

The new role of the construction manager/client engineer/quantity surveyor

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Abstract:

The traditional contracting/delivery system in Botswana, introduced by the US, UK, and European educators, consultants, and practitioners, has not been working well in Botswana. The poor project delivery system results have forced the organization of a new group, the Government Implementation Coordination Group (GICO) to attempt to solve the problems. In the fall of 2008, the University of Botswana (UB), through the US State Department sponsored Fulbright program, brought professor Kashiwagi, and the best value Performance Information Procurement System (PIPS) technology, the Information Measurement Theory (IMT), and the Industry Structure Analysis to the UB project management section. This paper proposes that the client's professional representative requires a new, more effective role. The role includes using performance information, transforming the client's expectations into a design/construction intent by using expert vendors, ensuring the vendors manage and minimize the risk that they do not control, outsourcing the technical responsibilities, and doing quality assurance instead of quality control. This paradigm will minimize project risk, maximize project value, and increase the professionalism of project management, construction management, and quantity surveyors. These concepts will be tested on three test projects in Botswana.

Keywords: new quantity surveyor role, new paradigm for construction management

1 Introduction: Management is an Inefficient Practice

Client construction/project management and quantity surveyors have an inherent theoretical problem in delivering construction. Management is a practice that is a "necessary evil" based on principles of inefficiency (a client's manager directing an expert) and having no accountability for results (contractors are often blamed for the failures.) Deductive logic or "common sense" leads to the following concepts:

1. Management is not required if the vendors are experts in their areas.
2. It is inefficient for a client/buyer to manage, control, and direct an expert vendor.
3. Organizations that have expertise are lean and minimize the need for management.

4. When organizations get too large or the number of partnering organizations is too many, there will be an increased flow of information, management, and transactions. Increased flow of information, transactions, and management are signs of inefficiency.

2 Literature Review

One of the possible reasons why the construction industry has not improved its performance radically over the past ten years is that the industry experts and consultants are proposing that the answer to becoming more efficient and effective lies with more and better management techniques, functions and practices (Hamel, 2007). This has not been proven, and goes against results and deductive logic. More management leads to (Deming, 1982, J. Kashiwagi, 2007):

1. More people making decisions, directing, and controlling instead of doing expert work.
2. More expertise required in management than those doing the work.
3. No transfer of risk and accountability to the workers/vendors.
4. The use of minimum standards and the movement toward lower quality of work.
5. The commoditization of construction work and the decrease in quality and expertise.
6. Reactive on the job training instead of proactive quality education and training.
7. Less preplanning, and more reactive management.
8. Repeated and wasted work effort.

Edward Deming (1982), the father of continuous improvement, and follow on Six Sigma and Lean movements in the manufacturing sector, gave 14 points of management which identified why the solution that the construction industry has used will not solve the problems:

1. Minimum standards are meaningless, counterproductive, and should not be used.
2. The price based system cannot work and should be abolished.
3. Inspection by experts is too late, costly, inefficient and nonproductive.
4. The management system is the problem and not worker nonperformance.
5. Production improves as quality control improves.

2.1 Case Study of Botswana Construction Industry

In 2008/2009, Fulbright Scholar (FS) Dean Kashiwagi was brought into the University of Botswana (UB) project management (PM) section to bring improvements to the Masters of Project Management (MPM) program in the Faculty of Engineering and Technology (FET) (Kashiwagi *et al.*, 2008). The FS proposed to implement a futuristic PM/CM model that minimized management, direction, control, and risk functions by using alignment and preplanning. He proposed that this would:

1. Minimize overall management activity and risk.
2. Implement simplistic measurements that minimized decision making.

3. Change the mindset of the industry by using “common sense” concepts.
4. Show dominant performance of 98% and reduction of management function by as much as 90%, while increasing vendor profit by as much as 100%.

The project management and construction management results is a major concern in Botswana, as the British implemented system of management, direction, control, and price based structure has not worked well, resulting in the government setting up a special oversight group, the Government Implementation Coordination Office (GICO), tasked to address project management concerns in construction and other industries (Adeyemi *et al.*, 2009). The authors are proposing that the traditional model of client management, direction, control, decision making, and inspection using highly technical engineers in a management and control role has been ineffective. The management approach that has been used in the U.S., in Europe, and in the U.K., has shown problems in delivering performance (on time, no contractor generated change orders, and meeting the initial expectations of the client) and has not resulted in increased construction technical training of craftspeople and the number and skill level of craftspeople (Adrian, 2001; HC&O, 2004).

