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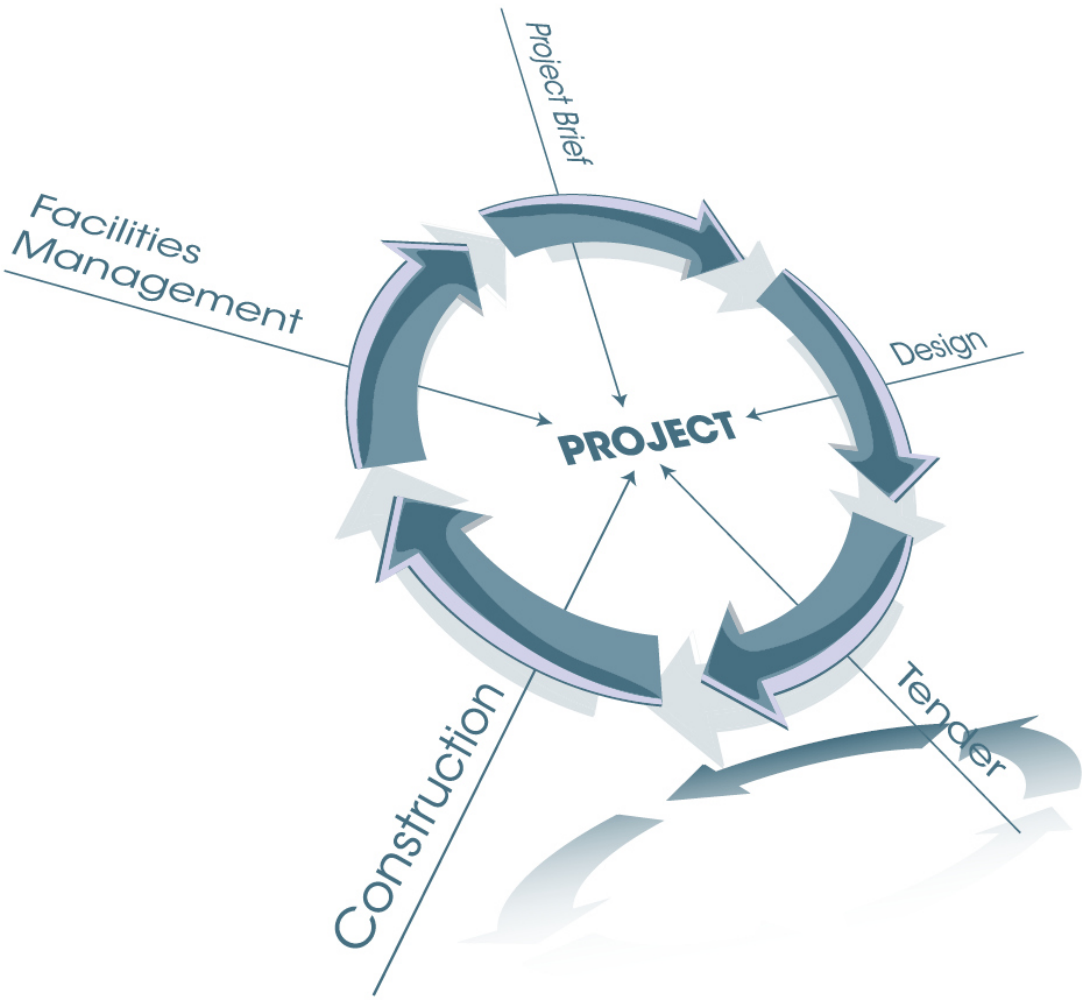

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Editorial

Welcome from the Editors

Welcome all readers to the Special Edition Issue of Malaysian Construction Research Journal (MCRJ). The eighth issue in its publication and first issue for the year 2011 will feature six of papers with the theme Construction Project Procurement. The editorial team would like to express our sincere appreciation to all authors and reviewers for their contributions and continuous support to this journal. It is hope that readers will find informative articles from this edition of MCRJ.

The first article by ***Dean Kashiwagi, et. al.*** presents the introduction of Construction Industry Structure (CIS) and best value Performance Information Procurement System to the Netherlands. The preliminary test results indicate that collusion problems may be caused by client delivery system, problem with construction industry performance is a process issue and not a technical issue and best value PIPS can solve Dutch construction problem issues.

Jeffory Meyer, et. al. entitled "General Services Administration Tests the Best Value PIPS Paradigm" in general explains the best value process which has been tested by the General Services Administration (GSA), one of the largest agencies in the U.S. federal government, for the past 16 years. The significance of the test includes giving huge impact on the contracting paradigm, allows the implementation of quality control and as tools to measure the project management performance.

Oyegoke, et. al. present a brief literature review on construction procurement and how it is used to integrate the supply chain within construction industry, through case studies, using case study research methodology. The paper concludes that the construction practice/industry in the UK needs both integration and fragmentation within its project supply chains in order to deliver the clients requirement as a finished facility.

Malik M A Khalfan discusses the recent innovative procurement initiatives by the public sector construction clients within the UK, which intends to empower clients to exercise more control over the supply chain and generate more co-operation among project participants. This paper also highlights the benefits of, and the motivation towards innovative procurement resulting into integration of supply chain members through four case studies.

In his paper, ***Ahmed Doko Ibrahim*** studies the development of procurement strategy for primary healthcare facilities in Nigeria based on public-private partnership (PPP) principle. This is in line with the macro-economic policy adopted for growth and the health reform agenda of the present government

Anthony J Mills identifies prequalification criteria that both clients and contractors believe are good indicators of future construction performance and discovers if those differences reduce the effectiveness of the procurement process. This paper contributes to a more clarified understanding of the impact or contrasting views between the stakeholders involved in the prequalification process.

Editorial Committee

CASE STUDY: PERFORMANCE INFORMATION PROCUREMENT SYSTEM (PIPS) IN THE NETHERLANDS

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Abstract
The Dutch construction industry experienced a problem with collusion for five years ending in 2003. Innovative Dutch visionaries perceived a potential relationship between an inefficient, transactions laden, over-regulated low price award environment and supplier collusion. Kashiwagi and the Performance Based Studies Research Group (PBSRG) introduced the Construction Industry Structure (CIS) and best value Performance Information Procurement System to the Netherlands in 2004. Heijmans (third largest Dutch contractor) and the Rijkswaterstaat brought the PIPS technology into the Netherlands by signing licenses in 2006, Santema and Scenter/Delft University of Technology followed later in 2006, and became the first successful research group to build a PBSRG type research platform. In 2009, the Rijkswaterstaat utilized Scenter's expertise to deliver $800M of fast track infrastructure construction utilizing the best value PIPS concepts. The preliminary test results included the following: collusion problems may be caused by client delivery system, problem with construction industry performance is a process issue and not a technical issue, best value PIPS can solve Dutch construction problem issues and is a paradigm shift more than a legal issue, validation of the PBSRG model of simultaneous basic theoretical research, prototype testing, and implementation using industry funding may be the quickest way to change industry practices.

Keywords: *Best value procurement; Netherlands; PIPS; performance; measured environment*

INTRODUCTION

The worldwide construction industry has performance issues with projects delivering on time, on budget, with satisfied customers for the past 20 years (Dun and Bradstreet, 1997; Post, 1998; Adrian, 2001; McKinnon, 2001; Kashiwagi, 2004; Doree, 2004; NDU, 2005; CFMA, 2006; Simonson, 2006; AGC, 2006; Lepatner, 2007; Wearden, 2008; Ortiz, 2008; Myer, 2010.) Latham and Egan identified the issues in the UK in the early 1980s (Egan, 1998; Cahill and Puybaraud, 1994.) The same issues have been identified in the United States. The industry has tried to change the delivery system. First it was design-bid-build, then it was design-build, then it was construction manager at risk. Now the industry is proposing integrated project delivery (IPD.) They have also implemented versions of Private Public Partnerships and Design Build Operate. The industry has failed to increase the quality while decreasing the cost. Industry craftsperson skill has become less important. The industry is attempting to use management to minimize risk instead of expertise. In 1991, Kashiwagi proposed an industry structural analysis diagram (Figure 1) which introduced the following concepts:

1. Clients/buyers of construction minimized the risk in the price based environment using management, direction, and inspection.
2. Contractors minimized the risk in the best value environment utilizing expertise documented by past performance.

Later analysis (Kashiwagi, 2010), identified the following dominant characteristics of both environments:

Price Based Environment
1. Required more parties and therefore less efficient
2. Depended on the contract to enforce quality
3. The owner who was less of an expert was doing the directing and controlling
4. Minimal accountability
5. Enforcement of the contract terms
6. Non-transparency

Best Value Environment
1. Required less parties and therefore more efficient
2. No dependence on the contract for enforcement
3. The contractor who is the expert writes the contract
4. Maximum accountability
5. Minimization of project cost and time deviation
6. Transparency

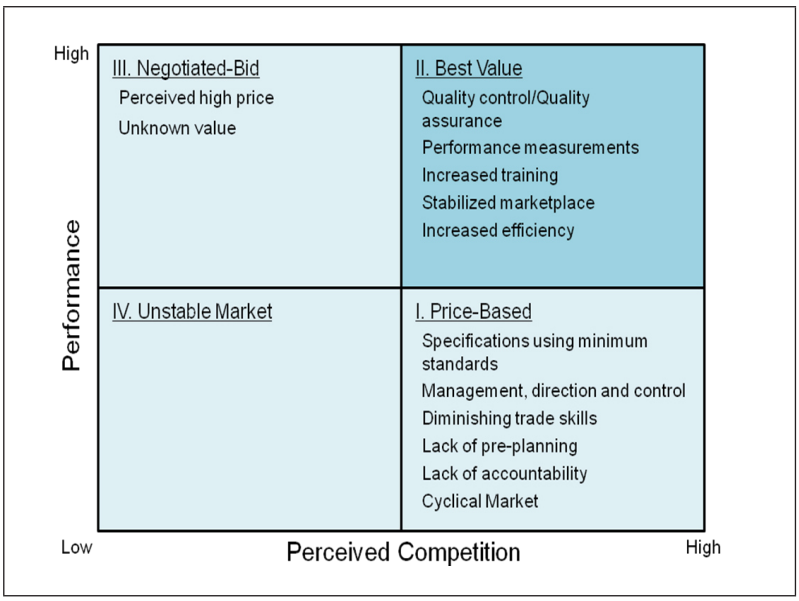

Figure 1. Industry Structure Diagram

In 2003 a legal/parliamentary/police effort identified that the Dutch construction industry was in collusion. The traditional reaction was to implement tighter procurement rules and more stringent management and inspection practices (Van de Rijt, Hompes & Santema 2008.) Kashiwagi proposed the opposite, fewer client rules and less client management, direction and control. Kashiwagi proposed that the clients had no control over the contractors; that cumbersome contracts did not minimize risk. He proposed that only expertise can minimize risk. He proposed that the heavily managed and directed price

based delivery system was the source, the rationale, and motivation of the collusion. He also proposed that the non-transparency, the lack of accountability, the lengthy documents and the large number of decision makers on the client's side was causing inefficiency. The inefficiency was driving profit margins of contractors to unsustainable levels, forcing them to partner in a more efficient collusion structure. Kashiwagi was proposing that the client's inefficient and non-transparent delivery system and unaccountable decision making, was forcing the collusion. This message was brought to the Netherlands in 2004 (George Ang, 2011). George Ang (2011) and others (Santema, 2011; Prager, 2009; Van Duren et al, 2008), identified the mood and reaction of the Dutch procurement profession at the time:

