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Botswana Construction Procurement Process: A New Approach

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Abstract
The construction industry in Botswana has been identified as low performing. Currently the Botswana government uses the design-bid-build process, using prequalification and award to the low bidder for construction services. The government can also use the design-build delivery system. The current delivery system uses an engineering group that delivers designs and construction, using a procurement group to award the contract and contract modifications. However, the analysis for all actions is done by the engineering group. Performance has not been good. The authors propose that the delivery system, the paradigm, and decision making by the engineering group causes risk to the project and results in poor performance. The authors suggest making modifications in the process and using design-build. The authors also propose to change the paradigm using best value PIPS/IMT concepts.

Keywords
Botswana procurement, New PM model, Paradigm change

1. Introduction

The construction performance in Botswana has been identified as low performing (Ssegawa *et al*, 2007). The major participants include the future building owner, the building owner's engineering representative, the procurement agent, the designer, and the contractor. In this process the procurement agent is the broker for all design and construction work, and the engineering representative is the technical representative representing both the client and the procurement agent. The process is management based, the engineering representative is the expert and does much of the contract administration, and depends on the procurement agent to enforce the contract (Rwelamila *et al.*, 2000).

Recently, the best value Performance Information Procurement System (PIPS) project management (PM) model has been introduced to Botswana (Kashiwagi *et al.*, 2008). Implementation of the new PM model requires both a change in paradigm, and a change in process. Legal changes can be made to enhance the outcomes, however, the researchers are proposing that a change in paradigm and processes within the existing legal system. This research study will capture:

1. The current Botswana government process.

2. The new paradigm of minimizing decision making, transferring risk and control to the contractor, forcing the contractor to do risk management and control, and contract administration, and the client to do quality assurance.
3. How the existing procurement system can be transformed within the legal constraints.
4. What the engineering organization must do to sustain the transformation.

The performance of Botswana Government delivery of construction has been "perceived as poor (Ssegawa and Ngowi, 2007)". This is partly due to over reliance on the traditional procurement system (TPS), a fragmented construction process being discarded in the western world but continued to be the dominant project delivery system in the developing countries. According to Bennet and Grice (1990), selection of appropriate Procurement system is a major determinant of Project success. Gordon (1994) reported in a study that it was possible to reduce project capital cost by an average of 5% through selection of the most appropriate procurement system. Failure to select an appropriate procurement method, according to Masterman (1996), is now well recognized as a primary cause of project failure.

However, quality control systems and performance measurements are required to verify the perception. The first step is to use the industry structure analysis to identify the current environment of the Botswana procurement system. The industry structure environments identify the location of the procurement delivery system, and can propose what actions are required to increase its performance. Using the characteristics of performance and competition, the movement from one state to a more optimal state can be described in terms of relative and related performance characteristics. The recommendation is therefore modifications to the procurement system in terms of performance characteristics. The advantages of using the industry structure analysis are the dominant, simple explanation of environmental characteristics and the recommended solutions. This process has been well tested and very successful in improving the performance of procurement systems (Kashiwagi *et al*., 2008).

2. Industry Structure (IS) Analysis

The industry structure (IS) analysis was created in 1991 (Kashiwagi, 1991), and has since been modified and refined (Kashiwagi, 2009). The industry structure (IS) chart is shown in Figure 1. The industry is divided into four quadrants by performance and competition. Interestingly enough, it is competition and not price on the horizontal axis. Quadrant I and II are the more dominantly used quadrants. If a particular skill or expertise is required, Quadrant III (sole source, long term partnership) is used. However, with a downturn in our global economy, Quadrant I, the low bid award, is the most dominant environment.