2.2 Problem

The traditional functions of project managers, construction managers, and quantity surveyors may be directly or indirectly connected to the price based environment and project nonperformance (Sullivan *et al.*, 2009). Instead of minimizing vendor caused risk, the client’s professional representative may be part of a structure that motivates poor performance. A change in construction management structure and process is required to make the construction manager, project manager, or quantity surveyor a practitioner of quality assurance, forcing vendors to practice quality control and deliver high performance.

2.3 Hypothesis

The authors propose that the future construction delivery structure will be the best value environment and client’s construction manager (CM), project manager (PM,) and quantity surveyor, must be transformed from management, control, direction, and inspection roles into a quality assurance role to ensure that risk is transferred to the contractor and the contractor practices quality control.

3 Research Methodology

The paper will use the following models and propose how it affects the clients’ CM/PM’s future role in construction:

1. Construction Industry Structure (CIS chart) and the transfer of control and risk to the vendor.
2. The difference between the price based environment and the best value environment.

3. Quality Assurance/Quality Control.
4. New risk model.
5. KSM model.
6. Best Value Performance Information Procurement System (PIPS) and Best Value Performance Information Risk Management System (PIRMS) test results.

4 Findings and Discussion

4.1 Construction Industry Structure

The Construction Industry Structure (CIS) (Figure 1) (Kashiwagi, 2009) identifies and simplifies the current problem.

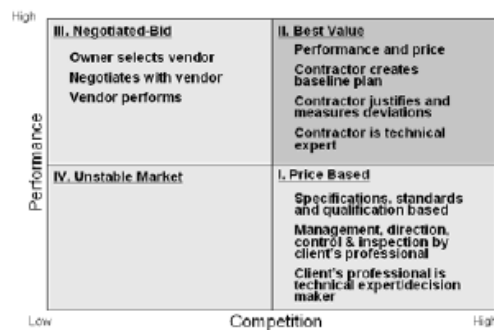


Figure 1. Construction Industry Structure

Due to the worldwide competitive environment, buyers of construction services have moved over to the right hand side (Quadrant I – Price Based Award and Quadrant II – Value Based or Best Value.) In the price based environment (Goodridge *et al.*, 2007):

1. The client's management directs, controls, and inspects.
2. There is no transfer of control and accountability to contractors.
3. Client's CMs, PMs, and quantity surveyors use minimum standards to identify the requirement and try to deliver projects by enforcing the specified minimums.
4. The minimum standards are turned to maximums by the vendors due to the price based environment and driven downward by vendors (Figure 2.)
5. Contractors who are short on experience, reactive, and only do what they are directed become more competitive because they can give a lower initial price.
6. Contractors who manage and minimize risk and who are the better value when considering total project cost, become noncompetitive because they do not fully take advantage of the change order or deviation system (reactive behavior.) This raises the perceived cost of construction and has the impact of making fair and compete prices look high due to the incomplete pricing of the low performing competitors (Figure 3).

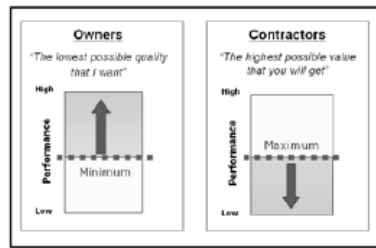


Figure 2. Minimum/Maximum Dilemma (Kashiwagi, 2009)

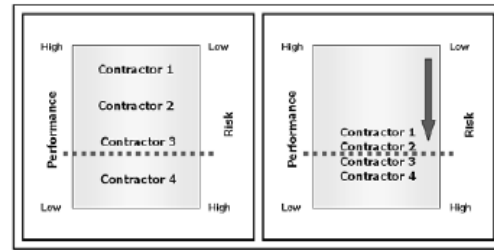


Figure 3. Price-Based Award (Kashiwagi, 2009)

The change order system, the reactive nature of the price based system, the pointing of fingers, the lack of preplanning and minimization of risk that the contractor does not control are all congruent to the price based environment, inexperienced vendors, and the client's control oriented CMs, PMs, and quantity surveyors. The client's CM, PM, and quantity surveyor are in control in the price based environment but are not accountable for nonperformance. They make the decisions and they control the vendor. In the best value environment, the risk is transferred to and minimized by the high performance vendor (Figure 1). The only vendor personnel who can reasonably accept the risk are the experienced, high performing individual(s) because they minimize the risk with their expertise. In the best value or value based environment, contractors must do the following to be awarded work (Figure 1):

1. Compete based on past performance of the company and key contractor components including project manager and site superintendent and critical subcontractors.
2. Quantify the scope of work and the risk that they do not control and how they will manage and minimize the risk.
3. Interview of their site superintendent and project manager to identify if they can create a baseline of the project from beginning to end, if they can manage and minimize the deviation and risk from the baseline schedule, and if they can be accountable.
4. Price. The price is determined by the vendor, and it must still be competitive. Higher prices must be justified and validated by the presentation of dominant added value. Each price is connected to a level of quality and value, and cannot be compared against someone else's perception of the price or cost. There is no client party to double check their price and determine if they know what they are doing. Contractors must accept accountability and liability for submitting a correct price.