"It became politically obvious that the current and more traditional procurement and business processes do lead to abuses in the form of collusion on pricing and the allocation of work. They also inhibited competition and innovation, and so reduced progress in quality standards and productivity. There were inadequate incentives for higher performance or better value and firms were not sufficiently orientated towards their clients. The overall effect was to give the industry an increasingly poor image, which would put off young talented people from seeking employment in the building and construction industry. It's a method to become more efficient. With an annual turnover of approximately € 60 billion, comprised of 85,000 firms and around 526,000 employees, the sector represents more than 7% of the Dutch GNP, i.e. a major national economic asset. The previous reports and the Parliamentary Inquiry therefore set a firm basis for reform. Due to market irregularities, and as a consequence of similar fraud and collusion scandals in a few other countries worldwide, the restoration of trust has become a major reform issue. Political commitment on this issue has been essential for the initiation of the Dutch national reform process in building and construction. Three Ministers (Trade & Industry; Transport & Civil Works; Housing, Spatial Planning and the Environment) issued a political Action Agenda in November 2003, based on five main objectives:

1. *Restoring trust between the government and the sector*
2. *Developing effective markets and a properly functioning sector*
3. *Enhancing professionalism in procurement*
4. *Instilling high standards in the supply chain*
5. *Less, but more effective, regulation*

An expert network for professional public procurement (PIANO: Professioneel Inkopen en Aanbesteden Netwerk Overheid opdrachtgevers) was raised as to support the implementation of these objectives. Since 2003 it became politically obvious that the same management, direction, and control would definitely not bring improvement after the 2002 scandal. Meanwhile, the best value PIPS method drew attention because it minimizes the need to management and direction, and because the performance measurements, increases transparency." (Ang, 2011)

Santema (2008) also proposed that the Dutch were being affected by the international competitive marketplace, and realized that the traditional procurement model of low price award and negotiation was actually lowering the quality of the products. He proposed that the Dutch needed a dominant way to simultaneously increase quality and cut cost. Best

value PIPS offered a methodology of utilization of expertise, alignment of resources, and efficiency to improve value and quality and reduce cost. The minimization of management, direction, and control transactions is in alignment with efficiency. The PIPS solution of using expertise instead of costly management transactions to minimize risk is an innovative proposal. Kashiwagi, using the industry structure model, proposed that the clients are responsible for the poor performance and collusion due to the inefficiency of the low price award delivery mechanism. He proposed using the best value environment utilizing best value PIPS. The major differences with PIPS included:

1. Minimizes client/buyer decision making, management, direction, and control.
2. Uses a vendor proposed contract as a risk management tool instead of a control mechanism.
3. Identifies the vendor as the expert, and not the client's representatives.
4. Minimizes the use of technical expertise of the client's representatives except to ensure that the vendor is an expert at the beginning of the project.
5. Utilizes expertise instead of management, direction, and control to minimize risk.
6. Identifies the client's intent, but allows the vendor to determine the final deliverable.
7. Lowers cost, and increases value and quality due to efficiency due to minimizing transactions and alignment of resources.

After hearing the industry structure presentation, George Ang invited Kashiwagi to Rotterdam to present to government buyers of construction in 2004. A Heijmans representative and representatives from Rijkswaterstaat, who attended the fall 2004 presentation, then followed up and attended the 2005 Best Value PIPS conference in Tempe, Arizona. As a result of the conference attendance, both Heijmans and Rijkswaterstaat signed licenses with ASU to use the best value PIPS technology in 2006. Heijmans used it to buy subcontractor services and materials, and to assist clients to utilize the best value service as a consulting project manager. The Rijkswaterstaat was educated annually by Kashiwagi, until 2008 when project managers Wiebe Witteveen and Carlita Vis received approval to run best value PIPS on the $800M US critical fast track projects in the Netherlands.

PROBLEM

Kashiwagi and Heijmans identify three problems in implementing best value PIPS in the Netherlands:

1. The vocabulary of best value PIPS and IMT needed a Dutch proponent who could translate best value PIPS into the Dutch language and vocabulary.
2. Dutch academic research groups in construction management have difficulty working with CIB W117 to transfer the technology. A research platform that could imitate PBSRG would be needed.
3. Dutch traditional procurement model is 180 degrees different, and resistance to change is almost insurmountable as 80% of all procurement is low price award driven (Van de Rijt, Hompes & Santema, 2008; Prager, 2009.)

Heijmans identified Sicco Santema, a marketing and supply chain professor at Delft University of Technology University, as the optimal Dutch proponent of PIPS in 2006. He was the perfect fit as he was teaching/proposing supply chain improvement by the minimization of transactions. His supply chain background, feel for common sense and simplicity, and his recognition of the accuracy of the PIPS concepts solved the first two problems listed above. What assisted Sicco was his understanding that the traditional academic structure may not be conducive to the PIPS implementation, so he augmented the university capability with his consultancy firm, Scenter. They immediately started running tests inside and outside of the construction industry. In 2008, Sicco and partner Jeroen van de Rijt, were identified as CIB W117 platform leaders in the Netherlands, and were licensed with the PIPS technology. They proceeded to setup small research tests to test best value PIPS, and also attended the annual conference in Tempe, Arizona. Scenter quickly picked up the PBSRG, Arizona State University (ASU) research model. PBSRG worked hand in hand to ensure Scenter had the following capabilities:

1. Deductive logic, observation, instead of inductive logic, exploratory research.
2. Industry funding model, aligning research funding from industry parties who are trying to solve the same problem.
3. Validation of research hypothesis by case study results of confirmation, continuation of industry funding and research testing instead of industry consensus through statistical analysis of industry survey results and academic peer review.
4. Use of extremes and dominance results minimized the need for statistical analysis of results that is normally needed in inductive research.
5. Use of deductive logic instead of industry best practice, and introduction of "disruptive" technology and not evolution of existing practices or stepwise improvement.

The PBSRG research model had not proven to be successfully transferrable to other research group or to other countries. Efforts to transfer the technology and research to Central Connecticut University in 2004, Florida International University in 2005/2006, Georgia Tech in 2007, Glasgow Caledonian University (2004-2007), University of Technology Mara (2004-present), University of Science Malaysia (USM), Penang, Malaysia, University of Botswana, Gaborone, Botswana (2008-present), University of Auckland, Auckland, New Zealand (2007- present), RMIT (Melbourne, Australia) (2009-present) have not been successful.

A review of a journal paper on the history of the development of best value PIPS (Ahmed, 2010), proposed that unless more traditional research testing is done, PIPS research would not be successfully transferred to other universities or countries. He proposed that until that time, the problem of the industry and academic research being isolated from each other will not be overcome. Scenter proved that once the paradigm is transferred and best value PIPS is implemented, the following are natural results:

1. Alignment of research partners from industry who are at risk with the research test, making the industry partner a full partner in the research, and allowing the visionary researcher full control over the research test.

2. The continuation of research funding with successful test results allowing the researcher to become an expert in the area of project delivery, risk management, and supply chain optimization. The researcher does not have to chase government research funding, which continues to change from year to year.
3. The researcher becomes a true expert, able to drill down into the subject matter.
4. Sustainable and continuous research with research laboratory and testing capability.
5. Continuous funding independent of government research funding which is highly competitive, often political (Kashiwagi, 2010), and awarded by board of academic peers with traditional research thinking.

REQUIREMENTS OF DUTCH IMPLEMENTATION

The following were the requirements for the Dutch testing of best value PIPS:

1. Setting up Dutch research group using PBSRG model of consultancy, using an industry funding model instead of government research grants, and simultaneous basic theoretical research and prototype testing of best value PIPS.
2. Convincing a client to partner with the research group.
3. Modifying best value PIPS to meet the European procurement laws.
4. Identifying Dutch clients to test the modified best value PIPS process.
5. Run the research tests.
6. Analyze the results.

HYPOTHESIS

Use deductive logic (observation of logical concepts) and case study testing to show:

1. Best value PIPS can resolve Dutch construction performance issues and collusion.
2. The PBSRG research model (funding, using deductive logic and dominant information) is transferrable and has the potential to impact industry practice faster than traditional research programs.
3. Problems with construction performance and quality may not be technical, but may be caused the buyer/client's delivery system.
4. Dutch collusion problem is caused by the government's delivery system (management, direction, and control, and award by low price) and not by the vendors, who are simply reacting to the environment of the client's delivery system.
5. PIPS is a paradigm shift more than a legal issue.
6. PIPS can increase value and quality and minimize delivery cost and time.

METHODOLOGY

The methodology to validate the hypothesis includes:

1. Identify Dutch government proponent that wants to optimize delivery of construction.
2. Identify Dutch visionary who can implement best value PIPS technology and can use a new research model to help change the industry.
3. Transfer PIPS technology to the Dutch visionary researcher, and industry practitioner.
4. Modify PIPS system and use components that meet European procurement law.
5. Run procurement tests.
6. Assess performance of the technology.
7. Assess the success of the Scenter application of the PBSRG model.

RESEARCH ACTIVITY

Scenter and Delft University of Technology signed license agreements with ASU in 2008 and became CIB W117 platform leaders in the Netherlands. In 2008 and 2009, Scenter had completed numerous PIPS projects, formed the W117 group, and a visionary group to help steer the Dutch effort. In 2009, Rijkswaterstaat decides to use the best value PIPS concepts to deliver $800M of critical infrastructure modifications called "fast track" projects. Scenter becomes key research partner/consultant in Rijkswaterstaat effort. In 2010, the 16 fast track projects were awarded, and Scenter had published the first PIPS book in Dutch.

BEST VALUE PIPS PROCESS

BVP/PIPS is a process/structure to optimize the delivery of services by hiring experts instead of managing the risk. It changes the procurement agent's role from being the guardian over the award of a contract, to a facilitator of the delivery of expert services. The new role of facilitator starts when a user has a requirement, and ends when the expert service has been delivered. The BVP/PIPS has three phases: selection, pre-award, and management of the project risk (Figure 2.). The selection phase has five filters (Figure 3): past performance information, competitive ability to manage and minimize project risk, interview of key personnel, prioritizing the vendors and doing a dominance check to ensure that the best value vendor is the best value. The client's representatives assume the vendors are experts through the selection process (award process in the Netherlands) then, to assume the best value vendor is not an expert in the pre-award phase to minimize the risk of the best value vendor not being an expert. The paradigm is to minimize the need for technical decision making in the selection process, and maximizing the need for the best value vendor to prove they are an expert in the pre-award phase. The paradigm forces vendors to show dominant differential in performance that minimizes the need for any client technical decision making during selection. The risk is shifted to the vendors to show value through dominant expertise, knowing that experts minimize both risk and cost, thus providing the best value for the lowest cost.

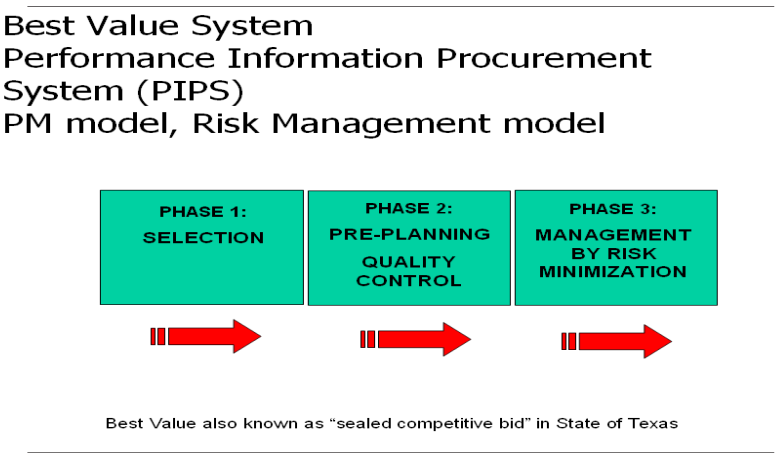

Figure 2. Phases of BVP/PIPS

Prioritization of Alternatives

Vendors are selected based on (in prioritized order of importance):

1. Interview (rated, and weighted)
2. Non-technical risk that the vendor does not control (rated blind and weighted)
3. Technical risk that the vendor does control (rated blind and weighted)
4. Value added deliverables (rated blind and weighted)
5. Past performance information (not rated or seen, weighted)
6. Cost (weighted, but not seen or rated by selection committee)

When a blind rating is done, the selection committee does not see the contractor's name. The maximum length for any blind submittal is two pages. The rating scheme for all criteria is "10" for dominantly better, "5" for the lack of dominant information, and "1" for dominantly poor performance. If a decision has to be made, the rating is a "5". Dominant information has to be either supported by verifiable performance information or best value practices, both which can be easily verified during the pre-award process. If any of the submitted information is not accurate, the contractor option is eliminated immediately upon discovery, but at the latest in the pre-award period.

