

Best Value Solution Designed in a Developing Country

Dean Kashiwagi (Arizona State University), (PhD, Fulbright Scholar, PE), Jacob Kashiwagi (Arizona State University), (MS), Abraham Kashiwagi (Arizona State University), and Kenneth Sullivan (Arizona State University), (PhD, MBA)
Performance Based Studies Research Group, Arizona State University
Tempe, AZ, USA

For the last two years, researchers have been working with parties in Malaysia to implement best value practices. After two years of research work, the effort has many lessons learned. Lessons learned include a combination of factors that make the best value approach difficult in a developing country such as Malaysia. The different strata of economic levels give the upper levels (owners) a greater perceived ability to control the supply chain even though they may lack the expertise. This causes owners to attempt to deliver construction by controlling the vendors, both professionals and contractors. This increases the difficulty moving from a price based or owner directed system to a best value environment, which releases control to experts. The authors use deductive logic models which show decision making, direction, and control negatively impact accountability, proactive behavior, and the use of expertise. The two-year research program results in addressing the issue of how a buyer in a developing country can utilize the expertise of experts, and how the expert can change their function to get a controlling owner to use their expertise. The paradigm shift needs to take place among the elite and the visionary, before the overall environment can make the change. The product of this research project is to meet the requirements of a visionary group of quantity surveyors in Malaysia.

Keywords: Best value approach, developing countries, Information Measurement Theory (IMT), Kashiwagi Solution Model (KSM)

Introduction

Academic and industry research has identified construction performance issues worldwide for the last 20 years. Every country has the same performance issues (Abdul Rahman et al. 2005, Abdul Rahman & Alidrisyi 1994, Berstein 2009, British Property Federation 1997, Cahill & Puybaraud 1994, CFMA 2006, Chan & Chan 2004, Davis & Sebastian 2009a, 2009b, Doree 2004, Egan 1998, Flores & Chase 2005, Georgy et al. 2005, Glancy 2008, Hamel 2007, Hamzah 2003, Imtiaz & Ibrahim 2005, Ibrahim et al. 2010, Langlinais 2011, Lepatner & Barry 2007, Murphy 2012, Post 2000, Rijt 2009, Rwelaimila et al. 2000, Simonson 2006, Tucker 2003, Wang 2009, Wearden 2008). This includes developed and developing countries. However, there is a “perceived” lack of technical expertise in a developing country by owners [it has never been proven]. By observation, owners in developing countries import expertise from developed countries to overcome the “perceived” technical shortfall. After meeting with professionals from the Institute of Engineers Malaysia (IEM) and the Royal Institute of Chartered Surveyors (RICS) in Malaysia, the number one challenge identified by professionals in Malaysia has been that the owners do not give proper attention to the expertise of the Malaysian professionals. This is not to say that the average level of technical competence in a developing country may be lower; however, vendors not having the capability to perform the work, and owners not listening to the expertise of highly trained technical experts, are two different problems. They also propose that

the environment will not turn around until the owners change. Professionals perceive that they are faced with the challenge of using and increasing their technical expertise, while reacting to owners who are using a top-down, management, direction and control philosophy, which ignores their technical expertise. These feelings were voiced in multiple industry meetings to the author (CIDB 2009, Hussien 2009, Kashiwagi 2010).

This problem is also faced by professionals in more developed countries (Child 2010). The basis of the proposed solution to the problem is to identify that the owner and professional may be in a situation of the “abuser and the abused” (Kashiwagi 2012). The authors propose that both the abuser of power, and the abused (who gives up the right to do what is right and stops the abuse from going on), are actually partners in crime. They need each other. Both are wrong. And to continue the situation, both must continue to ignore the concepts of an efficient supply chain and a “win-win” solution.

The resulting problem is that the expertise of professional experts is becoming less important. Relationships have become more important than expert capability. This relationship is a “win-lose” relationship for the expert professionals. The resulting research questions are:

1. Can the expert professionals find a way to optimize the value and minimize the impact of project cost of their expertise?
2. Can the expert professionals find a method to convince the owners of the value of their expertise?
3. Can the experts increase the professionalism of their profession?

An approach to the problem has been tested in three countries: United States, Netherlands and Canada (AEF 2010, Kashiwagi 2011, Little et. al. 2012, Meyer et. al. 2010, Rijt & Witteveen 2011, Riley et. al. 2012, Sullivan & Guo 2009, Sullivan et. al. 2012a, Sullivan, et. al. 2012b, Kashiwagi 2012). The solution has come from academic research, using a deductive logic called Information Measurement Theory (IMT), the Kashiwagi Solution Model (KSM) and the best value (BV) approach called the Performance Information Procurement System (PIPS) (Kashiwagi 1991). The authors propose the same IMT, KSM, and PIPS solution may be applicable in a developing country to overcome the problems of “silo” thinking and the inability to efficiently utilize the expertise of expert professional vendors.