The best value contractor is then required to:

1. Have a baseline plan based on time and cost.
2. Create a risk management plan (RMP) to manage and minimize all concerns and risks before the project starts.
3. Sign a contract that includes the above.
4. The entire team's performance will them impact their future performance rating by 50%.

In the best value environment, the contractor is selected based on performance and price. Performance includes the ability to manage and minimize the risk that the contractor does not control (nontechnical risk which includes client's over-expectations, incorrect and incomplete directions, risk caused by the client's representatives during the project, and unforeseen risks.) High performance contractors have great experience and technical expertise which minimize the technical risk, and result in the management of the only remaining risk that can minimize their profit: the risk that they don't control (Figure 4). Contractors, who are successful, attempt to minimize the deviation from their preplanned baseline, instead of meeting minimum standards (Deming, 1982.) Performing contractors provide high quality at the lowest possible price due to their technical expertise (best value). The combination of lowest price and high quality by utilizing expertise and preplanning is a lost art in the construction industry.

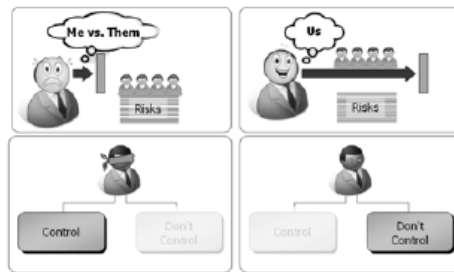


Figure 4. Inexperienced vs. Experienced Vendor Risk Model

A major problem with the traditional client management is the generation of inefficient transactions (meetings, documents, emails, approvals, negotiations, surprises or deviations.) This leads to the increased attempt to control the vendor and increases the number of participants and flow of information in the process. It clouds accountability by sharing all the information and increasing decision making by parties other than the accountable party. Industry shows the profit margin of contractors at 2 – 5%, while the change order rate is between 5 – 10 % (Adrian, 2001). Production of construction workers is in a downward trend, the only industry to show a decreasing performance (Adrian, 2001; HC&O, 2004). Deductive logic identifies the task of client's representatives validating, managing and controlling the contractor's cost under these conditions as a transaction. It adds very little value and results in poor performance. Even if the task is identified as a very important function of client's management and quality surveyors, it is nevertheless a reactive, inefficient transaction.

4.2 Test Results of Best Value Environment

The Performance Based Studies Research Group (PBSRG) at Arizona State University, the home of the International Council for Research and Innovations in Building and Construction (CIB) W117 Performance Measurement in Construction, has been testing best value procurement for the last 15 years (600+ tests, \$2.3B of delivered services, 98% client

satisfaction, on time, and minimized contractor generated cost change orders.) Test results show that in the best value environment, the following characteristics are evident when compared to the price based environment (Kashiwagi, 2009; PBSRG, 2009):

1. Efficient (up to 90% less CM/PM management required).
2. Performance is very high (98%), making risk negligible.
3. The number one cause of risk, if it occurs, is the client or client's representative.
4. Contractors make more profit (up to 100% more) without charging more.
5. There is no consistent relationship between performance and increased price.
6. At one test site, over 60% of the awards are made to the submitter with the lowest price.

The best value environment has also been moved outside of the construction industry into areas of food services, Information Technology (IT) Networking, Professional Services, and the delivering of commodities (\$1.4B of services) (Sullivan, 2009, Kashiwagi, 2009). PIPS/PIRMS has also been tested in areas where the construction has been based on price, and minimized change orders and time delays by 50%. The research results show that the delivery of construction may be no different from other delivery of service or products.