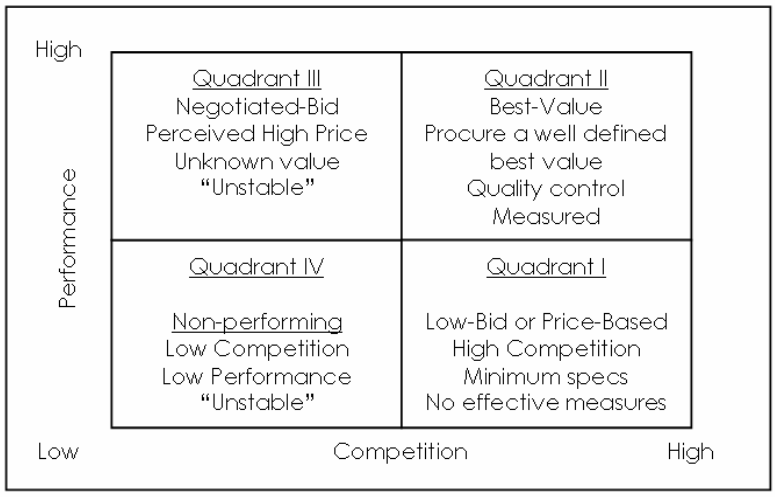


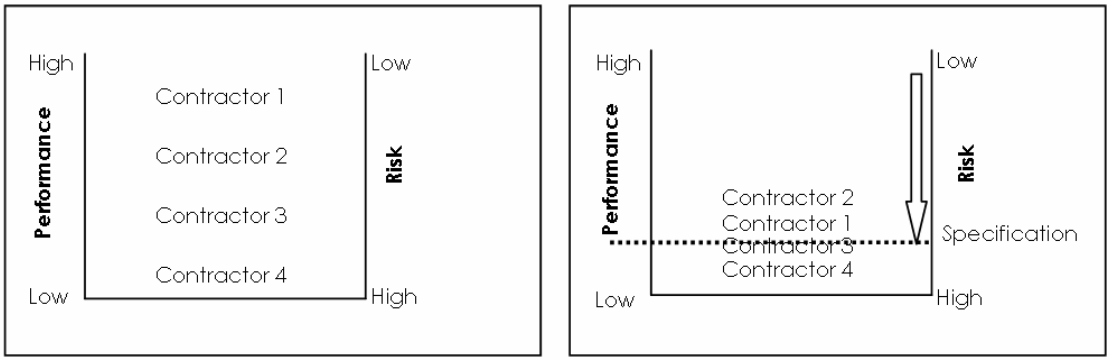
Figure 1: Industry Structure

In the low bid environment, the following steps are usually taken:

1. A client has a requirement.
2. The client hires professionals to transform their requirement from a non-technical, expectation (time, cost, and quality) into a technical requirement that can be competed among competing contractors.
3. The assumption is that the contractors are "equal" or "relatively the same" and can be managed, controlled, and inspected to ensure the expectation is achieved.
4. In this process the client's representatives, the professionals are in control of the project.

Over a number of years, a couple of theoretical flaws were discovered in the process. The first major flaw is the use of minimum requirements in the specifications. Using minimum specifications, the client's representatives used the minimum standard as a method to identify what is not acceptable. Because the project is normally required to award to the lowest price, the vendors used the minimum requirement as the maximum the client will receive. With the buyer and supplier moving in different directions, the price based environment creates an adversarial environment (Kashiwagi and Savicky, 2002).

Complicating matters is the concept that minimum standards are usually subjectively set, requires interpretation, and often is difficult to measure. This causes confusion, and in the confusion, suppliers and contractors are motivated to drive performance down. Another issue that arises is shown in Figure 2 (Kashiwagi *et al.*, 2005). The high performing contractors can see a project from beginning to end. Because they are experts, the only risk they have is the risk that they do not control. To maximize their profit, they preplan to manage and minimize the risk that they do not control. Contractor #4 on the other hand, is relatively inexperienced, lacks expertise, has technical risk, and does not factor in the risk that they do not control. While Contractor #1 does not have to be managed and controlled, Contractor #4 requires management and control. Because the only selection factor is price (after prequalification), Contractor #1 is actually encouraged to act like Contractor #4, do not consider risk that the contractor does not control, do not preplan, and price out only what the client's representative has identified. Contractor #1 is actually being directed to increase the client's risk, to become reactive, to minimize the use of their expertise, and to not control and minimize risk. This result has some damaging ramifications as contractor project managers and craftspeople take a reactive, non-thinking, minimum standard approach.