Proposal

The author proposes that owners and professionals are in a confusing situation where the use of expertise to assist clients is not being optimized (Kashiwagi 2009). The proposal is defined in the following steps:

- Identify a profession.
- Identify the current professional activity in terms of IMT and KSM characteristics.
- Identify the potential solution.
- Identify a potential plan to test the concepts.
- Run and analyze the results of the test.
- Run more tests.

- Educate the industry on the results.
- Make the new paradigm into an industry standard and educate the industry.

The authors are proposing to capture the first four steps in the proposal, based on the developed IMT and KSM logic. The industry must then move ahead and achieve the last four milestones. The authors are proposing that the problem facing the professional industry is that they do not have a logical solution to correct the reactive practices (IEM 2012, RICS 2012). The professional industry that the authors propose their solution to is the Malaysian Royal Institute of Chartered Surveyors, and in particular to the practices of Quantity Surveyors (QS). The justification of this proposal is the following:

- The logic of IMT and KSM has been developed for the past 20 years.
- The PIPS system has been tested over 1,500 times with a customer satisfaction rate of 98%.
- The solution has worked in solving the problem in developed countries (United States, Canada, Finland, and the Netherlands).

Case Study

The paper proposes a change in the quantity surveyor (QS) operating model that will increase their professionalism and value, assist them to be more proactive, and have sustainability through the next generation of automation that will come with the development of Building Information Modeling (BIM), 3 dimensional drawings, and integrated cost estimating.

Methodology

This paper uses a logic construct that is a recursive solution based on the foundation building blocks of simplicity and dominant extremes. The alignment of characteristics that lead to efficiency and effectiveness will be used as the methodology and the final check of the model. The normal iterative process of learning of an industry in a developed country will be cut short by a recursive solution called Information Measurement Theory (IMT) and the Kashiwagi Solution Model (KSM) that uses logical building blocks to optimize the perceived “technical” delivery of construction service. IMT and KSM will minimize the need for further case studies based on simplicity. IMT and KSM will only use dominant extremes (minimizes the need of information and more data). The “non-dominant ideas” which normally require decision making or use of experience or expertise will not be used in the solution process.

The authors will first start with an objective. It will be followed by definitions. It is then followed by the application of the recursive or seemingly infinite complex case and broken down into simple foundational building blocks. The foundational building blocks will identify the requirements for a future state of the QS. The objective of the paper is to identify the actions, which will lead to a future state of a professional Quantity Surveyor (QS), which is sustainable, adds value, and increases the professionalism of the QS in Malaysia.

Information Measurement Theory

IMT was first developed in 1991 by Kashiwagi at Arizona State University (Kashiwagi 1991). The basic tenants of IMT include:

1. Natural laws dictate the change in conditions from a set of initial conditions to final conditions.
2. Everything that happens or takes time is an event, with initial conditions and final conditions (which has changed over time.)
3. People change based on their level of perception of conditions and natural laws.
4. People who change faster are more perceptive to conditions, the change of conditions and natural laws.

Individuals who are fast changing have the following characteristics:

- Perceptive and observe/listen,
- Do not use control to override natural law,
- Use knowledge of initial conditions and natural laws to predict the future outcome,
- Do not use own limited experience and decision making to alter future outcomes.

Individuals who are slow changing have the following characteristics:

- Cannot observe and perceive conditions and laws,
- Attempt to control the conditions to change to some other conditions,
- Make decisions due to a lack of perception of the initial conditions. They base the future on their limited experience and expectation instead of on the initial conditions and natural laws,
- All natural laws and conditions are related and relative.

In utilizing KSM, the first step is the definition of natural laws, conditions and event.

Natural Laws, Conditions and the Event

The following is defined by the author (Kashiwagi 2012):

1. Natural laws regulate the change of conditions over time and exist in all locations and times.
2. Natural laws always exist, whether perceived or not and are discovered and not created.
3. Conditions are unique based on time and location. No two conditions can be exactly the same.
4. Conditions change over time and situation.
5. Whenever conditions change (due to time elapsing or situation changing) there is an event.
6. Initial conditions change into final conditions in an event.
7. The change and change rate is controlled by natural law.

8. An event and event outcome is fixed by the initial conditions, the passing of time and natural law.
9. Information is composed of descriptions of the conditions and the natural laws. If an individual had all information on the initial conditions and the natural laws, they can predict the future outcome/conditions.
10. If a person knows the information, they cannot predict the future outcome with a degree of accuracy.
11. However, not knowing does not infer that the outcome will not happen. It will still happen, and it will happen only one way as all events have only one observable outcome.

