

## **Can Developing Countries Leapfrog the Project Management Technology of More Developed Countries?**

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### **Abstract**

Developed construction industries in the US, UK, and Europe have battled to increase the performance of their construction industries. These more developed countries influence the underdeveloped countries. The underdeveloped countries hire academics, consultants and experts from the more developed countries to model their industry and practices. The author is proposing that the underdeveloped countries should not do this based on the low performance of the developed nation's processes, and use more efficient and effective practices that are based on logic, practices from other more efficient industries, systems with proven dominant or very high performance.

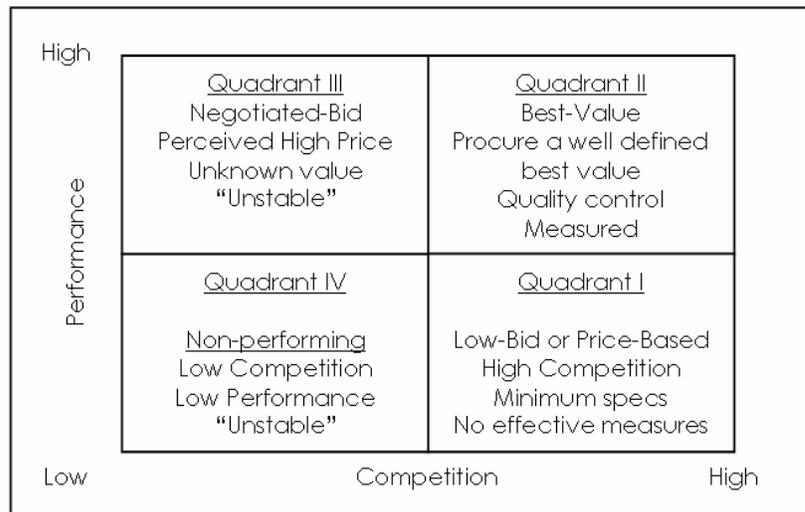
### **Keywords**

Project management model, Developing countries, Performance information

### **1. Introduction**

In 1991, Kashiwagi developed a construction industry structural (CIS) diagram. The diagram (Figure 1) is based on performance and competition (Kashiwagi, 1995). The CIS identified that the worldwide economy was forcing higher competition, and trying to get higher performance and value. This made Quadrant I and II the most popular procurement or delivery environments. Quadrant I, the price based environment, is an environment with the following characteristics:

1. Uses a detailed specification to define the scope of the project.
2. Uses minimum standards and requirements to define the scope.
3. Uses professionals to define minimum requirements.
4. Does not ensure a specific level of performance, therefore it requires management, direction and inspection to ensure the minimum requirements have been met.



**Figure 1: Construction Industry Structure**

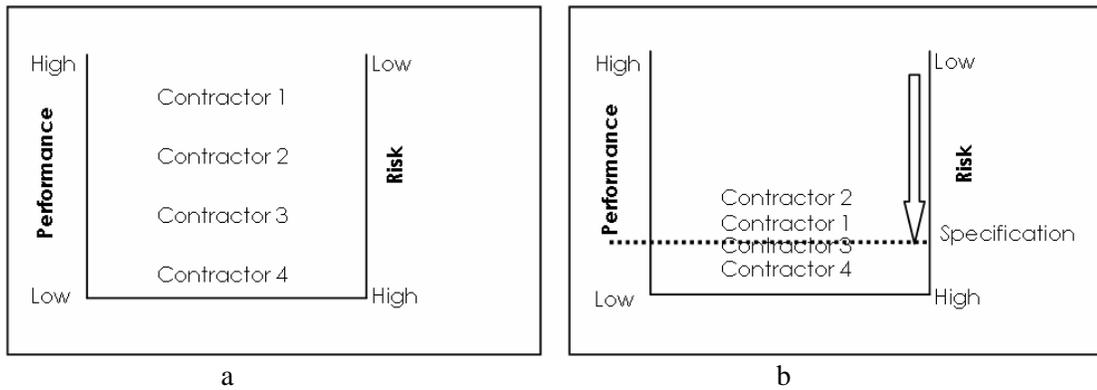
This model has some dominant flaws. The first is that the client's professionals use minimum requirements to define what is unacceptable, and the vendors change the minimum into a maximum and go in the opposite direction (Kashiwagi *et al.*, 2005). This forces an adversarial environment that now has to be managed, increasing transactions (more meetings, negotiations, interpretations/ decisions, and documentation) and transaction costs. It also results in the client and the contractors meeting after the award of a procurement process and coming to an agreement to change the requirements. This is sometimes called partnering. This invalidates the price based competition and motivates contractors to drop their prices to get the project then negotiate to increase the cost after award. A careful study of the construction/design industry reveals that it is more important to get work than to do work. Contractors and vendors put more resources into sales, marketing, and forming relationships than they do in performance measurements of their personnel and company.