Best Value Award Impact of Price Based Award

Figure 2: High Performance Contractor Motivated to be Reactive

3. The Best Value Quadrant

The best value quadrant or Quadrant 2 has high performance and high competition. It differs from the low bid award quadrant in the following ways:

1. It does not use minimum standards combined with low price.
2. It makes the selection of a contractor based on value (performance and price).
3. The contractors have high performance.
4. The contractors do quality control.
5. The contractors manage and minimize risk that they do not control.
6. The contractors set the project scope, time, and cost (baseline), and then measure deviations of time and cost in meeting that baseline.
7. The client's representatives do quality assurance.
8. The risk that the best value contractor does not control, is managed and minimized by holding the client accountable.

The authors propose that there must be movement from the price based environment to the best value environment for the Botswana government to increase construction performance (on-time, on-budget, meet quality expectations), to increase the capability of the local contractors and craftspeople so they can perform to a higher level, and to increase efficiency, accountability, and transparency. The authors propose that the Botswana government did not have inkling that they may be the source of the problems they are having. This is evident as the Fulbright Scholar Kashiwagi is slowly interfacing with the government agencies as a part of his Fulbright tour in Botswana.

4. Current Botswana Construction Delivery System

Botswana, like many other developing countries of the world, has limited herself mainly to the use of traditional procurement system (TPS) for the purchase of goods and services. And in conformance with Hillebrandt's postulation about construction industry structure in the developing countries, the central government remains a major client of the industry procurement of works, goods and services in Botswana is vested on the Public Procurement and Asset Disposal Board (PPAB) – formerly called the Central Tender Board (CTB). The board was established by an act of parliament, the Public Procurement and Asset Disposal Act of 2001. PPADB mandate was to manage the procurement and asset disposal system of the central government in a manner that reflects prudency, honesty and transparency. The board reviews bid packages relative to established standards and adjudicates tender evaluation reports submitted by procuring entities which are various arms of government such as Department of Roads, Department of Building and Engineering Services (DBES), Department of Water Affairs, etc.

The current Botswana construction delivery system matches the characteristics of the price based sector. Characteristics include (Lionjanga, 2003):

1. Decision making.
2. Lack of accountability of decision makers.
3. Management, direction and control of designers and contractors.
4. Award to the lowest price using minimum specifications.
5. Lack of contractor preplanning before contract award.
6. Lack of local skilled contractor base in critical subcontractor areas.
7. Change orders, time extensions, and client dissatisfaction.

The current Botswana delivery system is shown in Figure 3. Engineering groups (DBES and others) and the PPAB make decisions (due to incomplete information) are made at the following times:

1. The identification and validation of scope, funding, and construction period.
2. Identification of the best designer.
3. Confirming that the design is accurate and complete.
4. Identification of the best contractor.
5. Determining if the contractor can finish within the time and cost.

These decisions are made, but the procurement and engineering groups are never accountable in any way if there is an error in one of the decisions. If the decisions are not accurate, the impact is risk as the project continues. Other problems associated with one party making a decision, then directing another is:

1. Confusion. No one knows who is at fault.
2. No accountability.
3. Legal action and dependence on the contract language.
4. Contractors become reactive. They follow instructions even if they know it is high risk.
5. Meaningful performance measurements will not exist. Any effort to make someone accountable will turn into meaningless transactions which take time, cost, and energy.
6. Costly.