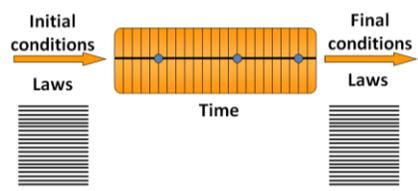


Figure 1. The event

The understanding of the natural laws and events leads to the observation that the only opportunity to change the outcome is to change the initial conditions. However, there is risk when someone does not understand the initial conditions, attempts to change what they don't understand, and then expects a different outcome. For example, when an owner perceives that they are hiring an expert who understands the initial conditions, they can still cause risk (not having final conditions that match their expectations) due to the following:

1. Directing the experts on what to do.
2. Does not listen to the experts.
3. Changes what the experts recommends.
4. Thinks that they are more expert than the experts.

Change Rate of Individuals

Individuals change at a different rate based on their perception of initial conditions and natural law. They perceive information that is already there, process the information, and if they understand a newly perceived concept, they will apply the new idea and will therefore change. The change always leads to the perception of more information. As individuals continue to learn (Figure 2), they will perceive process, apply newly perceived ideas, and change at a faster exponential rate. The faster an individual learns, the faster they change.

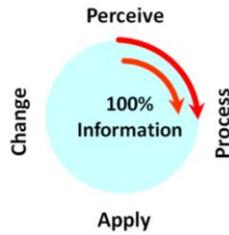


Figure 2. Cycle of learning

Figure 3 shows that the two-way KSM with the rate of change levels. All options in between the 100% knowledge and 0% knowledge are ignored (even though most people's characteristics are between extremes.) For example, the top of the left side (LS) of the KSM split rectangle is 100% perception of information. On the bottom of the right side (RS) is 0% information perceived, or 100% of the time, there is no information perceived. At every other level between the extremes, there is an amount of information that is perceived and not perceived. Type A individuals perceive more, Type C individuals perceive less. KSM is utilized to identify which characteristic is at the top or LS, and which is at the bottom or RS, and not the degree of the characteristic the person utilizes.

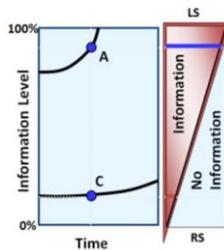


Figure 3. KSM rate of change

In practice, no one is at the very top (100% information) or at the very bottom (0% information). Every person is at a level which they have both the perceived information characteristic and the no-information characteristic. For example:

1. Some level of documentation is always required. It will be minimized if experts are being utilized, and maximized when non-experts are being utilized. Documentation is therefore a RS characteristic. Therefore if non-experts are hired, more documentation is required. If experts are being utilized, less documentation is required. Documentation will therefore be a RS characteristic, and "no documentation" is the LS characteristic. Possible metrics may be the number of documents or the number of pages of documents.
2. Some level of communication is required. The more non-expert parties will use more communication.

All the top LS characteristics will be related to perceiving and using more information. All the bottom RS characteristics are related to perceiving less and not using information.

Three KSM Levels

The author developed three KSM levels. The levels are: the foundation characteristics (information, decision making, and management, direction and control of others (MDC)), the second level is the easily observed processes and actions, and lastly the third level is the more difficult to define or perceived characteristics that explain what is happening (Figures 2-4). The first foundation levels are recursive; they are defined by their definition. Level I characteristics include:

1. Use of predictive information (no use of predictive information).
2. Decision making (no decision making).
3. Use of management, direction and control (MDC) to mitigate risk (no use of MDC).

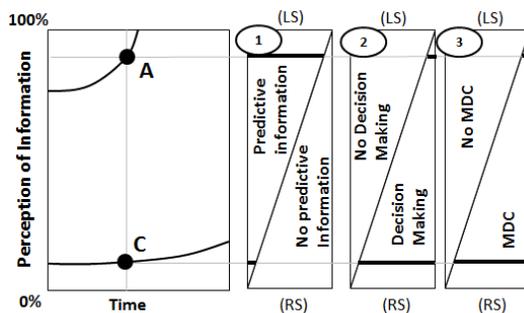


Figure 4. Level 1 foundational KSM characteristics

For example if someone perceived all information, they would not make any decisions because they would see the future outcome and know exactly what to do. Because they understand that the changing conditions are regulated by natural laws, they realize there is only one outcome, they do not need to make decisions on a single output. When they understand there is only one outcome, any attempt to control the conditions to result in a different outcome or to pick an outcome that is clearly not going to occur, is fruitless, therefore they do not attempt to control or change conditions that they have no control over. For example, if someone is using risk management, "Is the actual level of risk higher or lower?" Traditionally, people would answer lower, because risk is being managed. However, if there was an expert on the project, the risk would be lower, and risk management would not be used to manage the risk (because there is no risk). When people are using risk management to mitigate risk, they are actually increasing the risk because they hired a non-expert, and now must manage risk due to the non-expert's lack of expertise. An expert who has very little risk should be hired.