Dominance Check

The system is cost controlled by a dominance check before the pre-award phase. If a vendor is more expensive than a preset amount over the next best value or lower in cost than the average cost, dominant information is required to prevent elimination of that option. Dominant is a term that means easy to see, a consensus opinion, or a no brainer that minimizes the need for long justification explanations. The procurement agent's dominance check before the identification of the best value vendor can override the prioritization based on the selection criteria. This is a subjective decision made by the procurement officer based on access to all the information.

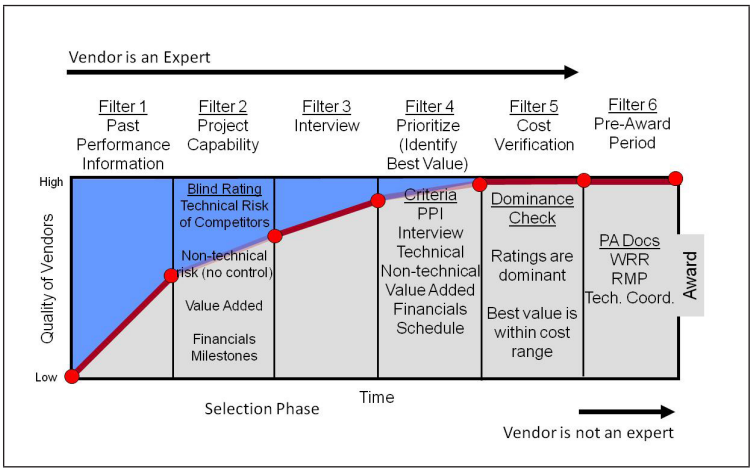

Figure 3. PIPS Filters

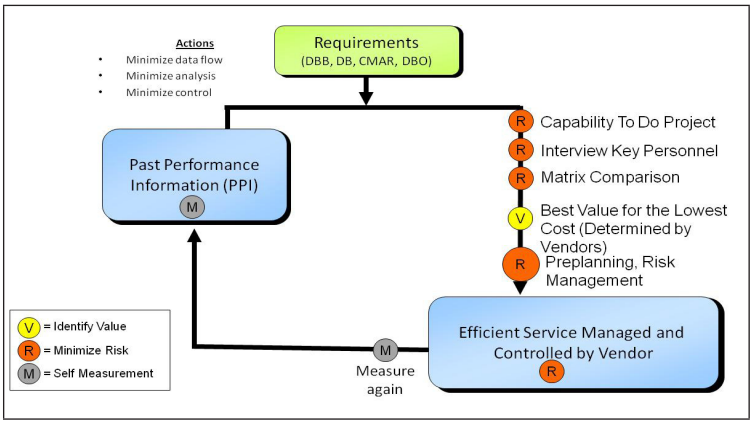

Figure 4. PIPS Self Regulating Closed Loop System

PIPS Pre-Award Phase

The BVP/PIPS is a closed loop system (Figure 4.) After prioritization, only one vendor at a time can move into the pre-award phase. The pre-award phase is the most important phase of the BVP/PIPS. If done correctly, the pre-award phase should be used as a clarification period to clarify how the vendor will deliver what they have proposed. It is the time to verify the technical competency of the contractor. Once the client is assured that the prioritized best value vendor is the best value (creates an approved risk management plan (RMP) and weekly risk report (WRR) and performance measurements (PM)), the contract is awarded to the best value vendor. The best value vendor uses the contract as a risk minimization mechanism, by meeting the technical requirements of the project and managing and minimizing the risk that they do not control.

The RMP is a living document that identifies concerns or risks to the project. The RMP should identify:

1. The risk and who causes the risk.
2. How the vendor will attempt to minimize the risk from happening.
3. If the risk happens, what the vendor will do.
4. Should identify the best ways to solve the risk, cost and time deviations, and which method should be used and why.
5. The time frame the client should make the decision to approve.

The RMP must be approved by the client, and becomes a living document throughout the project duration. The WRR contains the following:

1. Points of contacts who will receive the WRR during the project.
2. Milestone schedule.
3. Risk Management Plan (RMP).
4. Risk sheet that identifies who caused the risk, solution, and time and cost deviations.
5. Modifications (deviations) on the project.
6. Performance measurements for services contracts.

If a risk happens and causes a cost or time deviation, the risk is explained and documented on the risk sheet. If the risk has not happened it goes on the RMP, and a plan to minimize the risk, and mitigate it if it happens is documented. All modifications should have concise, simple, and dominant documentation. The WRR should be distributed weekly to all the participants who are involved and interested. The weekly risk report (WRR) and the risk management plan (RMP) are the main document and communications of the contract administration. It allows the owner's representatives to do quality assurance. It therefore defines quality assurance as a non-technical function.

DUTCH TESTING OF THE PIPS PROCESS

Scenter and others conducted tests other than the Rijkswaterstaat tests (CIB W117 Journal, 2011; Van Duren et al, 2008; Prager, 2009), but this paper will focus on the Rijkswaterstaat tests due to their size and importance. Wiebe Witteveen and Carlita Vis from the Rijkswaterstaat, utilizing the expertise of Sicco Santema and Jeroen van de Rijt of Scenter with the assistance of PBSRG, made the $800M fast track projects at the Rijkswaterstaat the largest PIPS tests in the world and the centerpiece of the Dutch effort (Veenendaal et al, 2011). Rijkswaterstaat is the government agency who is responsible for execution of the public works and water management, including the construction and maintenance of waterways and roads in the Netherlands. The Rijkswaterstaat is the executive arm of the Dutch Ministry Infrastructure and Environment. The road network in the Netherlands (specifically the Randstad area) is heavily congested, with unreliable journey times of one in five during the rush hour. Most of the traffic jams in the Netherlands (81% in 2005) are concentrated in the Randstad. The Randstad (a city at the edge of a circle, with empty space in the centre) is a conurbation in the Netherlands. It consists of the four

largest Dutch cities (Amsterdam, Rotterdam, The Hague and Utrecht), and the surrounding areas. Its 7.5 million inhabitants make up almost half of the population of the Netherlands. In the Netherlands there are extensive procedures preceding road construction. The average lead-time from idea to new road is over 20 years. A law was passed called "Besluitvorming Versnelling Wegprojecten" (translated: "Decision for Accelerated Road projects"). This law simplifies some public procedures concerning environmental issues for 30 specific road bottlenecks starting January 1st, 2009. This enables Rijkswaterstaat to take some quick measures to enlarge highway capacity and reduce congestion on several locations on the Dutch road network. The Dutch Ministry of Infrastructure and Environment has identified 30 major bottlenecks, which need to be resolved by May 1, 2011.

The procurement strategy focused primarily on the acceleration of the delivery of the projects. Rijkwaterstaat has developed a shorter tender procedure than the traditional way of tendering road projects. The second goal of the strategy was to maintain enough competitors for the projects. Another goal of the procurement strategy was to optimize price and quality (best value.) The main reason for using the Best Value Procurement/ Performance Information Procurement System (BVP/PIPS) is that the procurement of Design and Build-contracts usually leads to high transaction costs (efforts of all possible suppliers) and long tender procedures. In 2009 the tender capacity in the Dutch market was limited. Therefore suppliers/contractors have asked Rijkswaterstaat to develop a procurement strategy heavily based on quality (most economically advantageous tender (MEAT) where contractors receive credit for value) to lower the transaction costs and shorten the tender procedure. As a government agency Rijkswaterstaat has to follow the European legislation on public works. Rijkswaterstaat has adopted BVP/PIPS for 16 of the 30 bottleneck projects. As speed and quality is of the utmost importance, the BVP/PIPS will be used to select the best suppliers who will do the infrastructural work for 16 selected projects (typical work: asphalting, making acoustic screens, road signs and signals, lighting, adding extra lanes next to existing lanes, renovating bridges, gantry sign / overhead traffic sign, etc). The 16 projects have been divided into 6 clusters. For each of these clusters the Best Value Procurement process has been used. While designing the process, the goal was to stay as close to the original PIPS methodology (as developed by Dean Kashiwagi) as possible, with a few adaptations. The following differences are reviewed (Van de Rijt et al, 2011):

1. Use of "consultation sessions" for individual contractors.
2. Past Performance Information (PPI) was not used in the selection. PPI is currently a political issue in the Netherlands and in European law.
3. The project capability submittals did not include value added. All items had to be included in the contractor's submittal. This was a legal interpretation of the lawyers to meet European law.
4. Assessing the Risk Assessment independently from the Value Added plan. This was a difference when the project was planned, but is no longer a difference.
5. "Planning" (scheduling) was the coherence between milestones and the RAVA plan. This was a difference when the project was run, but is in congruence with the current PIPS process.
6. Less weight was given to the interviews based on the unfamiliarity of using ratings of interviews as selection criteria.

7. Vendors can choose themselves, which 3 roles (and corresponding key persons) to send to the interviews. This was also a difference at the time, but is no longer a difference.
8. Making use of two independent teams who each come to a consensus score through individual ratings of the submittals and the interview, after which the final score for each vendor (on each criterion) is determined by consensus of the two groups by the group leaders.
9. Ranking the vendors based on their absolute scores (instead of the relative scores), and based on price "deductions from quality scores." These rankings are based on an objective rating that is transferred into credit for value added. All credit is transformed into fictitious Euros with the lowest price being the prioritized best value.
10. The pre-award phase was not utilized due to the fear of "communications" after the prioritization. European laws are very strict on "communications" before the award. This difference is a legal interpretation, and since these tests, the Rijkswaterstaat may use the pre-award period as a clarification period in future tests.
11. Use of a "risk fund" or contingency fund. This can also be utilized in PIPS. Normally the difference is the contractor controls the fund.

Of the eleven identified differences, seven of them are no longer differences with the latest PIPS process. Except for the interview process, the Rijkswaterstaat ran a very good best value PIPS process.

RESULTS OF THE FIRST SIX TESTS

Six clusters have been tendered and have started the design or construction phase. The goal of the procurement strategy was to accelerate the delivery and minimize the length of the tender procedure, to maintain the competition and to procure the best possible value. The first conclusion is that this procurement strategy, made the acceleration of the projects possible. All the tenders were executed within a period of five months, where a tender for this type of projects usually takes eight to ten months. The transaction time is cut in half. The early involvement of the vendors has the potential to accelerate the delivery of the projects an additional 18 months. The focuses on timely delivery of projects, lead to shortened proposals by the vendors for construction. The number of vendors that participated in the six tenders was sufficient and comparable to the usual number for projects of this size. One of the most important findings of the market consultation was that there was a shortage in tender capacity in the infrastructure market in 2009. The risk for Rijkswaterstaat was that not enough vendors would participate for the projects of the Fast Track program. On average every tender has had 5 vendors bidding, with a minimum of 3 on one project and 6 on two projects. The vendors by their participation, showed keen interest in the new best value PIPS process (Van de Rijt, et al, 2011.)

The third goal of the procurement strategy was to achieve the best possible value for the projects. In 50% of the tenders the vendor with the highest quality is also the winner. In the three other tenders the winner had the second or third highest value. This suggests that

the procurement process had a bias to vendors with high quality. The test of the process was to produce the best value for the lowest cost. The risk was that the Rijkswaterstaat may pay a much higher price. In 5 out of 6 tenders the lowest price is not the MEAT (best value), the exception being package E. In 67% of the tenders, the second lowest priced competitor is the best value. This means that quality and a competitive price were obtained. The conclusion about price and budget however should be made at the end of the project, taking regard of all the change orders (Van de Rijt et al, 2011.)

The interviews made up 20% of the ranking. The interviews were very differentiating. There were no problems in scoring different key persons. The free choice of the key persons by the vendors did not raise any problems. This allayed fears of the Rijkswaterstaat that interviews would be perceived as non-transparent (Van de Rijt et al, 2011.)