Figure 2a shows that in a value based competition, contractor #1 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 nontechnical risk that they do not control. It is the over-expectation of the client, the risk that other parties bring to the contractor that they do not control (actions of client, designer, inspectors, users, and economy) that they must manage and minimize.
2. They preplan the project from beginning to end, preplanning ways to manage and minimize risk.
3. They have a fair 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 incomplete in its directions.
2. They have technical risk, due to their inexperience. They do not plan on being accountable to manage and minimize the risk that they do not control.
3. 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.

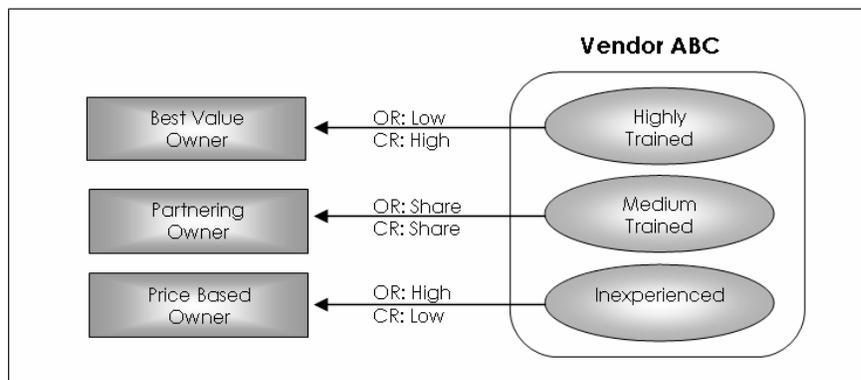


**Figure 2: a) Best Value Award    b) Impact of Price Based Award**

When the client awards based on price (See Figure 2b), Contractor #1 is forced to lower their price, bid the project as a reactive, “blind” contractor, who does not act in the best interest of the client. Contractor #1 is actually being directed to maximize the client’s risk, to be reactive, and to not use their expertise.

This delivery system forces the industry to (Kashiwagi and Savicky, 2002):

1. Continually lower performance.
2. Stops any motivation for accountability, being proactive, and managing and minimizing risk that they do not control.
3. Forces clients to use more management and supervision.
4. Forces client’s professionals to be more expert than the contractors doing the work.
5. Creates a business model with is not sustainable.



**Figure 3: Different Types of Owners (OR = Owner Risk, CR = Contractor Risk)**

Figure 3 shows three types of owners (Kashiwagi *et al.*, 2005):

1. Best value owner. The best value owner identifies who is the best value (price and performance), transfers risk and control to the contractor, and holds them accountable.
2. Partnering owner. Partnering owner wants to share in the accountability, risk, and solution. The partnering relationship is not as good as the best value, because whenever there is divided responsibility, there is no accountability.
3. Price based owner. The price based owner will direct the contractor on what to do, when to do it, and how to do it. They will manage, direct, and control the contractor. They will take no accountability

for nonperformance, surprises, changes, and other so called “risks”. The client is the expert, the decision maker, and the authority.

The contractors have three major personnel groups: The highly trained, the medium trained, and the inexperienced. The three groups have major differences in:

1. Pay or compensation, the highly trained being highly compensated.
2. Their ability to see the project from beginning to end before they do it, ability to preplan, and ability to minimize risk that they control and do not control.
3. Their ability to listen to someone else that may not have the same level of technical competence.

To maximize their payoff of profit, the contractor must align their personnel with the client type. If the client is a best value client, the only personnel who can manage and control the risk is the highly trained. If the client is a price based owner, to send the highly trained would minimize their effectiveness, as they would be forced to take directions from the client’s professional, who by definition would not have the experience to override the highly trained personnel of the contractor. This would create unneeded transactions, which would minimize the performance of the highly trained and the profit of the contractor.

On a much higher industry level, one can now quickly see if the majority of the clients/buyers of construction were price based, the industry would attract the inexperienced, the reactive, and the unaccountable, thereby raising the cost of the delivered construction (inefficiency and the cost of the professional management). Other ramifications would be increased need for project management, and decreasing quality, skill, and experience levels.

## **2. Best Value Quadrant**

The differences between the Best Value Quadrant and the Price Based Quadrant include the following (Chong *et al.*, 2007):

### Price Based Quadrant

1. Client controls and directs
2. Uses detailed specification (how, what, when)
3. Uses minimum requirements and standards
4. Cannot predict the level of service delivered until delivery
5. Client manages, controls, directs and inspects work
6. There are no accountable performance measurements
7. The most important document is the contract and there is great dependence on the contract for execution of services
8. Increases transactions and transaction costs
9. Increased flow of information during all phases of selection and construction.
10. Low price award favors the blind, the inexperienced, and the reactive.
11. Confusion of responsibility and non-transparency.
12. More regulations.