Level two addresses the observable process and action characteristics. They include (and their opposites) (Figure 5):

1. Meetings (no meetings).
2. Communications (no communications).
3. Passing detailed technical information (not passing detailed technical information).
4. Rules (no rules).

5. Documentation, which includes specifications, emails, meeting minutes (no documentation).
6. Prequalification (no prequalification.)
7. Experts engaged in the beginning of the event (engaged at the end).
8. Performance measurements (no performance measurements).
9. Posting of performance metrics (no posting of performance metrics).
10. Work short hours (Work long hours).
11. Blame (no blame).
12. Stress (no stress).
13. Surprised (not surprised).
14. Excuses (no excuses).
15. Approval (No approval).
16. Emphasis on contract importance (contract not important).
17. Owner inspections (quality control).
18. Vendor risk management (owner risk management or micromanagement).
19. Focused on technical risk you can control (focused on technical risk you cannot control).

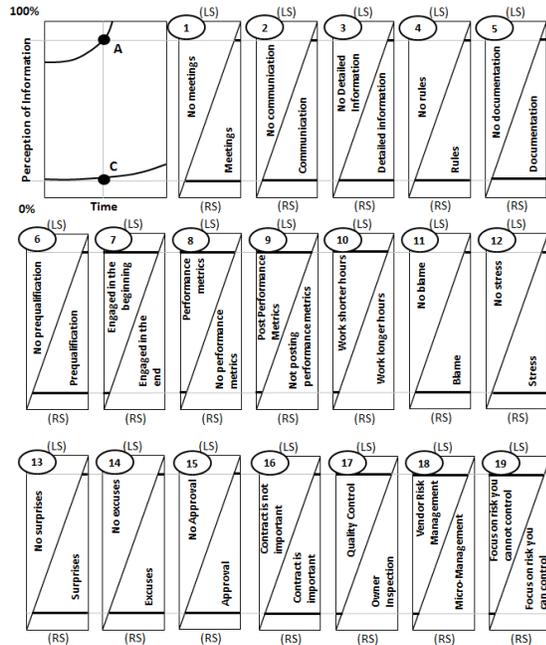


Figure 5. Level 2 observable KSM actions/characteristics

At level three are the difficult to define characteristics, where people normally make decisions to identify (Figure 6):

1. No risk (high risk).
2. Expert (non-expert).
3. Leadership (management).
4. Minimum standards (high performance).
5. Efficient (not efficient).
6. Effective (not effective).

7. Transparent (non-transparent).
8. Dominant information (non-dominant information).
9. Simplicity (does not require expertise to understand)/complexity or technical.
10. Strategic or longer term (tactical or short term).
11. Detailed or low level concentration (aggregate picture @ 30K feet).
12. Professionalism (no professionalism).
13. Confidence (no confidence).
14. Self-dependent (integrates with others).
15. Fear (no fear).
16. Accountable (not accountable).
17. Courageous (weak).
18. Value (no value).
19. Visionary (not visionary).
20. "Win-win" ("win-lose").
21. Abusive behavior (non-abusive behavior).
22. Abused by others (not abused by others).
23. Use expertise (do not utilize expertise).
24. Silo (supply chain approach).
25. Self (others).
26. Price based (best value).
27. Proactive (Reactive).
28. No Culture (Culture).
29. Expectations (No expectations).
30. Freedom (No Freedom).