4.3 New Risk Model

A new risk model has been developed that shows a major source of risk in project and construction management (PM/CM) is the inaccurate expectations and decision making by the client and their representatives (Mselle *et al.*, 2009.) Risk is caused by decision making, an inaccurate perception of the initial project conditions (requirement in terms of time and cost, accurate baseline plan on how to meet the requirement) and the client hiring vendors who do not have the expertise required. Instead of risk being caused by the vendors, the risk is being generated by the client and client representatives and increased by hiring nonperforming vendors. As the project proceeds, it becomes more obvious that the client's expectations are not being met, and this deviation is called risk and made the responsibility of the vendor. Thus, instead of managing and controlling risk, the client and construction manager may actually be creating risk and then increasing the risk by hiring a nonperforming contractor. The end result is poor project performance. The risk model proposes that project risk should be minimized at the start by (Mselle et al, 2009):

1. Minimizing decision making.
2. Using vendors who have expertise in understanding both the requirement and the accomplishing of the requirement.
3. Transferring risk and control to the contractor who can most accurately identify the requirement and a baseline plan to accomplish the project with minimal deviation.
4. To replace the client's expectations with the accurate assessment by the expert vendors, and allowing the experts to self regulate and measure the deviations.

4.4 Quality Assurance/Quality Control

Concepts of efficiency called quality assurance and quality control have been practiced in the manufacturing industry for the past 20 years (Deming, 1982.) Quality control is where the expert workers minimize risk of failure by constantly ensuring quality during the manufacturing process (Erturul and Aytac, 2009). Quality assurance is where the management ensures that the workers through their expertise in their job minimize risk of nonperformance, downtime, and inspection requirements during the manufacturing process by practicing a structure of quality control (measurement of deviation from the optimal.) The Corps of Engineers are trying to establish quality control and quality assurance, but are having difficulty due to the paradigm of client management, control, and direction that they practice over the vendors (Chong *et al.*, 2007.) These practices can only be done in the best value environment structure. In the price based award environment, the client's construction manager is directing, controlling, and inspecting the price based vendor's minimum standard work instead of allowing the vendor to manage their work based on deviation from a preset baseline plan. Quality assurance is to assure the client that the contractor has their quality control process or a process whereby the contractor minimizes deviation from a baseline plan (cost, time, and quality.) Quality control can only be practiced only by the vendors or contractors. To make this possible, control must be transferred to the contractor (best value environment.) In the price based environment, control is not transferred. The client's representative maintains the control, managing, directing, and inspecting the contractor's work (Figure 1).

Deming (1982), the father of quality assurance and quality control, identifies the major difference between the quality control/assurance approach and the management approach as the first regulates by minimizing deviation, and the second measures against minimum standards. The result of using minimum standards is the lowering of quality and the losing their high quality craftspeople through attrition, and having difficulty in replacing them due to the lack of requirement for craft-people and managers who have the understanding, experience, and high quality of work. Over time, on the job training replaces technical training, and minimal standards replace high quality and ability to preplan work. It also brings more importance to client management, direction, control and inspection of contractor's work. It also makes construction a price based commodity, as there is no difference in quality and expertise, but is merely an inspected minimum requirement.

4.5 KSM

The Kashiwagi Solution Model (KSM) (Figure 5) is a theoretical model that uses the change rate of individuals and a two way chart that relates the extremes of characteristics of people. The KSM uses an extreme comparison between the very visionary, information using, proactive, fast changing "Type A individual," and the very shortsighted person, who has less ability to perceive information to predict the future outcome, reactive, slow changing "Type C individual." Extremes are used to make the differential obvious, or dominant (easy for anyone to see despite different backgrounds and experiences.) A complete description on the KSM is available in the textbook "A Revolutionary Approach to Project Management and Risk Minimization" (Kashiwagi, 2009.)

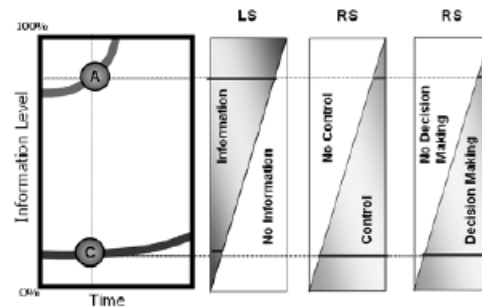


Figure 5. Rate of Change and KSM Example (Kashiwagi, 2009)

The objective of the KSM is to identify which characteristics are on the top side or related more to the “Type A” than the “Type C.” The opposite characteristic is then identified with the “Type C” individual. For example, by definition, the “Type A” characteristic is “use information,” the Type “C” characteristic is “not to use information) (Figure 5). Another characteristic is “control.” The Type “A” individual knows that there is no evidence that an individual can control another individual. However, individuals without the experience and information, try to control other individuals. There is no evidence of success of this model in any industry, while the failure of this perception can be found in world history, our criminal system, rehabilitation programs, and other attempts to change and control other people (Kashiwagi, J, 2008, Deming, 1982.) A third characteristic is decision making. Type “A” individuals realize that decision making takes place in the absence of information, and decision making has never been as successful as using information (Snijders *et al.*, 2003). Type “C” individuals perceive decision making as a use a major use of expertise and their professionalism. A major practice of Type “A” individuals who are efficient is delegating the responsibility to the lowest levels, where experts can apply information to minimize risk and decision making (Deming, 1982.)