### Best Value Quadrant

1. Control and risk is transferred to the contractor
2. Specification is used as an intent, contractor delivers the highest possible quality
3. Minimum requirements and standards are used only to communicate intent

4. Level of service is established before contract award, and client gets what vendor identifies as what they are delivering
5. Contractor practices quality control and risk management
6. Client practices quality assurance which is to ensure that the contractor is doing quality control
7. The contractor measures deviation from their baseline plan, making all parties accountable through dominant documentation of risk
8. The client does not depend on the contract, but on the contractor to perform
9. Decreases transactions and transaction costs.
10. Decreased flow of information.
11. Best value environment favors the highest performers.
12. Transparency.
13. Less regulation.

Movement from the price based environment to the best value environment requires the following changes (Sullivan *et al.*, 2005):

1. The client must release control.
2. The client must buy based on value and not price.
3. The client needs a selection process that minimizes decision making (bias of the client's professionals).
4. The client needs a selection process that forces the contractors to preplan, identify risk that they don't control and know how they will minimize the risk (take control of not only the project, but everyone who touches the project).
5. The contractor becomes the controller of the project, the documenter of risk, and the administrator of the project.
6. The client, the client's representatives and professionals become accountable to the contractor.
7. The contractor writes the majority of the contract.
8. The client must realize that they are the biggest source of risk to the project.
9. There must be a decrease of transactions, and flow of information.
10. The new environment must be more competitive for performers instead of nonperformers.

These actions have been done in the manufacturing industries, but not in the construction industries in developed countries. They have (Baretta *et al.*, 2005; Semler, 2004; Womack, 1991):

1. Minimized management.
2. Practiced quality control.
3. Measured performance.
4. Minimized transactions.
5. Continuously improved.

The construction industry has always claimed that they were unique, that their service is provided on site by highly skilled personnel. However, in testing out the hypothesis that the above is correct, the Performance Based Studies Research Group (PBSRG) validated that logic and best value practices (efficient and effective) should be used instead of current construction best business practices which were formed from past experiences.

### **3. Example of a Best Value Model**

The best value Performance Information Procurement System (PIPS) model was developed in 1991 as the Performance Based Procurement System (PBPS), and continually tested and modified over the last fifteen

years (Kashiwagi, 1991; Kashiwagi *et al.*, 2008a). What differentiated PIPS from other industry solutions was (Sullivan *et al.*, 2007a):

1. The risk and control was transferred to the best value contractor.
2. The system identifies the client as the major risk of nonperformance.
3. The system allows the contractor to write the risk management portion of the contract.
4. The system allows the contractor to administer the contract.
5. The system does not depend on the contract for performance.
6. Legal and procurement activity is severely minimized.
7. Decision making of client professionals is minimized.
8. The process minimizes up to 90% of the client's risk management activity.
9. The contractors increase their profits without increasing their costs.

Simply stated, PIPS did the following (Pauli *et al.*, 2007):

1. Minimized the role of the client's professional.
2. Transferred risk and control to the best value and high performing contractors.
3. Allowed the contractor to set a baseline plan, measure their own deviations, and manage the risk of the project by holding all parties accountable.
4. Minimized management.
5. Maximized efficiency.
6. Hired contractors who preplanned, were capable of doing the work, and minimized interruption by the client.

The construction industry resisted PIPS because it forced one of the largest components of the delivery chain, the client's professional to change their paradigm (Goodridge *et al.*, 2006). The new paradigm is:

1. Leadership and not management.
2. Efficiency and not more activity.
3. Release of any control.
4. Measurement of performance.
5. Use of past performance information and the ability to preplan, be visionary, and minimize risk before it happens.
6. Eliminate all duplicity of work.
7. Construction management, quality control, and cost estimating are contractor's responsibilities.

One of the biggest professions, quantity surveyors, was being required by PIPS, to leave regulation to the delivery structure, and minimize their activity and transactions. It also identified that their current professional roles was actually causing a decrease in construction quality and value, instead of protecting the client.

#### **4. Current Construction Industry Performance**

The construction industry has been in the price based model for the last twenty years. The performance has been very poor. The construction industry has tried to improve performance by Sullivan *et al.* (2007b):

1. Getting out of the price based sector by awarding based on performance.
2. Using alternate project delivery mechanisms such as design-build (one point of accountability), construction management @risk (CMAR) where the designer and contractor work for the client, but

work together to complete the project, privately funded initiatives (PFI) which the contractor is the bank/financier, designer, contractor, and oftentimes owner of the construction, design-build-operate (DBO) where the contractor takes over the construction for a period of years of operation, and public-private-partnerships (PPP) where it is a joint venture.