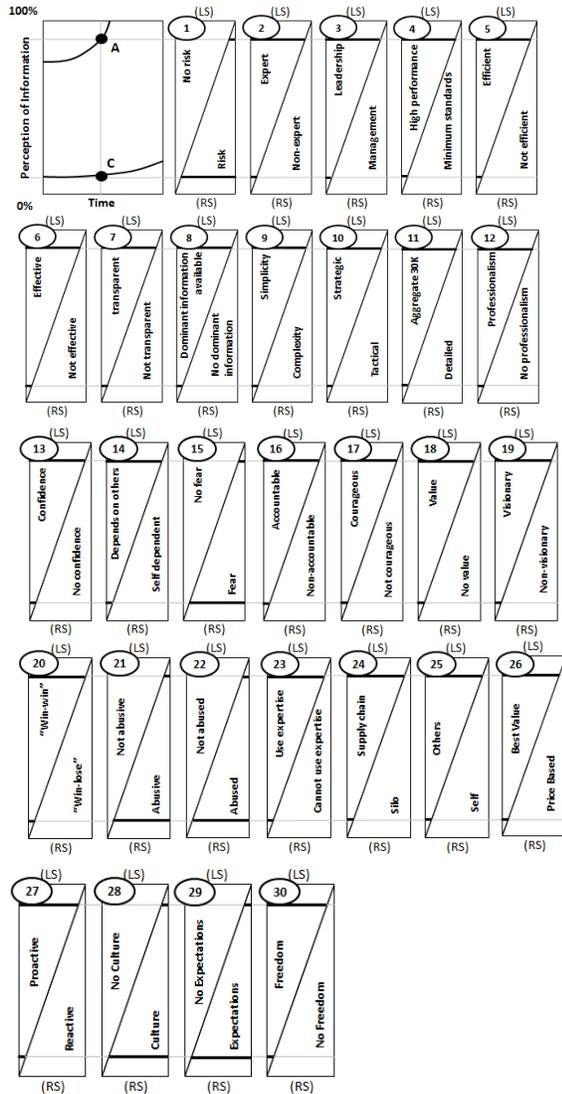


Figure 6. Level 3 difficult KSM concepts to grasp

Level Two and Level Three are created by deduction or observation from Level One. Level Two characteristics should be easily observed. The definition of Level Three characteristics are often debated, but resolved by simple logic. All three levels are consistent with the foundation factors:

1. Someone who perceives all information (leader) does not control others, rather aligns them to be successful.
2. Someone who perceives all initial conditions and natural laws (expert) knows there is only one outcome. There will be no decision making. Decision making enters when the initial conditions are not totally understood.

Characteristics from all levels are related by either being on the top (left side) or bottom (right side). If they are on the bottom in any level (I, II, or III), they have all the characteristics of the bottom of right side KSM diagrams. Therefore, a practitioner can observe the actions going on,

identify if the actions are LS or RS on Level II, and then identify the characteristics of the actions in Level III. For example, extensive meetings by an organization is a manifestation of abusive and "win-lose" actions. In this organization, morale will be difficult to raise, individuals will be reactive, and expertise and paradigm shifts will be difficult to implement.

Case Study Development Using the QS Profession in Malaysia

Currently the QS in Malaysia perceive that they are facing the following issues (IEM Meeting 2012, RICS Meeting 2012):

1. Owners are pricing their services below perceived market value.
2. Owners are controlling the QS.
3. QS are blamed for projects, which are over budget.
4. QS are heavily dependent on the owner's desires and the work of the other professionals before they can do their work.

QS wait until the designers and engineers are finished with their detailed design before they can cost out the project. When the project is over budget, the project undergoes value engineering, and the QS are forced to recost the project. The shorter time to react/doing rework will increase the stress of the QS. Further adding to the dilemma of the QS is the technology of BIM and 3D drawings with costing systems that threaten to replace the professional services of the QS.

Analysis of the event and KSMs identify the following about the work of the QS (Figure 7):

1. They are brought in at the end of the event (Level II, #7, RS).
2. They have no control over the other stakeholders.
3. Their value is not being recognized (Level III, #18, RS).
4. They are reactive and not proactively engaging in actions to mitigate the risk that they do not control (Level III, #27, RS).

Proposed Change in the QS Model

Based on the KSMs and the event model, the author proposes that:

1. The QS needs to enter the event earlier in the event, preferably in the beginning (Level II, #7, LS).
2. The QS needs to be able to use their expertise (Level III, #2, LS).
3. The QS needs to minimize drawing focus on their reactive or detailed activities (Level III, #27, LS) and become pro-active (Level III # 18 LS).

Using the event diagram from Figure 7, the Figure is redrawn to show the reality of the QS situation, showing first the traditional practice, and second the LS, proactive practice.

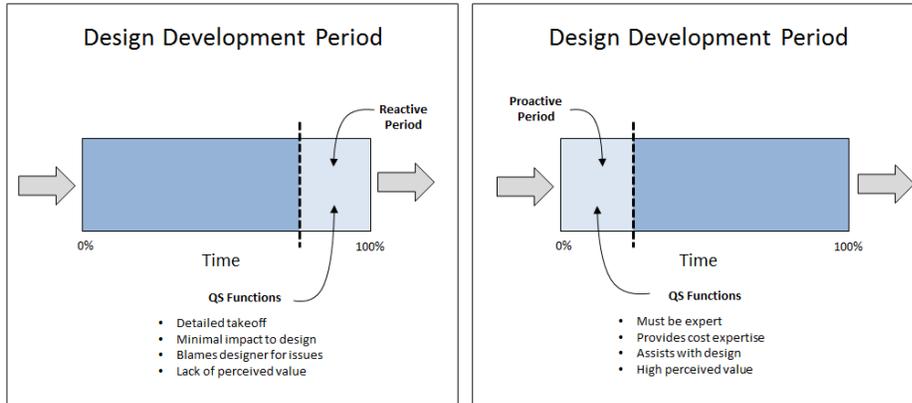


Figure 7. QS expertise: traditional and new approach

If the QS are to have an added value impact, they will have to have the capability to estimate costs at a very general level. This requires the capability to scope and cost. This is when detailed information is usually not available. The QS will also be required to do detailed costing for construction drawings and bill of quantities (BQ) to ensure that their costing was accurate.