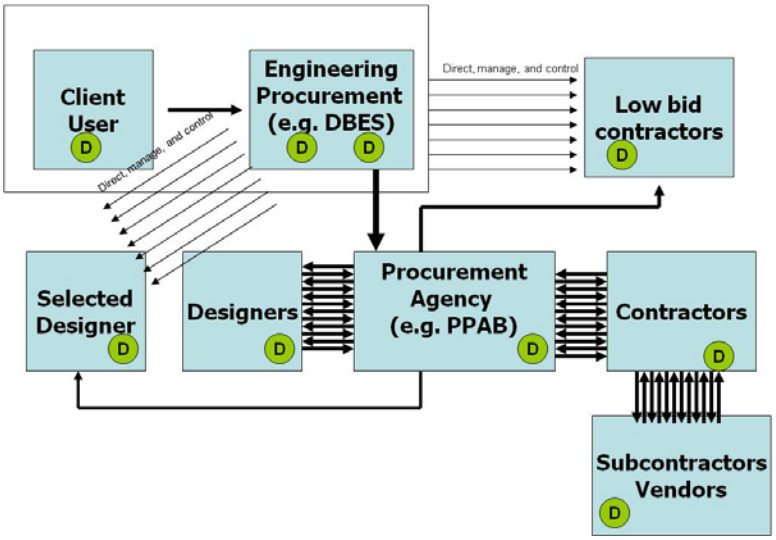


Figure 3: Current Botswana Delivery System

5. Performance Information Procurement System (PIPS)

PIPS is a best value structure/process that has the following characteristics and test results (www.pbsrg.com):

1. Developed in 1991 (Kashiwagi, 1991), and continually modified for the past 17 years.
2. Based on Information Measurement Theory (IMT), that uses dominant information and deductive logic to predict the future outcome (Kashiwagi *et al.*, 2008b).
3. Has the following characteristics: efficiency (minimize management of contractor), transparency (uses dominant performance information that accurately predicts the future outcome), uses past performance, the ability to control and minimize risk, and the visionary/ability to predict and preplan as selection criteria, transfers risk and control to the contractor, contractors self administer the contract by documenting a baseline and measuring deviations from the baseline.
4. Based on alignment instead of control, direction, and inspection.
5. Uses quality assurance by client's representative and quality control by the contractor's personnel.

6. 550+ tests, $620M of construction services developed.
7. 98% client satisfaction and performance.
8. $1.5B of non-construction services delivered.
9. Minimizes management of risk activity by client's representative by up to 90% (Sullivan *et al.*, 2007c).
10. Maximizes vendor profit through efficiency, preplanning, and accountability of all parties (Sullivan *et al.*, 2007a).

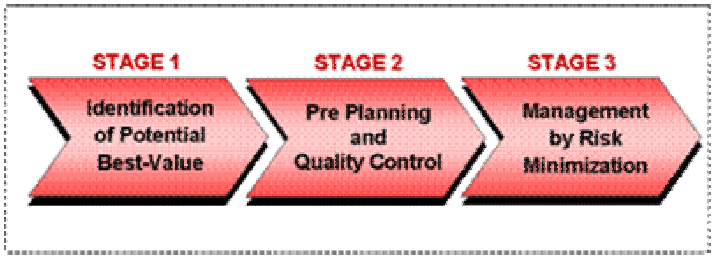


Figure 4: Three Phases of PIPS

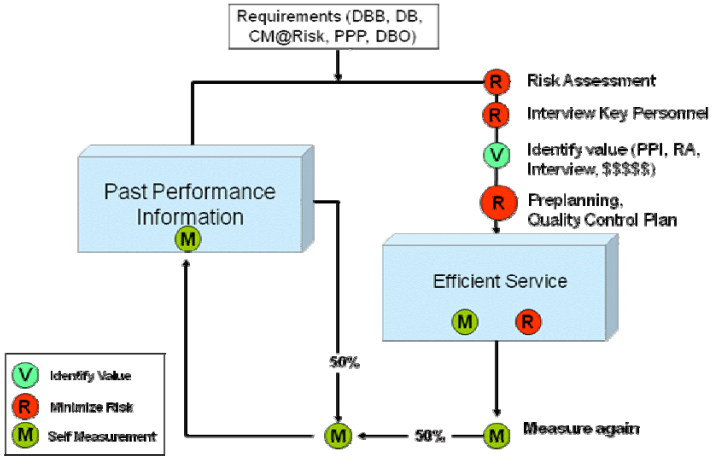


Figure 5: DMAIC Structure of PIPS

PIPS is made up of three major phases: the selection phase, the pre-award phase, and the management by risk minimization or construction phase (Figure 4) composed of several filters (Kashiwagi, 2009). Previous results have shown that the pre-award phase is the most important phase. This is where the best value contractor is forced to (Goodridge *et al.*, 2006):

