereby some competitors refrain from bidding or withdraw an already submitted bid to create chance for the artificial winning bid.
2. Complementary, a situation whereby some of the conspirators submit either over-priced bid or bids containing conditions that are not acceptable to the buyer.
3. Bid rotation, a scheme whereby the conspiring bidders submit low bids in turn.
4. Subcontracting, an arrangement whereby competitors who agree not to bid or who submit losing bid are engaged as sub contractors.
5. Complementary market sharing

This is a situation whereby customers are divided among the conspirators in accordance to certain characteristics such as location. A conspirator assigned to a particular location is to submit a winning bid while the others submit higher bids. Careful observation and reflection will reveal that all these collusive tendencies can thrive only the in the low-bid environment since the contractors are not selected based on value.

VI. CONFLICTING OBJECTIVES AMONG CLIENT, CLIENT REPRESENTATIVE AND THE CONTRACTOR

The corrupt and collusive practices enunciated above have been shown to emanate from the contractor selection process which is based on low-bid mentality. It will be shown further that differing objectives among the contractor, the client, and the representative of the client often manifest fraud, self centeredness and bad values during project execution.

The contractor is in business to make profit and is always loss averse. When the client sets his objective of minimum standard, that is, the lowest possible quality he wants, the contractor cleverly reverses it to his own maximum objective, that is, the highest possible value that the client will get. These contradicting objectives are depicted in Figure 5.

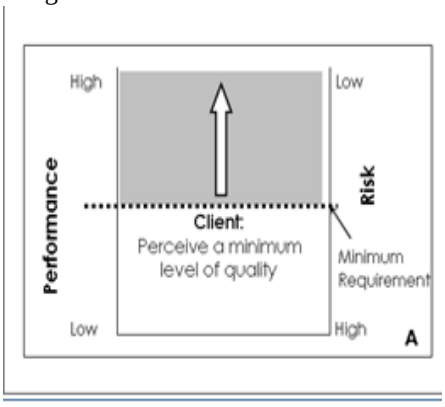

Fig. 5a: Client versus contractor's conflicting objectives [9]

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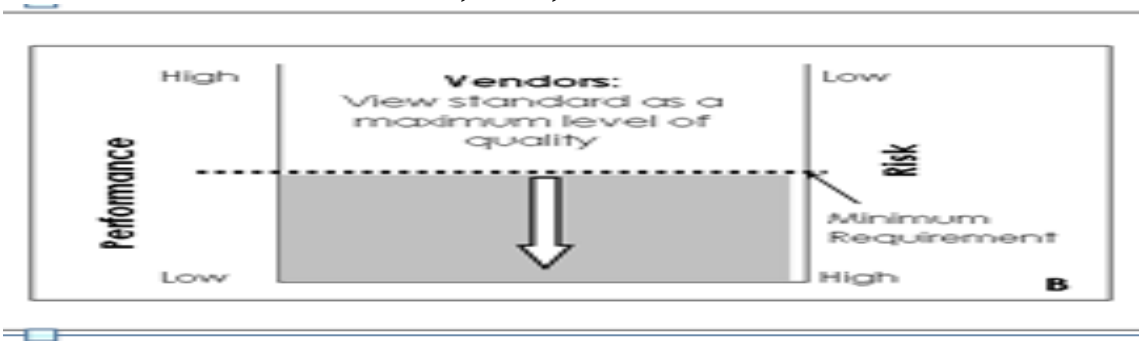

Fig. 5b: Client versus contractor's conflicting objectives [9]

Another entrenched fallacy in low-bid procurement is the way high performance contractors are dissuaded from bidding and hence encourage the low performance contractors to perpetrate themselves. Figure 3a shows that in a value based competition, contractor1 has the highest performance and the lowest risk. It is because they are an expert, and therefore have the following characteristics:

1. They have very little technical risk. Their risk is non-technical risk that they do not control. It is the over-expectation of the client, that the risk that other parties bring to the contractor that they do not control (actions of client, designer, inspectors, users, and economy) must be managed and minimized.
2. They preplan the project from beginning to end, preplanning ways to manage and minimize risk that they do not control.
3. They have a fair and accurate cost to do the project to deliver on time, no change orders, and meeting the client's expectations.

Contractor 4 is an inexperienced contractor. They have the following characteristics

1. They cost out what is specified, even if the drawings and specifications are incomplete.
2. They have technical risk, due to their inexperience.
3. They do not plan on being accountable to manage and minimize the risk that they do not control.
4. They are reactive, do not preplan, and their price does not include managing, minimizing and being accountable for anything that they are not clearly directed to do.

Procurement type by vendors. The diagram depicts that price-based customers are matched with crafts people with minimal experience while partnering and outsourcing owners are matched with medium and highly trained crafts people respectively.