Another observation is that the individual consultation sessions during the tender sometimes led to attempts to verify chances of risks minimizing measures by the vendors. Not answering these questions was sometimes misunderstood by the vendors and led to perceptions of non-transparency. This is due to lack of understanding by the vendors and should be resolved with more education and experience with the best value PIPS process.

ANALYSIS OF THE DUTCH EFFORT

There were three main problems identified at the beginning of the Dutch effort. First, can we find a Dutch researcher/practitioner who can translate best value PIPS into the Dutch language and vocabulary. This has been solved with the setting up of Scenter as a PBSRG unit in the Netherlands, and with the core team of the Rijkswaterstaat. Second, was the issue of finding a Dutch academic research group that was capable of using the PBSRG's model. This has also been satisfied by Scenter. It is the opinion of the authors that regardless of how many become certified to teach BVP/PIPS, a group like Scenter which is tied to PBSRG, is essential for continued stability and implementation of the BVP/PIPS. Third, where the traditional procurement model is 180 degrees different, will the Dutch procurement be able to make the paradigm shift? This has been resolved as the 2010 NEVI keynote address by Kashiwagi to a well receiving audience of over 300 procurement agents, the high number of PIPS tests in the last two years, the attendance of 25 Dutch procurement dignitaries, Rijkswaterstaat officials, and other government procurement agents to the 2011 Annual Best Value Conference in Tempe, Arizona, the invitation of PIANO to Kashiwagi as a keynote address in the 2011 conference and the possibility of exposing over 1,000 Dutch procurement agents to PIPS, a very positive review of the PIPS process by one of the leading procurement specialists in the Netherlands (Telgen, 2010), and congruent analysis of the PIPs process by other experts (Van Duren et al, 2008), the publishing of the first PIPS book in Dutch which sold 2,000 copies of the first edition (Van de Rijt and Santema, 2009), and the introduction to the rest of Europe in the 2011 Innovation conference shows that the procurement community has understood and is willing to make the paradigm shift. The analysis leads to the successful validation of the hypothesis:

1. Best value PIPS can resolve Dutch construction performance issues and collusion.

2. The PBSRG research model (funding, using deductive logic and dominant information) is transferrable and has the potential to impact industry practice faster than traditional research programs.
3. Problems with construction performance and quality may not be technical, but may be caused the buyer/client's delivery system.
4. Dutch collusion problem is caused by the government's delivery system (management, direction, and control, and award by low price) and not by the vendors, who are simply reacting to the environment of the client's delivery system.
5. PIPS is a paradigm shift more than a legal issue.
6. PIPS can increase value and quality and minimize delivery cost and time.

CONCLUSIONS

The following are preliminary results and conclusions to the current Dutch testing:

1. PIPS is not only an American solution and can be run within European law.
2. The new research model of using deductive logic, action research, can be transferred from PBSRG, Arizona State University (ASU) to other institutions and parties and can be used to impact the industry practices.
3. Dutch Rijkswaterstaat agency is testing best value PIPS concepts in the largest test of PIPS in 17 years, $800M delivery of critical infrastructure highway improvements (16 different projects.) A Rijkswaterstaat initiated feasibility study on PIPS was complimentary and allows further PIPS testing (Van Weele, 2008), and a secondary review of the tests based on the input of all the participants is allowing further testing (Telgen, 2010.)
4. A consultancy has been hired to create a plan to make best value PIPS sustainable in the Rijkswaterstaat.
5. Further testing at Rijkswaterstaat.
6. Secondary study done on the validity of PIPS (Van Duren et al, 2008.)
7. Third study done by a masters student in innovation management also identifies successful test results (Prager, 2009.)
8. Dutch version of Best Value PIPS book sold out 2,000 copies in the first year (Van de Rijt and Santema, 2009.)

As a result of the Rijkswaterstaat test results, other test results, and Scenter's success in transferring the technology and using the PBSRG research model, the following is taking place in the Netherlands and in Europe:

1. Kashiwagi was selected as a keynote 2010 keynote speaker at NEVI (Dutch association of procurement managers) and as a result, NEVI will be focusing on best value PIPS in 2011.
2. Rijkswaterstaat visionaries are taking best value PIPS to the 2011 European Innovation conference to expose other European clients to the PIPS philosophy.
3. Scenter has expanded testing to other industries (shipbuilding, medical, commodity services, and other private sector clients.)

4. Scenter and Delft University of Technology and other Dutch visionaries are now working on a strategic plan to sustain the testing and development of PIPS.

The Dutch tests have been a validation of the new research model initiated at PBSRG, Arizona State University (ASU). Using deductive logic and observation, instead of inductive logic and exploratory research, an impact is being made in the Dutch delivery of construction services. The use of operational funds of a visionary client instead of government research funding, has aligned the efforts of different industry parties who are trying to solve the same problem. Validation of research hypothesis is done by dominant case study results of confirmation. It has also led to continued industry funding and research testing instead of the traditional consensus of peer review by academic research peers. The use of dominant results (minimizes the need for decision making and inductive studies), minimizes the need for statistical analysis of surveyed industry perceptions. The use of deductive logic instead of industry best practice, and introduction of "disruptive" technology instead of evolving existing practices has led to dramatic breakthroughs in increasing value and quality of construction services.

RELATED QUESTIONS AND FURTHER RESEARCH

The following are topics for further research:

1. Is the current university research model effective in solving industry issues, or are other models, more efficient?
2. Does the research of construction industry practices belong in the industry or at the universities?
3. Is the reason for difficulty in solving the problems of construction industry performance issues in the research system or in the complexity of the problem?

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GENERAL SERVICES ADMINISTRATION TESTS THE BEST VALUE PIPS PARADIGM

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Abstract
The General Services Administration (GSA) Heartland Region is testing a best value process (which minimizes time and cost deviations 98% of the time.) The best value Performance Information Procurement System (PIPS) has been tested and optimized for the past 16 years. The significance of the test includes that huge impact on the contracting paradigm when the client assumes that the vendor is an expert. It allows of the transfer of risk and control to the vendor. It allows the implementation of quality control and contractor risk management and the implementation of a quality assurance based project management model by the client. It minimized the decision making in the delivery process. It forces the paradigm to concentrate on preplanning instead of construction management. It also motivates the contractor to manage and minimize the risk that the contractor does not control, and to not depend on the contract for leverage but to use preplanning to maximize vendor profit. The General Services Administration has also been very interested in measuring their project management performance, and they are very interested in the concept of having the performance and value measurement system not dependent on project managers to continually update the performance metrics. The implementation of PIPS also implements the concept from Edward Deming of using the minimization of deviation instead of minimum standards to increase value and performance. The impact of this paradigm shift in one of the largest agencies in the U.S. federal government addresses several issues of large government organizations including can a very large bureaucratic organization change paradigms.

Keywords: *Best value procurement; minimized government management; high vendor; performance; measured environment*

INTRODUCTION

The General Services Administration (GSA) is the largest buyer of non-military services in the United States. It is a large management based organization. An Achilles heel for any large organization is the number of layers of management, the large number of managers and subject matter experts (SME) and the practice of managing, directing and controlling vendors/contractors who are supposed to be experts at what they do. Implementation of new programs has the following characteristics:

1. Top down direction.
2. Policies are set, and the entire organization implements the change.
3. Implementation of paradigm changes is very difficult.
4. Programs are implemented without complete knowledge of the potential impact to performance.
5. Measurement of success or the improvement of the paradigm shift is very difficult.
6. Many programs are implemented to continuously change or improve the system.

The current status of most projects in the GSA is where vendors (architect/ engineers and contractors) continually rely on being managed, directed, and controlled by GSA project managers and contracting officers. To get a quality set of construction documents, the government project managers complete extensive quality control reviews of the A/E's construction documents, once the sole responsibility of the A/E design firms. GSA personnel (COR's, PM's, and CO's) are forced to continually manage, direct, and control the contractors in construction. Control, risk, and accountability are not transferred to the vendors. It is difficult to hold design vendors accountable for project time and cost deviations resulting in government directed change orders due to design deficiencies. Projects are not being completed in a timely manner and the actual close-out of projects could take between 1 to 4 years. GSA processes and requirements are continually being developed and expanded at various levels both nationally and regionally in an attempt to change the paradigm and increase the performance of the vendors.

Upper level management in the GSA has struggled with implementing a sustainable, useable, and accurate system that measures the performance of their vendors and project managers. Shrinking budgets, increased workload requirements, and the increased need for project managers to manage, direct, and control vendors, make the updating, collection, and analysis of performance information very difficult. The GSA Central Region as well as the entire GSA organization has struggled with creating an efficient and effective proactive measurement system (Meyer et. al., 2010).

The GSA has been exposed to many management measurement systems and philosophies (Alsup, 2010; Topi, 2010):

1. Quality Management Circle (part of TQM)
2. TQM (total quality management) (early 1990's)
3. eTMP (electronic transaction management playbook) (2006)
4. TMP (transaction management playbook) (2006)
5. HCAM (included the following TMP, OMP, LCP, & AMP) (2005)
6. OMP (occupancy management playbook)
7. LCP (large construction playbook)
8. AMP (account management playbook)

However, the strategic objective of measuring and using the measurements to increase project management and vendor performance remains elusive. Due to the number of participants and complexity of the projects, it has been nearly impossible to increase the accountability of all participants in the supply chain. The researchers raise the possibility that the solution lies in top down direction, control, and influence may not work.

PROBLEM

The stubbornness of the problem of the GSA's inability to sustain performance measurements in a timely fashion and increase vendor performance may be a systems problem and not a GSA unique management problem. The current GSA system forces the project managers to document, maintain, and report the performance information. Because

of the current project manager/vendor relationships and their heavy workload, project managers may not be motivated to accurately and consistently document the performance information. The current system of delivery has the following characteristics that may not be feasible:

1. The GSA project managers are required to manage, direct, and control the vendors. This assumes the control of the vendors is possible.
2. There is no transfer of risk or control to the vendors, forcing the GSA to be subject matter experts.
3. The relationship between the vendors and the project managers may dilute accountability because one party is the expert, and the other party is doing the work.
4. The current delivery system does not motivate vendors to preplan and manage and minimize the risk that they do not control (think in the best interest of the client).

This research effort will implement Edward Deming's approach of system stability to solve the problem instead of management decision making. It will assume that Deming's assumption that when decision making becomes frequent and critical, the problem is not technical but system based, and require a new system. What makes this research effort unique is that the problem solution is disruptive (forces a change in paradigm and function of supply chain personnel) and requires a system and paradigm change, and not an iterative change in current functions. The question for a large government agency, is can a large organization which by nature and definition implement a disruptive technology solution?

HYPOTHESIS

Deming (1982) identifies the type of problem the GSA is facing as a systems problem and not a problem caused by the lack of technical expertise. The authors propose that based on Deming's approach, the system may be stabilized but not meeting the expectations of the GSA's upper level management. Increasing effort to optimize performance in a stable environment may not be successful. The system must be changed.

METHODOLOGY

The authors proposed that the GSA identify and find a new system that has the following characteristics:

1. Has a bottom up instead of top down solution.
2. Assumes that the vendor is an expert.
3. Implements a buyer project management approach of quality assurance (ensures that he contractor is using a system of quality control and risk management.)
4. Forces the vendor to manage and minimize risk that they do not control.
5. Uses a solution of minimizing project deviation instead of minimum standards.
6. Changes the paradigm to a more proactive instead of reactive approach, moving the emphasis from contract management to preplanning.
7. Transfers the risk of defining how the project is done to the vendor, changing the paradigm from buyer directed to vendor defined.

The methodology for such a system would be different from the traditional GSA approach. The approach would be deductive, or observation instead of inductive, requiring analysis, decision making, and technical expertise of the GSA PM.

SEARCH FOR PERFORMANCE MEASUREMENT SYSTEMS FOR VENDORS / ORGANIZATIONS

The GSA team composed of a visionary project manager and a procurement officer team, proposed the above plan to their division manager in the heartland region located in Kansas City. They proposed using a best value approach to solicitation to procure the services of an organization that could:

1. Identify a system that meets the requirements of leadership: efficiency, effectiveness, measurement, and accountability.
2. Provide a procurement process that used observation instead of technical expertise.
3. Prove the system had the capability to increase results and efficiency.