1. Have a baseline schedule and plan with major milestones.
2. Coordinate the project with all subvendors to confirm the prices and scopes.
3. Ensure that there is no technical risk.
4. Identify all the risk that contractor does not control. This includes risk caused by any party that is not under direct control of the contractor. These risks are caused by client's representatives, designers, inspectors, overdesign/expectation, schedules that are too short, other participants who will interface into the project.
5. Identify how the risks that the contractor does not control will be management and minimized. This becomes the risk management plan (RMP).

6. The RMP is listed on the last page of the weekly risk report which will include the risks that the vendor does not control that happen despite the contractor's risk management, the costs and time deviation.
7. The weekly risk report will contain the deviations due to risk, the milestone schedule impact, and the cost impact, and the RMP and other risks and client concerns that have not occurred.

The scope/requirement, the weekly risk report with RMP, and the client's legal documentation become the contract for the project. The contractor then administers their risk management/quality control using the weekly risk report, and the client's representative does quality assurance by ensuring that the contractor is doing the weekly risk report. The weekly risk report uses dominant information and does not replace other documents which track contractor materials, labor hours, and subcontractor costs. Dominant information includes:

1. Risk information that has an impact on cost or time or both.
2. Simple, concise explanation of risk that has happened.
3. Date of risk, time to resolve, and actual resolution.
4. Rating of the contractor's response to the risk.

The biggest difference between the current Botswana model and the PIPS model is:

1. The DBES maintains control, makes decisions on the accuracy of scope, cost, and time.
2. Contractors are not allowed to identify risk that they don't control, and allowed to manage and control that risk.
3. The Botswana system (PPAB and DBES) forces contractors to be reactive instead of proactive.
4. The accountability and continuous improvement feedback loop in PIPS (six sigma based) (Figure 5).

6. US Corps of Engineers (COE)

The US COE has a very similar construction delivery system to DBES. They use an engineering group to transform the requirement to a design RFP, then they procure a design, and then they compete the design for construction. Recently they have moved to design-build to minimize transactions. There are two case studies where the COE procurement groups have implemented PIPS process steps. The first project is the US Army Medical Command (MEDCOM) Maintenance and Repair Program (Kashiwagi *et al.*, 2008c; b *et al.*, 2007b). The COE put the PIPS Phase 2 and 3 activities in the specification, and made it a requirement. This was totally independent of the selection phase. MEDCOM then followed up and instructed the COE and MEDCOM project managers and quality assurance representatives to minimize their activity to quality assurance. The definition of quality assurance: ensure that the contractor was doing the weekly risk report and the RMP and check its accuracy. Even though the selection was not tied into the process, the inclusion of the Phase 2 and 3 activities into the specification resulted in the following:

1. Weekly risk reports on 100% of the projects.
2. MEDCOM could easily identify which PMs and QAs were not doing their responsibility.
3. Contractors were forced to justify deviation.
4. Facility managers could not abuse the contractors.
5. Change orders decreased significantly.
6. Procurement action delay was clearly documented.

The forcing of the contractors to administer the contract through the weekly risk report has created a new environment. Even though many of the projects have been awarded through low price, the client transferred the risk and control to the contractor. The contractors also realized that because the majority

of the risk caused, is caused by the client, the contractors have become very good at managing and minimizing risk that they don't control.