3. More management and verification of contractor performance.

## 5. Obstacles of the Developed Construction Industries

As previously discussed in the PIPS section, developed construction industries cannot easily change. They have the following sources of resistance (Kashiwagi *et al.*, 2008b):

1. The academic/research units have been teaching construction management as a function of control and inspection in a confusing and adversarial environment.
2. The academic/research groups have identified the problem as a technical problem, and are trying to solve the problem with technical based engineers and designers.
3. The component of construction managers, consultants, and design professionals doing construction management is politically powerful, and is very resistant to a change.

Until PIPS was tested successfully, the industry advocated the client exercise more management and control. They were proposing that the construction industry was different, complicated, and fraught with risk. The PIPS research program dispelled many of these traditional notions by Kashiwagi (2009):

1. Tested over 600 times, over 15 years, on all types of construction services.
2. Resulted in 98% performance.
3. Minimized client management up to 90%, increased value by at least 30%, and delivered at the same or lower costs.
4. Tested the concepts outside of construction with the same results, validating the more effective and efficient concepts of the PIPS delivery process.
5. Identified the source of non-performance as a supply chain issue, of hiring personnel who couldn't meet the expectations of the buyer, and the client thinking they had a level of control over the supplier.

Potential problems in developed construction industries include (Kashiwagi, 2009):

1. Many quantity surveyors, engineers, and design risk management and quality control personnel doing management, direction, and control instead of quality assurance.
2. Not enough qualified contractor personnel and craftspeople.
3. Unstable delivery system which minimizes the motivation to have effective and efficient contractor and craftspeople education and training.
4. Treating construction vendors as commodities, which minimized the opportunity to develop local construction talent.
5. Attempting to practice control, when the concept of control may be creating unneeded and difficult to document transaction costs.
6. Identifying the contractor as the source of risk when it was really the client/buyer delivery system.

In trying to change the paradigm in developed construction industries, the following factors make it very difficult (Hamel and Breen, 2007; Kashiwagi *et al.*, 2008):

1. The change agents may be the problem and are trying to protect their current roles and position.
2. The change agents are those who created the inefficient system, and now must admit that they may be the problem.

3. The change agent with the most potential to turn the industry would be the academic researchers, but they are entrenched with teaching client construction management based on management and control.
4. If an efficient model is implemented, many of the jobs and transactions are no longer needed, but there is no plan to transform the managers into another role.

## **6. Option Open to Developing Countries**

The authors are proposing that developing countries do not have the years of tradition and a large population of professionals who need to protect their job and who are not open to a new paradigm. Developing countries also have less resources, and growing requirements of their cultures trying to improve. Instead of copying the developed countries and using the construction delivery systems that practice management and control, they can implement the practices of the Best Value Quadrant. They can implement logical concepts of minimized decision making, preplanning, administering their own contracts and documenting deviations from the preplanned baseline. The systems are simple, logical, and require less technical background to understand.

Underdeveloped countries may have a better chance at changing the client delivery system than more developed countries. The authors propose to test this concept of underdeveloped industries leapfrogging the technology of more developed countries, by bringing the highly advanced but simple PIPS system into Gaborone, Botswana for testing. The test includes:

1. Educate a group of UB project management faculty.
2. Implement the education into the graduate project management program.
3. Give presentations to the local industry, and convince them to run tests implementing PIPS.
4. Run tests using the more efficient and effective PIPS delivery system.
5. If tests are successful, and hypothesis is validated, form joint venture between clients, contractors, and the UB research group to create the proper education to increase the testing/implementation and make the PIPS model sustainable over time.
6. If construction tests are successful, the participating organizations may extend testing to other industries such as IT, university services, and the providing of commodities.

## **7. Conclusions and Recommendations**

Construction industries in developed countries have problems of diminishing project management and craftsperson expertise, inefficient operations leading to low profit margins and high risk, overdependence on client professionals to manage and control, and low on time, on budget, meeting the client's expectations. Other problems include safety incidents, collusion, and litigation.

Developing countries often get their expertise and practices from the developed countries. Despite the poor performance of the construction delivery systems in developed countries, the underdeveloped countries follow in the footsteps copying the flawed systems. The authors hypothesized that this was not the best option, that underdeveloped countries should identify stable, high performance platforms which are built on measured performance, logic, and simplicity, and test and use these instead of the well tested but unsuccessful construction delivery systems.

The authors have setup a test to prove this hypothesis in Gaborone, Botswana. The test includes seeing if the Botswana industry can understand the deductive logic, run tests successfully, and build a platform around education, testing, and implementation that can be sustained over a long period of time.

The authors recommend that if the construction tests are successful, the testing can be expanded to other industries in the underdeveloped countries.

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