The GSA team did preliminary research to identify the Performance Information Procurement System (PIPS) as a potential system that could meet the requirements they had identified. They then used the deductive logic of PIPS (Information Measurement Theory (IMT)) to do the following:

1. Identify potential systems that could meet their requirements.
2. Identify which system was able to provide increase in performance, efficiency and effectiveness.

The solicitation was posted on August 15, 2009. Contrary to the traditional perception that there are many systems that could provide effectiveness and efficiency, there were only three proposers. The GSA selection system used the concept of observation, requiring documentation of proven performance. The contract requirement was to guarantee an increase in performance. The first stage of the research dominantly identified PIPS as the only system based on past documented performance that had the potential of meeting the requirement. It was the only system that documented the following characteristics:

1. Documented performance (over 15 years.)
2. Documented the minimization of management, direction, and control.
3. Showed the transferred risk and accountability to the vendor by minimizing project and risk management transactions (test results showing up to 90% reduction.)
4. Measured the performance of the vendor and all other participants in the process.
5. Provided a mechanism whereby the vendor managed the risk that they did not control.

The other vendor options proposed to use a performance measurement system, but would not accept the responsibility for ensuring the performance measurements on all participants, a resulting increase in performance and value, and measured minimization of management, direction and control. The GSA contracting officer identified that the selection process results were so dominant in terms of proven performance and capability, a sole source justification could easily be written for the testing/implementation of PIPS. This differentiates the validation of PIPS from merely a traditional academic research exercise to an actual competitive selection test and verification by a huge federal agency. As a result of the selection process, the GSA entered into a contract with Arizona State University for a four year contract with a maximum value of $800K to test and implement the best value PIPS system (GSA contract #: GS06P09GYD0027).

INDUSTRY ANALYSIS

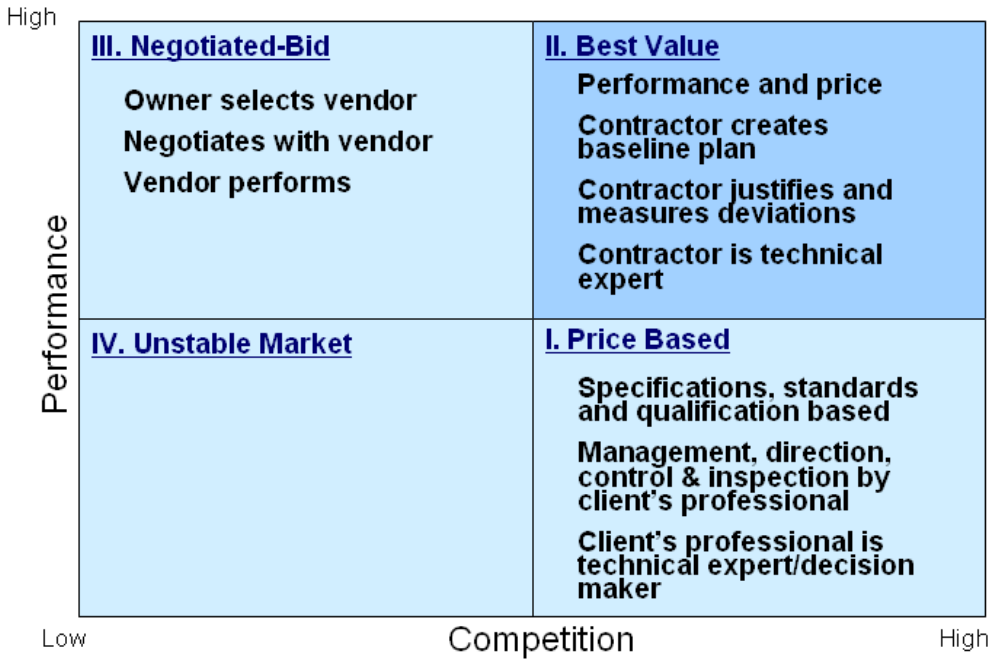


Figure 1. Construction Industry Structure (Kashiwagi, 2010)

The CIS identified the current GSA system as a price based system regardless of the perception of the owners of not awarding projects based purely on price (Sullivan, 2005). The Price Based System (Quadrant I), has the following characteristic:

1. Owner representative attempts to direct and control the vendor.
2. The party who should know less about what is being done is directing (through detailed specifications) someone who should be an expert in what is being delivered.

Deductive logic assumes that the owner would only hire a vendor who knew what they were doing (expert). However, under the price based environment, minimum standards are used to increase the number of vendors instead of minimizing the vendors to those with proven expertise. In the best value system, the client identifies their intent, but asks the vendors to deliver the best value. This system has the following characteristics:

1. Vendors identify what they do, and what it costs.
2. Client selects the best value based on performance and price (using their value expectation).
3. Vendors preplan to manage and minimize risk they don't control.
4. Vendor identifies how the final product and how it will be delivered.
5. Clients do quality assurance (ensures vendor does quality control and risk management).

The price based system (Rubio et. al., 2009; Kashiwagi, 2009; Goodridge et. al., 2007):

1. Results in inefficient because it requires more people, and the people who direct and control know less than those doing the work.
2. Has more confusion.
3. Depends on the subjective perception and decision making of the buyer.
4. Requires a higher flow of information because the buyer is directing the user.
5. If performance measures are kept, they are very subjective.
6. Requires people to partner and form relationships.
7. Requires relationships to overcome differences of opinion.
8. Becomes adversarial due to one party wanting higher performance for a lower price and the other party delivering the lowest priced service for the lowest price.
9. Forces a decline in performance due to minimum standards and low price award.
10. Minimizes accountability of all parties. The buyer's representatives do not want responsibility of low quality work by vendors, and the vendors claim that they are being forced to provide the lowest cost products without regard to quality.
11. Increases the risk of not meeting the expectation of the buyer.
12. Documented low performance (on time, on budget, meet client's expectations).

The best value environment:

1. Is more efficient and requires less people.
2. Is measured with few and simple measurements.
3. Is transparent.
4. Uses alignment of resources.
5. Minimizes partnering exercises.
6. Managed by minimizing deviations.
7. Has continuous improvement.
8. Has a high level of accountability.
9. Has high performance and low risk.
10. Minimizes transactions.

DIFFERENCE BETWEEN THE TWO SYSTEMS

The difference between systems is that the price based vendor is reactive, managed, controlled and directed by the client/buyer, the best value vendor is proactive, preplans, manages and minimizes risk that they do not control, measures their performance, and manages their project by minimizing deviations. In the price based sector, the client directs the vendor using minimum requirements; the vendors transform the minimum into a maximum, and drive the performance the opposite direction (Figure 2).

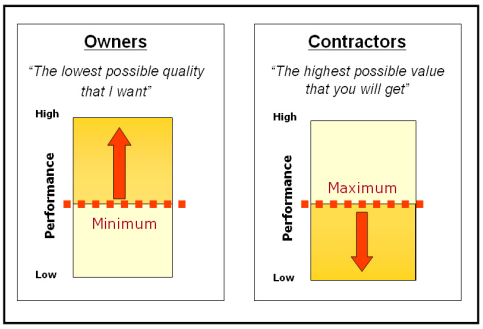


Figure 2. Min/Max Dilemma
(Kashiwagi, 2010)

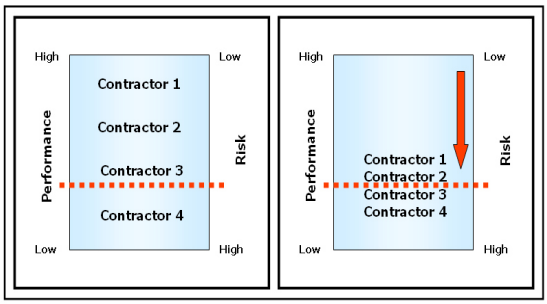


Figure 3. Price-Based Award
(Kashiwagi, 2010)

The high performance vendor (high performance and low risk) can see a project from beginning to end. They identify risk that they do not control, and plan solutions to minimize the risk. The low performer (high risk) prices only what they are directed to price. The overall effect of the client directing the vendors is the following (Figure 3):

1. High performers become reactive instead of proactive. They are told to price only what is directed, regardless of completeness, correctness, or whether it is doable.
2. Therefore, they are directed to give the lowest possible price.

Figure 4 shows the business approach to Quadrant I Price Based system. The high performers, who get paid more for their expertise, get sent to the price based system, where they are directed and controlled by someone who is not an expert. The confusing environment results in lower production of the high performer. They become out of alignment, overpriced, and leave the environment. A more damaging result of the system is that the less experienced are not motivated to become like the highly trained.

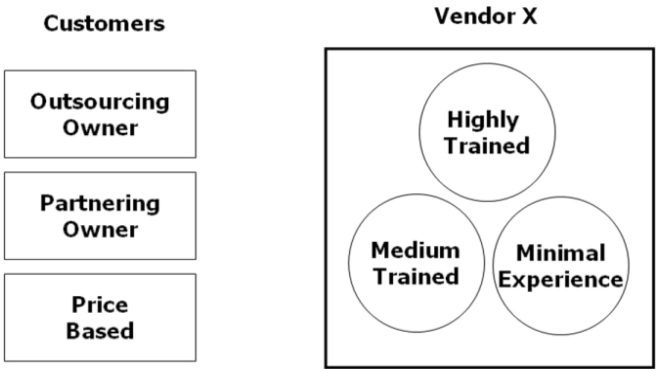


Figure 4. Business Approach (Kashiwagi, 2010)

The outsourcing owner who transfers risk and control to the expert vendor will get the high performer. It is the only win-win situation. The high performer will preplan, manage and minimize risk that they do not control to finish on time and maximize their profit, do the project once, and get paid and not go back to redo or fix problems. This is the efficient best value system.

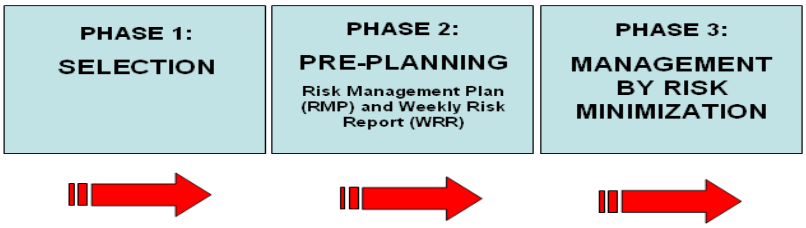
BEST VALUE PERFORMANCE INFORMATION PROCUREMENT SYSTEM (PIPS)

After identifying the requirement to have a new system/environment that reflected the best value environment, the GSA selected the best value PIPS system to move from the price based to the best value environment (GSA contract #: GS06P09GYD0027) The documented performance of the PIPS system included:

1. 16 years of testing (1994-present) delivering 700+ construction services projects valued at over $800M.
2. Research funding of $8.5M.
3. Minimized client risk/project management activities by up to 90%.
4. Maximized vendor profit by up to 100%, at no additional cost to the client.
5. Delivered performance of 98% on time, no contractor generated cost and time deviations, and meeting client's expectations.
6. Arizona State University (ASU) moved PIPS into non-construction areas including the delivery of food services, IT networking, IT data centers, help desks, sports marketing, gym equipment, document control, long distance education services, and furniture buys. ASU received investments of $100M over ten years due to the change of system environment, from price based to best value.
7. The Dutch infrastructure agency used PIPS to deliver $1B of highway infrastructure to solve their problems with the delivery of construction.
8. The Bank of Botswana used PIPS to deliver a critical bank facility and found it tremendously better than the traditional process.
9. The State of Alaska is delivering a $200M Electronic Resource Planning system using PIPS.

PIPS are a licensed structure/process from Arizona State University developed by Dean Kashiwagi and the Performance Based Studies Research Group (PBSRG). PIPS have three main phases shows in figure 5.