The second case study of the COE was a test of a procurement of a $53M (USD) design-build project of a Battlespace Laboratory at the Kirtland AFB in Albuquerque, NM. The COE used the following procedure:

1. Prequalified using go-no go requirements. These requirements included: safety; minimum government bonding requirements; government database of past performance; small business plan; agree to do weekly risk report.
2. Competitive Range Determination (Technical and Price)
    a. PIPS Past performance information on critical components
    b. PIPS Risk Assessment Value Added Plan (RAVA) (rated)
    c. Schedule (rated)
    d. Small Business Participation Plan (rated)
    e. Price
3. Best Value Selection
4. PIPS Interview (rated)
5. Clarifications and Award
6. Post-Award: Risk Management Plan and weekly risk reporting
7. Notice to Proceed

The COE selection team gave the following comments on the outbrief (2008):

1. Allowing the contractors to turn in RAVA plans was one of the best ideas they had seen.
2. Allowing the rating and interview of the key personnel resulted in the submittal of the best personnel and teams, and allowed the contractors to tell the COE what they could do.
3. The weekly risk report and RMP was a key component in ensuring quality.

Within the traditional engineering analysis and quantity surveyor role, the change of paradigm to allow the contractors to identify the risk they did not control, and manage and minimize the risk made a huge difference in performance. This would not stop the client's engineering group from inspecting and confirming, but they would be transferring the risk and control to the contractors.

7. Hypothesis

Botswana government organizations (PPAB and DBES) can move toward the best value environment by copying actions of the US Army Medical Command and Corps of Engineers. A best value system can be developed that even works in the price based sector as a part of the specifications. In order to move into the best value environment, DBES and other organizations must take on characteristics of the best value environment. These include:

1. Think strategically.
2. Use proactive instead of reactive models and structures.
3. Use performance measurements inside and outside of the organization.
4. Transfer of risk and accountability to vendors.
5. Build local industry trades and local expertise.
6. Motivate continuous improvement.
7. Do quality assurance instead of quality control.
8. Have transparency.
9. Practice accountability.
10. Minimize regulations and directions.
11. Minimize boards and oversights.

8. Methodology

Change of large organizations cannot happen overnight. Small units can change, large units cannot. This dictates the methodology of applying change. Create a strategic plan, and tactical plans to move forward. The following tactical steps will be proposed:

1. Identify a champion.
2. Identify an expert with a simplistic delivery system/organizational model that has had dominant results.
3. Hold a presentation for the group to identify a core group of testers.
4. Identify the existing processes and measurements.
5. Identify what changes can be made.
6. Test the new processes, and compare measurements against the traditional processes.
7. Continue to expand the tests.
8. Continue to educate.
9. Use measurement system to measure the entire organization's performance and allow groups to volunteer to use new, efficient, and stable delivery systems.

The concepts to be discussed and implemented as a part of the PIPS technology are:

1. Use best value design-build where possible.
2. Insert the PIPS weekly risk report and risk management plan into specifications of price based award.
3. Transfer the risk and control to the contractors.
4. Client's representatives practice quality assurance (ensure contractors are accurately doing weekly risk report).
5. Minimize direction, decision making, and control.
6. Designers should be doing weekly risk reports.
7. Implement PIPS Director's report when possible.
8. Constantly use performance information to educate the government and taxpayers to educate them on the importance of efficient and effective risk management systems.

9. Conclusion

Best value practices differ from best practices. Best value practices include efficiency (minimize transactions and transaction costs), measurement, transfer of risk and control to contractors, forcing preplanning (set baseline and measuring deviations), and where contractors do quality control and client's representatives do quality assurance. These practices bring transparency, accountability, efficiency, and high performance. The overall model turns from management to leadership, from complex to simple, and increases the importance of technical competency.

The change from traditional practices to best value practices is more of a change or paradigm than a legal change. Legal changes which allow best value selection and the transfer of risk and control to the contractors do assist the effort. The Botswana government agencies can move to the best value paradigm, by using practices which currently are allowed like design-build in conjunction with best value practices, and also change their paradigm by implementing best value PIPS practices in their design-bid-build processes. The key is education. The agencies must be exposed to the theoretical accurate constructs of best value PIPS.

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