It must be remembered that the use of low-bid process in the first instance is an imposition by the client's representative (designer) to achieve his own personal objectives on the project. This fraud was traced by [15] to the changing role of the design and engineering firm over time in the low bid environment by first being responsible for the design, then Corrupt practices by the contractor come into play in various guises by taking advantage of his professional expertise to use inferior materials as much as possible, providing shoddy workmanship and unnecessary change orders. In addition he uses less trained and less paid crafts people to achieve his objective. In reality, low-bid procurement has been a source of disincentive for highly trained personnel because contractors come to the realization that they do not fit into the low-bid environment since the management and control mechanism of the client will not give them freedom to use their expertise [9]. Figures 6a and 6b depict the logical matching of crafts people according to owner or transforming itself to enforce a set of arbitrary minimums.

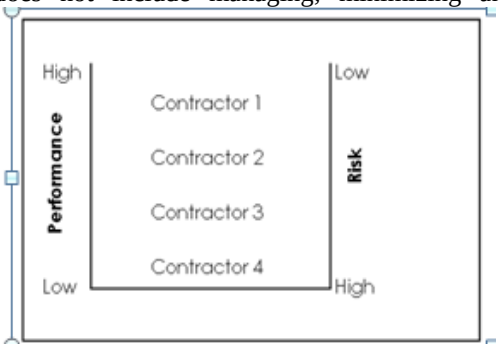

Fig. 6a: Best Value Award[9]

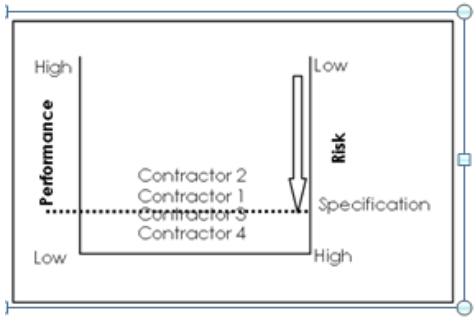

Fig. 6b: Impact of Price Based Award [9]

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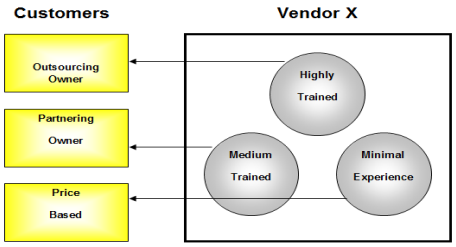

Fig.7: Different types of owners and the type of craftsperson they attract from the Vendor [9]

Figure 7 show that client actually controls the level of skill used by contractors. The difference between the price based owner, the partnering owner, and the best value owner, is that the best value owner transfers the risk and control to the contractor, while the price based owner tells the contractors in detail how to do the project, when to do the activities, and exactly what to do; The best value owner transfers the risk and control to the contractor requiring someone who knows what they are doing, while the price based owner is awarding to the lowest price, and requires someone who reacts to the expert, who is obedient to their directions whether optimal or not. The experienced project managers and craftspeople are paid more, thus requiring a more efficient environment where they have control, preplan, do projects just once, and do not have any problems. Their efficiency is minimized tremendously in the price based owner's environment, thus making them overpriced and expensive. This can be seen in many industries and countries as:

1. The population of inexperienced increases.
2. The population of experienced decreases.
3. There is very little motivation for technical training.
4. Transfer of risk and control; the use of performance measurements; Contractors practicing quality control; and the measurement of deviation are not possible in the low-bid environment.
5. In underdeveloped countries like Botswana, the government is now dependent on foreign contractors and experts, because there is no incentive for local contractors/craftspeople to increase in technical skill.

It must be remembered that the use of low-bid process in the first instance is an imposition by the client's representative (designer) to achieve his own personal objectives on the project. This fraud was also traced by [15] to the changing role of the design and engineering firm over time in the low bid environment by first being responsible for the design, then transforming itself to enforce a set of arbitrary minimums.

Over time however, due to price pressures and motivation to gain control over the construction, designers convinced the owner that they could deliver the construction as a commodity, at the lowest price, and minimize the risk by managing and inspecting the contractor. The primary objective of the design and engineering professional here is a cut of 6-10 percent of the project funding and not necessarily acting so much on behalf of the client. By inspecting the contractor, the design and engineering firm have moved to an area where they are not experts by training and professional callings. The repercussion of this singular act of deceit is that it has contributed to projects not achieving its specified objectives of time, budget and quality and in no small way contributes to claims and litigations, which are bad values [9].

VII. CONCLUSION

In this paper it has been shown through deductive logic, that the low-bid environment will naturally promote non-sustainability in infrastructure procurement due to the low-bid mentality of the client that places no premium on quality but price. As a result, any contractor/vendor with little or no experience can bid for the contract and in actual fact becomes very competitive. The situation has created confusion which results in bribery, fraud and bid rigging on public procurements. The management and control mechanism of the client have together with his minimum standard mentality created differing objectives with the contractor on one side and the client and their representative on the other. The situation will remain in as much the client continues to operate in quadrant I of the procurement industry structure.

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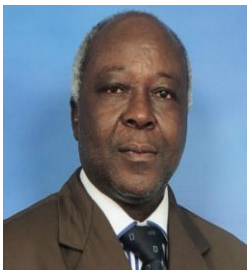

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