1. Phase I: Selection of the best value vendor.
2. Phase II: Pre-award/pre-planning and creation of the risk management plan (RMP) and the weekly risk report (WRR.)
3. Phase III: Project delivery by the risk management of deviation of time and cost.



Source: Kashiwagi, 2010

Figure 5. PIPS/PIRMS Phases (Kashiwagi, 2010)

The pre-award, preplanning phase is the most critical phase. The risk management capability of PIPS became obvious, and the term, the Performance Information Risk Management System (PIRMS) was created to allow owners to use the risk management capability of the system independent of procurement and selection. The selection phase has five major filters to ensure performance (Figure 6 and 7):

1. Requires the vendors to provide documented past performance including the performance of critical team components (project manager, and sub-vendors (engineering, professional consultants, or other crafts).
2. Vendors are rated on their capability to do the project as an expert. They must show they have no technical risk, can manage the risk that they do not control, and add value.
3. The vendor is also asked for a milestone schedule and price.
4. Vendors personnel are rated in an interview based on their ability to see the project from beginning to end and manage and minimize the risk that they do not control.

The Pre-award Phase where just the prioritized best value vendor moves forward and create a risk management plan (RMP) and a weekly risk report (WRR) that they will use to manage and minimize the deviation of the project. The WRR and RMP track risks that the vendor does not control. This is the key mechanism in PIPS/PIRMS, and is the regulator that ensures that risk and control is transferred to the vendor. This becomes a key component of the contract, and decommissions any attempts by the owner's PM to manage, direct, and control the vendor. This results in an alignment of resources.

The Pre-Award phase is the first time in the PIPS process that technical questions are addressed. At this time, all technical and non-technical concerns of the client's technical representatives, users and project manager are identified. The contractor is requested to address the issues in a RMP. If they cannot, they are released, and the next best value is brought in. The contractors are informed from the beginning of the process that the user assumes they are a technical expert and have no technical deficiencies.

A major paradigm shift is the movement from management, direction, and control to quality control/quality assurance. This movement assumes that the vendor has no technical risk, and therefore the only risk they have is the risk that they do not control. Therefore they will concentrate on identifying, and managing and minimizing the risk they do not control. This will be more fully explained in a following section.

The vendor then writes their own contract (technical proposal which meets the approval of the buyer, legal requirements of the buyer, risk management plan and weekly risk control report). The project is then awarded. The vendor self manages themselves based on the minimization of time and cost deviation. At the end of the project, the vendor is rated. The rating becomes 50% of the vendor's future rating.

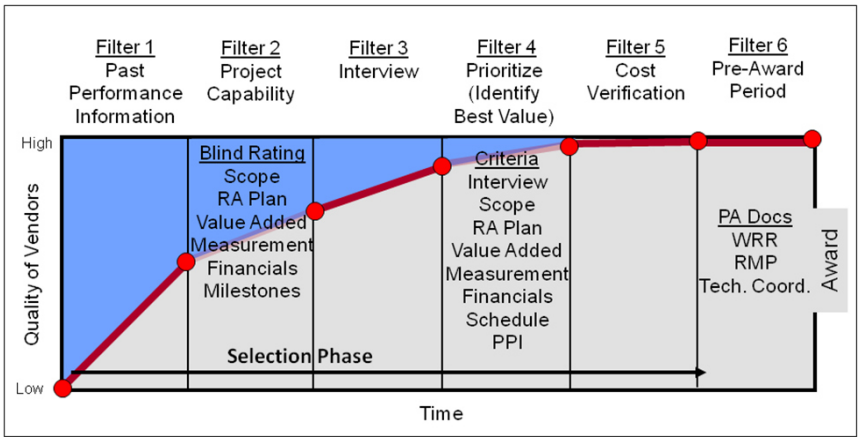


Figure 6. PIPS/PIRMS Filters (Kashiwagi, 2010)

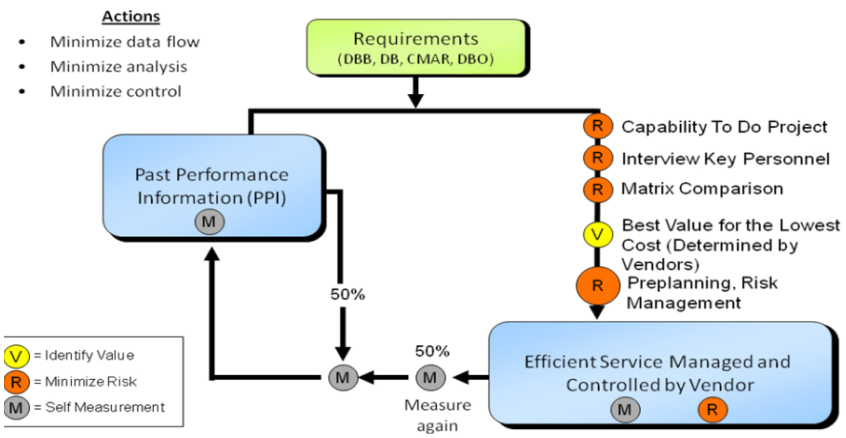


Figure 7. PIPS/PIRMS Self Regulating Closed Loop (Kashiwagi, 2010)

A PARADIGM SHIFT: UNDERSTANDING THAT EXPERT VENDORS HAVE NO TECHNICAL RISK

A major departure from the traditional project management practices is the understanding and handling of risk. Information Measurement Theory (IMT) identifies that by definition, high performance/expert personnel have minimal or no technical risk (Kashiwagi, 2010). If there is technical risk, it is only because the client hired a vendor who does not have the expertise and therefore is not capable of minimizing the technical risk. Instead of managing, directing, and controlling the vendor, the owner is now creating a new environment, where the vendor is identified as the expert. Therefore the new environment minimizes all management, direction, and control of the vendor.

The authors propose that the impact of unforeseen conditions can be minimized if experts can manage and minimize the risk that they don't control. The only risk high performers have is risk that they do not control (risk that is brought by other participants, mainly the client in the form of over-expectations, items outside of the scope, decision making by other participants at the wrong time during the process, and the changing of expectations) (Figure 8). This concept has been reinforced by the extensive application of the PIRMS on the U.S. Army Medical Command system projects (Kashiwagi J., 2009) and at the University of Minnesota (Sullivan et. al., 2007).

The new paradigm motivates vendors to preplan the project from beginning to end and identify and manage the risk that they do not control. By deductive logic, a system that increases client management, direction, and control moves the activity to the more inexperienced vendors and personnel (Figure 8). This results in lower performance, reactive behavior, minimum standards or expectations, and minimum accountability. By moving from the left hand side of Figure 8 to the right hand side, contractors who are not experienced and have expertise are non-competitive. The right hand side of Figure 8 is also related to the best value environment in the CIS (Figure 1) which is more efficient, less expensive, and leads to minimal time and cost deviation. It is the only environment where quality control and quality assurance (by definition) can be practiced.

Price based contracts emphasize the technical risk that the vendors must control. Price based contracts attract the less experienced, and low price makes the inexperienced more competitive (Figure 4 and 8). Best value contracts must identify and communicate the expectations of the client but emphasize the requirement of the vendors to manage and minimize the risk that they do not control, thus thinking in the best interest of the client and creating a "win-win" situation. Price based contracts must cater to the inexperienced and increase the flow of information, contract documents, and client management, direction, and control. Best value contracts cater to the high performing contractors who need minimal information, who act in the best interest of the client by giving high technical service (no technical risk) and manage and minimize the risk that the vendor does not control through the use of quality control and risk management plans.

Figure 8. Inexperienced vs. Experienced Vendor Risk Model (Kashiwagi, 2010)

These deductive concepts have not only been confirmed through the 15 years of testing, but have been identified in other non-construction industries. By minimizing the management, direction, and control of subject matter experts (SME), transferring the risk and control to the vendor, forcing the vendor to write the contract, and by forcing the vendor to manage and minimize the risk they do not control, a structure has been created which aligns experts to the requirement. The regulator of the change is the weekly risk report (WRR) and the risk management plan (RMP). They create transparency which minimizes the need for management, direction and control.

METHOD OF MEASUREMENT

The method of measurement of performance utilized by PIPS is a novel approach which has had successful results in the past five years (Kashiwagi, 2009). The assumption is that a large organization delivering services with project managers who are accustomed to manage, direct, and control, will have a difficult time consistently and doing timely reporting and analysis of performance. PIPS identifies who should be at risk (expert), and forces the measurement of performance (deviation of project time and cost) to the vendors. The deviations are then reviewed for accuracy by the client/buyer's professional (quality assurance). The following information goes directly to the top decision maker in the organization, bypassing the normal filtering system in a bureaucracy:

1. Identifies the deviation rates of all projects.
2. Identifies the top ten riskiest projects, and which participant in the supply chain caused the deviation.
3. Measures all participants in the supply chain, giving a relative performance rating based on deviations and performance.

The PIPS measuring system overcomes the major obstacles large organizations have:

1. Constant updating of measurements.
2. Subjective filtering of measurements.
3. Lack of timely reporting.

4. Lack of time to do accurate reporting.
5. Lack of dominant information which motivates personnel to change their behavior.

GSA STRATEGIC AND TACTICAL PLANS TO IMPLEMENT PIPS

The GSA signed a five year contract with the Performance Based Studies Research Group (PBSRG) to implement the new best value system. Previous research results (Kashiwagi, 2010) identified that both a strategic plan and a tactical plan are required to successfully make the transformation. Previous results identified the following priorities:

1. Identification of a small core group to run tests.
2. Education, development of the core group of visionaries to learn how to use the system.
3. Identifying visionary vendors who can assist the buyer to run best value PIPS.
4. Implementing and modifying PIPS to fit the environment of the owner.
5. General education to the owner's organization of the PIPS system.

The strategic plan encompasses the first three objectives, and the tactical plan is the last two objectives. The tactical plan cannot be implemented without a strategic plan. The strategic plan therefore, must include:

1. The development of the visionaries in the organization.
2. The development of an industry advisory group that contains visionary vendors who will implement the best value PIPS practices into their own company.
3. Continuous education of the visionaries to prevent a reversion into traditional practices.
4. Jobtransformation of the visionaries from project managers to leaders and educators.
5. Documentation of the transformation of the organization.
6. Peer review by other visionaries.
7. Development of measurements showing the improvement in performance and value.

The tactical plan must include:

1. The modification of the PIPS to move the owner's organization without increasing resistance due to the change of efficiency and structure.
2. Education on PIPS to both vendors and PMs running the system.
3. Prototype testing and implementing PIPS by core team visionaries.
4. Design of the information system.

If the concept of transferring risk and control to the expert vendor, and aligning the resources in the entire supply chain through measurement of cost and time deviation is accurate, this system transformation is not industry specific. It is a system regulated by measurement, it will align all participants in the supply chain.

PROGRESS OF THE GSA

The implementation of PIPS in the GSA has been relatively optimized due to the following:

1. The head of the core team visionaries, the region director of the organization, was already attempting to transform the organization to a measured organization. His strategic goals of efficiency and effectiveness of both vendors and the GSA organization was already in place.
2. The PMs of the core team were identified and selected based on the Information Measurement Theory (IMT) and therefore were attempting to use the concepts of PIPS before the transformation effort.
3. This is the first time in 16 years of testing, that both a PM and procurement officer were original members of the visionary core team, and the director was already attempting the transformation.
4. This is the first time that the PIPS was selected through application of PIPS, thus confirming to the core team that PIPS was dominant in its ability to transform organizational environment/systems.