The authors propose that the BQ is not to give to vendors in the price based award system, but to check their own general estimates to ensure the project is within scope and cost. Testing of the best value concepts with contractors in Malaysia quickly showed that the ability to determine their own BQ was a primary factor in identifying if a contractor was an expert and could understand their own project. Although the test did not preclude a non-expert contractor from being awarded the project, it did show that the awarded contractor (Kashiwagi 2012):

1. Knew their project better than the buyer and the buyer's experts.
2. Could see their project from beginning to end.
3. Was into risk mitigation despite slightly higher costs.
4. Did not low price the project, but could justify their pricing as being "normal."
5. Was slightly uncomfortable with the new "transparent" environment and the release of control to use their expertise.

The new proposed QS model would move the QS's emphasis to general estimating of project scope and cost at the beginning of the project, and a control on scope and cost during design, rather than the detailed costing currently done at the end of the project, and value engineering which is the cost cutting activity, and assisting to negotiate vendors' prices down at the beginning of construction. This new expertise would be based on database of construction activity costs, experience, and the ability to scope and cost in an environment of limited information at the beginning of the project development cycle and the development of the construction drawings. The QS role would be more of assisting other supply chain partners rather than one of direction, control, regulation and inspection.

The QS needs to have the expertise to do cost estimating at 30K feet level of major components in an environment when there is incomplete information. The QS cannot be focused on the details, because the details are not available until later in the project (when they are forced to be

reactive, and where repeated transactions occurred because of the lack of expertise in the beginning of the project). However, if the other stakeholders know the estimated cost of the major construction divisions or components, they are much less likely to overdesign or have unreal expectations. To be able to talk simply, communicating with stakeholders who have no understanding of scope and cost is utilizing the expertise of the QS.

The QS needs to come in earlier, needs to be able to cost out a preliminary intent, and needs to ensure that the other “blind” or “non-expert” scoping and costing stakeholders stay within their bounds. The QS must use a system, which is simple and dominant (helps the ignorant participants do the right thing due to obvious implications).

Proposed Solution to Change Paradigm

The proposed solution to assist the QS community to change the QS role includes:

1. Identify a postgraduate research program where a visionary researcher who is a best value expert can assist the industry. In the 20 years of BV development, the only BV visionaries who can bring industry change have been identified in university research programs.
2. Have the postgraduate research program work with government heads, RICS, and visionary QS.
3. Create a strategic plan, which includes testing of the proposed new QS.
4. Seek a grant from the CIDB to implement the strategic plan.
5. Create an education program.
6. Educate owners and QS.
7. Change the education in the QS undergraduate programs to include and focus on using expertise and understanding industry structure.

This solution has worked in the U.S., Canada and the Netherlands. Based on the success of those programs, the authors propose that this program has a chance of success. In presentations to both the engineers and the quantity surveyors in Malaysia, the experienced in the industry agree with the deductive model explanation. They must now face the challenge of changing the paradigm.

Conclusion

The professionals in a developing country face the problem of a controlling owner not using their expertise. The Information Measurement Theory (IMT) and Kashiwagi Solution Models (KSM) identify that the industry does not understand how to resolve their problem. This problem is not confined to Malaysia and developing countries, but also in developed countries. The solution lies in the understanding of industry structure, and the use of expertise to minimize confusion and transactions. The analysis of the problem identifies that the traditional role of the QS is too late in the development/design, the expertise is needed but not used and the traditional role of a reactive and detailed function needs to be changed.

As a result the professionals find themselves in an abusive relationship. The simple IMT/KSM analysis proposes the value that the QS can have if they enter the project earlier, be proactive and

assist the owner to minimize their expectations caused by the lack of expertise. The results of this research will be used to propose to the QS professionals to attempt to implement the conclusions of this research.

References

Abdul Rahman, H., Alidrisyi, M.N. (1994). A perspective of material management practices in a fast developing economy: The case of Malaysia, *Journal of Construction Management and Economics*, Vol. 12, 413-22.

Abdul Rahman, H., Mohd Rahim, F.A., Hamid, M., Zakaria, N. (2005). Beyond basic: the potential role and involvement the QS in public projects – an observation. QS National Convention 2005; Sustaining the Profession – Towards Diversification, August 10-11, Kuala Lumpur, Malaysia, 10-18.