4.6 Future Roles of Client Construction/Project Managers, and Quantity Surveyors

The future role of the client’s professional will align with the best value environment (Chong *et al.*, 2008; Kashiwagi, 2009):

1. Doing quality assurance and not quality control functions.
2. Using performance measurements of vendors during selection, construction, and after the project is completed.
3. Proactive by running best value procurement on designers and contractors.
4. Using alignment and not management, direction, and control of vendors.
5. Minimization of the flow of information to dominant information that measures performance and forces vendor accountability.

The future role of the client’s professionals (CM/PM) will move toward quality assurance (non-technical) and away from the technical management (quality control.) Along with this transformation will come the realization that the “perceived value” that they were providing in doing management, control, and direction is inefficient and one of the sources of

construction nonperformance. The concept of using a set of drawings and specifications is still needed in the design-bid-build process, but the assumption that the client's professional can efficiently prequalify contractors, manage and direct them, and deliver construction effectively and efficiently is not logical and will be exposed as inefficient.

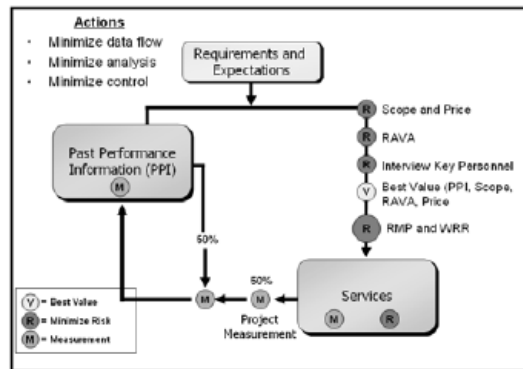


Figure 6. PIPS/PIRMS Closed Loop Structure

Using the above theoretical discussion, the future CM/PM model will require a structure that allows the CM/PM function to perform quality assurance (QA) and force the contractors and vendors to do quality control (QC.) The authors are proposing that the Performance Information Procurement System (PIPS) and the Performance Information Risk Management System (PIRMS), which have been tested together or separately, meet the above requirements, and has proven very successful in tests over the last 15 years. PIPS has three phases: selection, pre-award and preplanning, and risk management. The closed loop structure is shown in Figure 6. PIRMS uses a weekly risk report (WRR) and a risk management plan (RMP), that becomes a documentation of all project deviations (Pauli *et al.*, 2007). The WRR and RMP (QA) ensure a QC is being implemented.

4.7 University of Botswana Is the Implementor

The FS proposed that the UB would be the only vehicle to facilitate the change in Botswana due to the required change in paradigm, the redefinition of roles of the industry participants, and the university is the only group without a biased agenda and the capability to develop and implement a theoretically based concept. The FS accomplished the following to start the change (Mselle *et al.*, 2009):

1. Set up three major groups for testing: the Bank of Botswana, the UB IT department, and the U.S. Embassy.
2. Set up a group of UB PM Section faculty for implementation.
3. Identified a group of organizations in Botswana who are interested in cooperating with the research group, potentially running tests in their organizations.

The FS proposed that the Botswana professionals who were trying to solve the problem, may be an integral part of the problem, and therefore cannot solve the problem due to a

“conflict of interest.” The professionals are using a highly managed, controlled, directing, and inspecting approach, which minimizes the impact of high performing vendors, and confuses the accountability issue if anything does go wrong. The UB will be the implementor through a research program. The mechanism will be the graduate students working in partnership with the UB faculty, bringing the projects from their organizations to the university for testing, and documenting the test and test results. The graduate students will then become experts in their organizations, slowly changing the culture and the delivery process.

5 Conclusion and Further Research

Extensive research work has been accomplished to show that the future client construction management and project management model will be one that utilizes a best value environment, uses quality assurance and contractor quality control, transfers risk and control to the contractor and vendors, manages risk by forcing the contractor to minimize deviation of time, cost, and quality, instead of directing and inspecting based on minimum standards, and understands that the major source of risk is the client’s inaccurate perception of the initial conditions. This change in paradigm can only be developed and tested through universities, who are not a critical part of the current industry structure or paradigm. These issues in Botswana will be addressed at the University of Botswana (UB) and industry organizations in Botswana over the next year through research partnerships started this last year. The testing at the UB will complement testing in the U.S. and the Netherlands.

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