FIRST MEASUREMENT OF EXISTING PERFORMANCE AND FUTURE MEASUREMENTS

The core team selected 8 projects where information was readily available to identify the baseline performance of the existing environment:

1. Average Cost/scope of projects: $526,992
2. Average duration of projects: 152.5 days
3. Cost deviation of projects (percentage): 7%
4. Time deviation of projects (percentage): 231%
5. Customer satisfaction (1 -10 rating, 10 being optimal): 6.5

The core team is also interested in the following measurements and the impact of the change of paradigm:

1. Vendor profit margin
2. Vendor rating of delivery system
3. Vendor perception of new system (1 – 10 rating)
4. Number of projects a PM is responsible for

The GSA's next step is to complete six (6) test projects and collect data to confirm increased performance with the new best value PIPS system. The Contractor and PM shall rate the following before and after on the traditional system vs. the new best value PIPS system:

1. Effectiveness (deviations.)
2. Value of preplanning by vendor as perceived by both the vendors and the GSA PM.

3. Value of vendor managing and minimizing the risk that the vendor does not control as perceived by all participants.
4. Vendor's profit margin maximization.
5. Accountability of all the participants as perceived by all participants.
6. Successfulness and impact of the transfer of risk and accountability to the vendor.
7. Project coordination by the vendor with the client.
8. Minimization of surprises.

SCHEDULE OF IMPLEMENTATION

It is a five year tactical plan:

1. Year 1: set up core team structure. Run the first tests with core team and a few PMs.
2. Year 2: set up the Directors Report and expand both the running of the entire process and the risk management reporting (which measures the performance of projects).
3. Year 3 - 5: expand implementation within organization. Visionary core team becomes a subject matter expert (SME) to assist in the transformation of other organizations.

ANALYSIS OF THE EFFORT

This research effort is using the deductive approach (confirmatory) instead of the inductive approach (exploratory). The success of the project will be determined by measurements of observation which minimize subjectivity as much as possible. The following are observations of the effort thus far:

1. PIPS has been identified by a GSA selection process as the only option with documentation of proven success to transform an organization's environment from a management, direction, and control environment to a best value, alignment, leadership based environment.
2. A large federal organization who is constrained by federal law, will for the first time implement the PIPS process for selection of vendor and contract administration.
3. A visionary core team has been organized that is optimal in terms of a high ranking visionary leader, and visionary PM and procurement components.
4. For the first time, strategic and tactical plans have been drawn up and will be used in the research test.

CONCLUSION

The GSA Heartland region is implementing an advanced and theoretically sound best value Performance Information Procurement System (PIPS) delivery process to transform the system from a price based to a best value environment. The major objectives include: minimization of management, direction, and control transactions in a large bureaucratic organization, the transfer of risk and control to vendors who can minimize the risk where previously the GSA controlled the projects, measurement of performance of the vendors and the GSA organization, and to measure an increase in performance and value of the services being delivered. A core group of visionaries are attempting to transform the organizational approach from one of management of personnel to a systems management, where performance measurements drive alignment of resources. This is a significant effort for a large federal organization that normally is management based and has difficulty in minimizing bureaucracy.

This research effort is advancing the theoretical development of the following concepts:

1. Leadership based paradigm replacing management based paradigm.
2. New contract model: transferring control of the project to the vendor including the tasks to write the contract, identifying the final deliverable, having the contractor document and administer their own time and cost deviations, and putting the buyer/client personnel in a position of being accountable to the contractor.
3. Quality assurance: ensuring the contractor is doing their quality control and risk management.
4. Decision making: minimizing of the buyer/client's project managers decision making.
5. Paradigm shift of best value: changing from enforcing minimal standards to assuming that the contractor is an expert, and transferring the responsibility of understanding required details to the contractor.
6. Risk model: proactive plan of preplanning, spending more time before the project is awarded to manage and minimize risk instead of doing it during the project.
7. Transparency: reduction in flow of information to create effective measurement system and accountability.

The success of this research will change the mainstream thinking of project management and risk management. It is simultaneously performing basic theoretical research, prototype testing, and implementation of concepts. If successful, government organizations may change their structure from management based to leadership based organizations, and become much more efficient and effective.

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SUPPLY CHAIN INTEGRATION: MYTHS AND REALITIES

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Abstract
The aim of the paper is to help understand the concepts of social and economic integration of supply chain participants in parallel with the nature of fragmentation within the UK construction industry. The paper presents a brief literature review on construction procurement and how it is used to integrate the supply chain within construction industry, through two case studies, using case study research methodology. The current status of the UK construction industry is also presented to support the argument through latest published statistics. The paper analyses the argument and concludes that the UK construction practice/industry needs both integration and fragmentation within its project supply chains in order to deliver the clients requirement as a finished facility. Both presented case studies are public sector construction client and maintenance projects. The biggest implication of the above is that public sector clients operate under defined guidance through different policies, which influences the way they procure work and integrate their project supply chain. The authors, in the future, would test their arguments in the future research with the private sector clients. The current structure of a supply chain on a particular project within an emerging procurement method is integrated upstream and fragmented downstream. That means, the supply chains are not fully integrated in practice and consist of both integration and fragmentation element. Authors also argue that there is nothing wrong in having fragmentation within the industry; in fact it is healthy. The paper's main contribution is to start the debate and give justification through evidence that the UK construction practice/industry is both socially integrated as well as fragmented.

Keywords: *UK Construction Industry, Integration, Fragmentation, Supply chain.*

INTRODUCTION

The problems in the UK construction industry, including delays, over-spent, inferior quality, and over all dissatisfied clients, have prompted a series of studies in last 12 years, aimed at improving efficiency and adding value for money. Most of the reports from these studies prefer integration of supply chain participants to other forms of organisation setups. The overall aim of this study is to present the degree of variability in the form of integration suggested in policy reports, as well as the level and form of integration in a project supply chain. This study utilises social as well as economic notions of integration as a measure of the supply chain integration. It also utilises the statistical data from the UK construction statistics, theoretical analysis of points of responsibilities via procurement routes, and four case studies from the industry for the analysis. The result shows that: (1) the UK construction industry is not (economically) integrated because, (a) the specialist trade firms are actively involved in construction processes, (b) the Small Scale Firms (SSFs), the Medium Scale Firms (MSFs) and the Large Scale Firms (LSFs) have maintained their positions in the industry with increment in their number by 7.56%, 75.81%, and 45.72% respectively between 1999-2005. Their value of work done between 1999 and 2005 has surged by 2.98%, 102%, and 109.03% respectively. (2) the strong performance of the MSFs

category support the fact that the industry utilises social integrative devices i.e. a form of management-oriented approaches e.g. collaborative arrangement, framework arrangement, partnering, etc. through innovative procurement methods instead of actual integration (economic) process. The study can serve as learning opportunity for the construction stakeholders by laying stronger emphasises on management system rather than point of performance responsibility.

The Latham (1994) and Egan (1998) reports outlined series of problems which can be summarised into three types: 1) the product development process, e.g. fragmented process; 2) problem related to the stakeholders e.g. lack of integration; and 3) the contracting process, e.g. supply chain problems. Many studies have favoured integration and partnering, i.e. taking a single point of responsibility in order to avoid fragmentation that is believed to be the root cause(s) of the construction industry's ills (Latham 1994; Egan 1998; Bresnen and Marshall 2000; Hellard 1997). A report by the Strategic Forum for Construction (Egan 2002) set a strategic target of 20% of construction projects by value to be undertaken by integrated teams and supply chains by 2004. However, Cox and Ireland (2002) emphasise that the Latham (1994) and the Egan (1998) reports suffer from inappropriate methodology in analysing the causes of inefficiency in construction procurement as well as choosing the subjective preference for partnering solutions. Readily, some of the flaws in integration (e.g. the false dichotomy between the points of responsibilities) are well-demonstrated in many different types of procurements. For instance, Chritamara and Ogunlana (2001) highlight problems experienced on design and build projects.

The paper will present a brief literature review on construction procurement and how it is used to integrate the supply chain within construction industry, through two case studies. This will be then followed by the discussion of the structure of the supply chains involved in those case studies to support the argument that having both fragmentation and integration within a supply chain is normal and healthy, and that is how our industry is performing and delivering at this moment in time.

The aim of the paper is to examine the level of supply chain integration in the UK construction industry based on the concepts and measures of social and economic notion of integration in relation to the policy documents. The paper argues that the UK construction practice/industry is both socially integrated as well as fragmented. Therefore, scope of this paper is to analyse the argument that the UK construction practice/industry needs both integration and fragmentation within its project supply chains in order to deliver the clients requirement as a finished facility.

INTEGRATION VS FRAGMENTATION

Fragmentation often denotes multiple points of responsibilities with multiple form of ownership by different players. Risks and responsibilities are carried by each of the player for his tasks or trade. Lawrence and Lorsch (1967) conceptualise an organization structure in terms of integration and differentiation. They believed that the functional departments of a firm differ from one another, yet there is a need for them to cooperate in order to achieve the organisation's goal i.e. the integration of the differentiated units. Further, they profess

that differentiation between departments occur because they differ in their tasks, goals and time orientations, formality of structures, and interpersonal orientations. Integration is needed through integrative devices/mechanism because the greater the differentiation the more integration is required for effectives of the overall organization.

In construction, project procurement defines project organisation set up. Love et. al. (1998) define procurement as an organisational system that assigns specific responsibilities and authorities to the organisations and people, and defines the relationships of the various elements in the construction of a project. In other words, project procurement establishes the contractual framework that determines the nature of relationships between the project team within the duration of their interactions. In construction project, integration denotes single point of responsibility in risks, responsibilities and under single ownership, e.g. traditional design and build. Conversely, multiple points of responsibilities denote fragmentation of risks, responsibilities and under different ownership, e.g. traditional and management contracts. Nowadays, the dichotomy is faint as all the procurement routes have multiple points of responsibilities either directly or indirectly through outsourcing.

A building project organisation has a multi-organisational structure that involves layers, levels, units and sub-units of organisations. This is because there are different design solutions, building methods and techniques on a project-by-project basis that imply many different components, elements, fittings and tasks. Therefore, the industry by nature is fragmented, and usually one-off. The fragmentation of a supply chain is also due to the effects of a technologically driven notion which has caused a significant changes to conditions of standardisation, innovation, mechanisation, and prefabrication of materials, plant and labour (Atkins 1994 and Cox and Ireland 2002). Miller and Rice (1967) asserted that the poor performance of building project organisation is because of the lack of integration between individual organisations and because of the lack of a considerable differentiation between members of the building process. In practice, design companies carry out the design work; major construction elements are contracted to subcontractor as an entity or as an integrated part of the contracting firm.

On the other hand, integration means that there is a single point of responsibility for project in all stages. In traditional design and build (Akintoye 1994), the contractor accepts the total responsibility for both the design and construction. The design and construction is the responsibility of a single firm, usually a construction firm; a single point of responsibility and risks. Although, there is a variety of design and build forms (Akintoye 1994). For instance, Atkins and Pothecary (1994) proposed an integrated system based on the UK Design-Build route and the French “La consultation performancielle”. The system that allows schematic design, client requirements and performance specification precede contractor involvement. Technically, the newer forms of design and build do not fall under single point of responsibility because portions of the responsibilities are subcontracted to other firms/companies, especially design/documentation and specialists’ works. Thus, shifting single point of responsibility to single point of (performance or non performance) responsibility.

ECONOMIC AND SOSIAL NATIONS OF INTEGRATION

The term integration was coined from economic studies which was later applied to information technology (system integration) and construction processes (process integration and clustering). Gort (1962) defines integration concept from economic perspective as the act of combining two or more separable stages of production under common ownership. This view was shared in construction process where the traditional design and build combines separable tasks and activities in different stages under common ownership. The economic notion of integration has become a means of measuring the level of integration in a practice. For instance, Oyegoke (2006) refers to the UK practice as moving towards integration based on the number and value of design and build contracts from Langdon and Everest survey of 1984-1998.

As the design and build becomes fragmented through outsourcing of key activities and tasks, integration shifted from common ownership to point of (performance) responsibilities. Nowadays, the term integration is loosely applied to inter-firm collaboration (industry level), framework agreement, partnering and alliances (project level), system clustering (system level), trade and task outsourcing (trade and task level) etc. These forms of arrangements can be referred to as management-oriented approach or social integrative devices.