Andersson Elffers Felix (AEF). (2010). Innovative market approach: Evaluation of the procurement of six packages from the Program Priority Roads (commissioned of RWS, Infrastructure Department) Utrecht. Andersson Elffers Felix, Retrieved from http://www.rijkswaterstaat.nl/images/AEF%20Evaluatie%20innovatieve%20marktbenadering_tcm174-294996.pdf

Berstein, H. (2003). Measuring productivity: An industry challenge. *Civil Engineering—ASCE* 73(12), December 2003 46-53. Web.19 Jul 2009. British Property Federation. (1997). Survey of Major UK Clients. In Egan, J. (1998). *Rethinking Construction*. DETR. 11.

Cahill, D. and Puybaraud, M. (1994). *Constructing the team: The latham report*. Construction Reports 1944-98. Blackwell Science Ltd, 145-160.

CFMA. (2006). *Construction industry annual financial survey*, Moss-Adams, LLP, Eighteenth edition.

Chan, A.P.C., and Chan, A.P.L. (2004). Key Performance Indicators for Measuring Construction Success. *Benchmarking an International Journal*, Emerald Group Publishing Limited, 11(2), 203-221.

Child, G., Kashiwagi, D., and Sullivan, K. (2010). US Department of Defense Procurement Systems Approaching Best Value. CIB World Congress 2010, The Lowry, Salford Quays, United Kingdom, 1580, 1-14 (May 10-13, 2010).

Child, G., Sullivan, K. and Kashiwagi, D. (2010). The Decision-less Environment of the Future PM. PM-05 Advancing Project Management for the 21st Century "concepts tools & Techniques for Managing Successful Projects", Heraklion, Crete, Greece, 152-159, (May 29-31, 2010).

CIDB. (2009). Bridging the Gap between Construction Industry Stakeholders and Researchers, (University/ Academia REPORT ON R&D FORUM), CIDB Convention Centre, Kuala Lumpur, Malaysia.

Davis, B., and Sebastian, R. (2009a). The relationship between contract administration problems and contract type. *Journal of Public Procurement*, 9(2), 262-282.

Davis, B., & Sebastian, R. (2009b). An analysis of the consequences of contract administration problems for contract types. *Journal of Management Research*, 1(2).

Doree, A.G. (2004). Collusion in the Dutch construction industry: An industrial organization perspective. *Building research & information* (March-April, 2004), 32(2). URL <http://www.tandf.co.uk/journals> (visited 2007, 7 March).

Egan, S.J. (1998). Rethinking construction: The report of the construction task force to the deputy prime minister, John Prescott, on the scope for improving the quality and efficiency of UK construction, The Department of Trade and Industry.

Flores, V. and Chase, G. (2005). Project Controls from the Front End. *Cost Engineering*. April 2005, 47(4), 22-24.

Georgy, ME., Luh-Maan, C. and Zhang, L. (2005). Engineering Performance in the US Industrial Sector. *Cost Engineering*, 47(1).

Glancy, L. (2008). OFT Accuses 112 Firms of 'Bid Rigging'. [CNplus.co.uk](http://www.cnplus.co.uk), 24 April 2008. URL <http://www.cnplus.co.uk/printPage.html?pageid=1155654> (visited 2008, 6 February).

Hamzah, H. (2003), Future Prospects for Project Management in the Malaysian Construction Industry, University Malaya, Kuala Lumpur.

Hussein, J. (2009). Bridging the Gap between Construction Industry Stakeholders and Academic Researchers. A keynote address for 2nd Construction Industry Research Achievement International Conference (CIRAIC 09), Kuala Lumpur, Malaysia.

Hussein, J. (2009). Graduate Education Research Model of the Future, Chairman of Construction Industry Development Board Malaysia, 2nd Construction Industry Research Achievement International Conference, Kuala Lumpur, Malaysia, Keynote Speaker 1, (November 3, 2009).

Ibrahim, A., Roy, M., Ahmed, Z. and Imtiaz, G. (2010). An investigation of the status of the Malaysian construction industry, *Benchmarking: An International Journal*, 17(2), 294 – 308.

Imtiaz, G. and Ibrahim, A. (2005). Lean production system in project delivery: the way forward for Malaysian construction industry, Proceedings of Kuala Lumpur Quantity Surveyor Convention, Kuala Lumpur.

Kashiwagi, D. (1991). Development of a Performance Based Design/Procurement System for Nonstructural Facility System. Dissertation in Partial Fulfillment of the Requirements for the Degree Doctor of Philosophy, Arizona State University.

Kashiwagi, D., Kashiwagi, J., and Sullivan, K. (2010) Obstacles in Becoming a Research Institution in Developing Countries. RICS COBRA 2010, University of Dauphine, Paris, France, paper 2, ISBN: 9781842196199 (September 2-3, 2010).

Kashiwagi, D. and Kashiwagi, J. (2011). Best Value PIPS Research Reaches Malaysia, Sixth International Conference on Construction in the 21st Century. Construction Challenges in the New Decade, July 5-7, 2011, Kuala Lumpur, Malaysia, CD 33.

Kashiwagi, D. (2011) Case Study: Best Value Procurement/Performance Information Procurement System Development. *Journal for the Advancement of Performance Information and Value*, 3(1), 12-45.

Kashiwagi, D. and Kashiwagi, J. (2011). Case study: Performance information procurement system (PIPS) in the Netherlands. *Malaysian Construction Research Journal*, 8(1). URL <http://pbsrg.com/app/wp-content/uploads/publications/papers-intro/Case-Study-Performance-Information-Procurement-System-PIPS-in-the-Netherlands-02-2011.pdf>.

Kashiwagi, D. and Kashiwagi, J. (2012). A new risk management model, *Journal of Risk Analysis and Crisis Response*, 2(4), 233-251.

Kashiwagi, D. (2012). Best Value Standard, Performance Based Studies Research Group, Tempe, AZ, Publisher: KSM Inc., 2012.

Kashiwagi, D. (2012). Information Measurement Theory. Performance Based Studies Research Group, Tempe, AZ, Publisher: KSM Inc., 2012.

Langlinais, S. (2011). Fraud in major contract projects, Langlinais fraud and audit advisory services. IRMI. URL <http://www.irmi.com/expert/articles/2011/langlinais01-risk-mitigation-fraud.aspx>. (visited 2011, 25 August).

Lepatner, B.B. (2007). Broken Buildings, Busted Budgets. The University of Chicago Press, United States of America: Chicago.

Little, M. and Kashiwagi, D. (2012). State of Idaho procurement of IT services. International Public Procurement Association (IPPA), 2012 IPPC Seattle, WA, August 17-19. URL <http://www.ippa.org/IPPC5/Proceedings/Part11/PAPER11-1.pdf>.

Meyer, J., Witt, S., Kashiwagi, J., and Kashiwagi, D. (2010). General Services Administration Streamlines the Procurement of Construction Services. Proceedings Seventh Annual Acquisition Research Symposium Volume II, Naval Postgraduate School, Monterey, California, pp. 609-625, (May 12-13, 2010).

Murphy, C. (2012). Major capital projects. Western Australia Auditor's General Report, Report 12, October 2012.

PBSRG (2012). Performance Based Studies Research Group Internal Research Documentation, Arizona State University, Unpublished Raw Data.

Post, N. (2000). No stamp of approval on building plans: Contractors sound off over difficulties with bid documents, *Engineering News Record*, 244(17), 34-46.

Rijt, J. and Witteveen, W. (2011). Contractor selection using BVP in the construction industry Case studies at the Dutch Ministry of Infrastructure, *Ipsera Conference Proceedings Maastricht*, 1398-1404.

Rijt, J. and Witteveen, W. (2011). Best value at the directorate-general for public works and water management in the Netherlands, *Journal for the Advancement of Performance Information and Value*, 3(1), 90-101.

Riley, J., Kashiwagi, J. and Kashiwagi, D. (2012). Eliciting maximum performance in service contract. International Public Procurement Association (IPPA), 2012 IPPC Seattle, WA, August 17-19. URL <http://woppaa.org/wp-content/uploads/2012/09/PAPER-IV.3-ELICITING-MAXIMUM-PERFORMANCE-IN-SERVICE-CONTRACTING.pdf>.

Rwelamila, P. D., Talukhaba, A. A., and Ngowi, A. B. (2000). Project procurement systems in the attainment of sustainable construction. *Sustainable Development*, 8(1), 39-50.

Simonson, K. (2006). Quick Facts. Association of General Contractors, Chief Economist Report.

Sullivan, K. and Guo, Yan. (2009). Contractor cash flow and profitability analysis between best value and low bid. Association for the Advancement of Cost Engineering, Morgan Town, WV, 51(9), 16-20 (Sept 17, 2009).

Sullivan, K., Lines, B., Stone, B., Stewart, B., Warren, H. (2012a). Change management principles: Best value implementation case study. RICS COBRA, 10-13 September 2012 Conference Las Vegas Nevada.

Sullivan, K., Lines, B., Stewart, B., Warren, H. (2012b). Impact of preplanning on construction project successes: Pre-contract planning case study. RICS COBRA, 10-13 September 2012 Conference, Las Vegas Nevada.

Tucker, W. W. (2003). Construction productivity study executive summary, Michigan Tri-partite Committee Web Site. URL <http://www.mitripartite.com/ExecutiveSummary1.pdf> Mangasarian (visited 2009, 2 September).

Wang, Y. (2009). A broken fantasy of public-private partnerships. *Public Administration Review July/August 2009*. 69(4), 779-782.

Wearden, G. (2008). OFT accuses construction firms of price rigging. [guardian.co.uk](http://www.guardian.co.uk), URL <http://www.guardian.co.uk/business/2008/apr/17/construction.carillionbusiness> (visited 2009, January).