Lawrence and Lorsch (1967) concept of integration and differentiation take into account the separable functions by different departments in the same company under single or common ownership. Construction is a very complex process involving many stages of productions. Separable process can be define under different productive functions either in a form of stages, trades, or tasks both in preconstruction and construction phases and along consulting and contracting processes. This is because productive process can be performed successfully under single or separate ownership with a major and auxiliary activities or tasks. The major activity for a main trade contractor is construction and for a consortium group is design documents. Although a main contractor's firm has many specialist task within his organisation while a consortium firm has many consultants within the group. The combinations of production of design documents with actual construction work delineate the feature of economic integration in construction.

The social notion of integration allows for collaborative working arrangement between project stakeholders in different construction business levels in the industry. The aim is attain overall project objectives by facilitating team building/working across contractual boundaries (inter firm relationships), which may be project specific or strategic in nature. Perin and Price (2004) differentiate between partnering and alliance arrangement. The former describes an arrangement between to organisations, usually a client and a contracting organisation while the later describes an arrangement between more than two organisations.

Egan (1998) recognises the flexibility strength of fragmentation process and stresses that a weakness can be said to be a discontinuity of teams that results to a negative effect on efficient working. An integration of the process and the production team around the product is one of five key drivers of change for the construction industry to deliver value to customer (Egan 1998). Therefore, social notion of integration in construction is aimed

at encouraging alliances between different stakeholders beyond a single project. Figure 1 presents different business levels in construction industry in relation to the type of integration. Economic integration focuses on integration within a firm while social integration focuses on integration among firms within the industry. Economic integration ensures that task, trade and project levels are integrated within a firm under a single ownership. The span of integration extends from task level to industry level in social integration while it extends to firm level in economic integration. However, the ratio of number of firms with economic indicator is used as a measure of integration in a practice. It is pertinent to state that company which is economically integrated can as well use social integrative devices to socially integrate in higher social integration level, e.g. partnering between designs and build firm and project owner.

Figure 2 shows different levels of social integration. The higher the scale of integrative device the greater social integration is achieved. There are enough evidences that the two forms of integration (economic and social) are mutually reinforcing forms of growth. For instance, among many other advantages social integration leads to team building while economic integration in addition to tam building leads to administrative economies of scale.

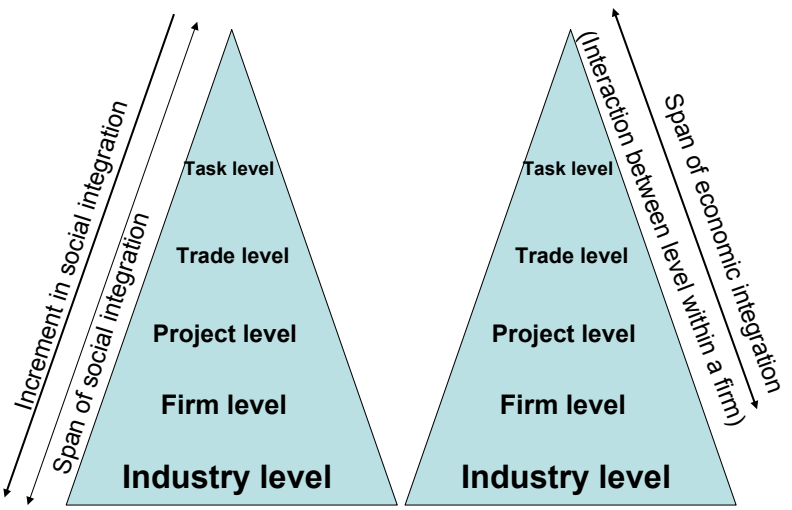

Figure 1. Different business levels in construction industry

Social integration flourished in a practice which is fragmented. The social notion drives on a number of management-oriented studies which have contributed immensely to the management of construction processes. These management tools are devices for promoting collaboration in industry across different construction business levels, i.e. project, trade and task levels. This has not in anyway lead to integration of different levels as separable functions and tasks are performed by different companies under different ownership. A good example is prime contracting. The Defence Estates defines prime contracting based on a prime contractor accepting responsibility for the management and delivery of a project using a system of incentivisation and collaborative working to integrate the activities of the supply chain members to achieve project objectives (Nicolini et al. 2001). According to Ndekugri and Corbett (2004) the prime contracts are divided into a number of clusters (e.g. mechanical and electrical service, frame and external envelope, internal finishes, etc.)

of designers, subcontractors and suppliers, with each cluster being led by a "cluster leader" who is responsible to the prime contractor for delivery of specific element of the project.

Partnering is another arrangement that encourages social integration. Extensive work on partnering and collaborative partnerships' has been carried out by CII 1989; Bennett and Jayes 1995; Bennett and Jayes 1998 (Bresnen and Marshall 2000). Although Bresnen and Marshall (2000) postulate that in the 1990's partnering and related forms of collaborative frameworks were seen as a way of dealing with the fragmentation and the lack of integration. Collaborative partnership or partnering or framework agreement in a form of design and build was advocated as a means of integrating the process through single point of responsibility.

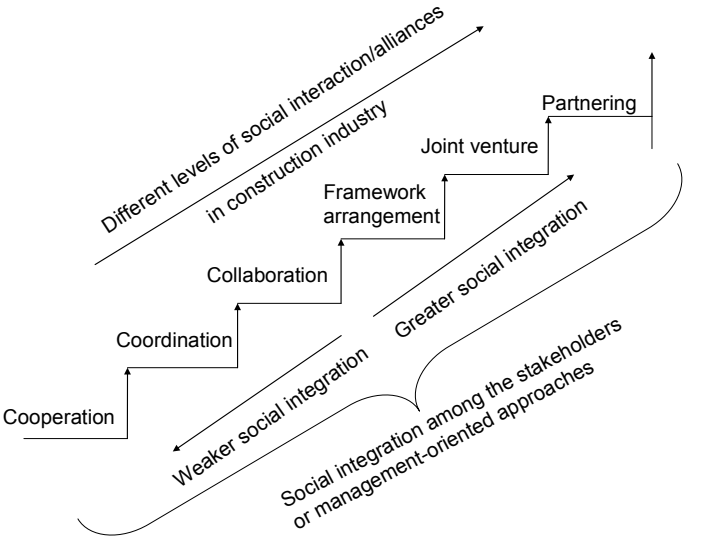

Figure 2. Different levels in social integrative devices

According to the report of the Strategic Forum for Construction (2002) "*integrated team includes the client and those involved in the delivery process who are pivotal in providing solutions that will meet the clients requirements. Thus those involved in asset development, designing, manufacturing, assembling and constructing, proving, operating and maintaining, will have the opportunity to add maximum value by being integrated around common objectives, processes, culture/values, and reward and risk. An integrated team requires team members to harness the potential of their integrated supply chain*". This definition is operationally fragmented and is a collaborative way of working within team building. One can deduce that the aim is to enable social integration among the team which can progressively developed from lower level cooperation through to higher level partnering arrangement in project level as shown in Figure 2.

THE UK CONSTRUCTION INDUSTRY OUTLOOK

The UK economy has witness a steady positive growth since 1992. The economic performance is a mixture of different trends: a current annual growth of about 1.6%, about

2.4% inflation rate, current account deficit of 3.2% of GDP, and low unemployment which is about 1.4 million people when compared to over 3 million people in 1993 (National Statistic Office 2006).

The demand chain of the UK construction sector comprises of private and public clients with huge investment in housing, infrastructure, non-housing, etc. For instance, in 2005 about 9.7 billion pounds was the combined new orders by both private (8.5 billion) and public (1.2 billion) in housing sector (Construction Statistics 2006). According to Construction Statistic (2006) the new order for infrastructure amounted to about 4.8 billion pounds while in non-housing sector (excluding infrastructure) public order amounted to about £4.9 billion, private commercial 9.8 billion, and private industrial 2.8 billion. The public sector is further fragmented along different tier of government, departments, etc.

The supply side of the UK construction industry is fragmented both from consulting and contracting point of view. In consulting practice, different firms across different disciplines are represented by different professional bodies engaged in different tasks and activities. For instance, the survey of UK construction professionals undertaken in 2001/2002 shows that there are 8882 architectural firms, 6,309 civil and structural engineering firms, 1,875 Building Services Engineering firms, 1,871 Quantity Surveyors firms, 1,558 for other Surveyors, 722 for Managers, and 2,293 for others frims (including Planners). Each of these disciplines has a range of specialisations resulting in a further fragmentation of the professional supply chain. In 2001/2002, the industry employed about 225,000 people with estimated income of about 12.3 billion in fee income.

From the contracting spectrum, the industry remains fragmented as the number of Small Scale Firms (SSFs) increased during the year 1999-2005. The Statistical data on the number of private contractors from 1995 to 2005 in Table 1 shows a mixed trend as there were increments in the number of contractors operating in each category. This was due to the overall effect of boom in the UK economic and most especially in construction sector. The number of private contracting firm rose from 165,561 in 1999 to 182,644 in 2005. In 2005 the share of the small scale firms (SSFs) from 1 to 13 employees amounted to 93%, medium scale firms (MSFs) from 14-79 employees 6%, and large scale firms (LSFs) from 80-1200 over 1%. The small scale business or specialist have grown in sizes, for instance, the number of firm from 8-13 employees has almost triple from 4,148 firms in 1999 to 11,599 in 2005. The firms with 14-24 employees grew by 94% and 35-59 has increased by 62% from 1995 to 2005. There was a sharp decline in the number of the firm with 1 and 2-3 employees and with 68% improvement in the firms with 4-7 employees.

The structure of the industry indicates high level of collaboration in the industry among main and subcontractors as the number of firms under main contractor (general builders, building and civil engineering contractors, non-residential building, housing and civil engineering) decline while subcontractors with specialist trades increased in number as shown in Figure 3. The number of main trade decline by 33.15% from 60,858 in 1999 to 45,706 in 2005 while the number of specialist trade surged by 23.54% from 104,703 in 1999 to 136,938 in 2005.

The influence of specialist trades in UK construction industry has been immense as shown in Figure 4. The value of work done by both main and specialist trades increased due to the economic boom. The share of specialist trade rose from 46.26% in 1999 to 50.65% in 2005. The main trade has £811 million average growth between 1999 and 2005 while specialist trade grew by average of 1,068 million between the same years.

Table 1. The structure of the UK industry by number of private contracting firms

Categories	Size of firm (employees)	1999	2000	2001	2002	2003	2004	2005
SSFs	1	88 018	87 712	77 926	71 431	70 370	71 620	73 117
	2-3	49 350	48 773	50 653	50 306	53 022	55 027	57 320
	4-7	16 969	16 584	22 455	23 963	25 704	26 865	28 435
	8-13	4 148	3 790	8 044	9 819	10 508	10 982	11 599
	Sub total	158 485	156 859	159 078	155 519	159 604	164 494	170 471
MSFs	14-24	3 271	3 104	4 920	5 427	5 892	6 161	6 341
	25-34	1 332	1 201	1 782	1 809	1 932	1 985	2 037
	35-59	1 188	1 109	999	1 782	1 821	1 906	1 928
	60-79	397	364	354	457	583	550	573
	Sub total	6 188	5 778	8 055	9 475	10 228	10 602	10 879
LSFs	80-114	304	271	304	425	451	464	469
	115-299	379	341	433	520	535	560	556
	300-599	105	91	129	123	135	148	148
	600-1199	58	51	68	62	75	75	65
	1200 and over	42	35	56	57	64	60	56
	Subtotal	888	789	990	1187	1260	1307	1294
	Total (all firms)	**165 561**	**163 426**	**168 123**	**166 181**	**171 092**	**176 403**	**182 644**

Source: Construction Statistics Annual 2006

Figure 3. Comparison of the value of work done by main and specialist trades in UK (1999-2005)

Figure 4. Comparison of number of main and specialist trades in UK (1999-2005)

Figure 5 graphically compares the percentage number of firms and value of work done across the three categories. The involvement of different types of firms (specialists) is noticeable although to varying degrees. The SSFs n have larger number of firms but lowest value of work done SSFs v from mid 2001. The MSFs n have maintained a stable growth in number as well as in value of work done. LSFs n have lowest number of firm but larger value of work done with substantial growth in 2000.

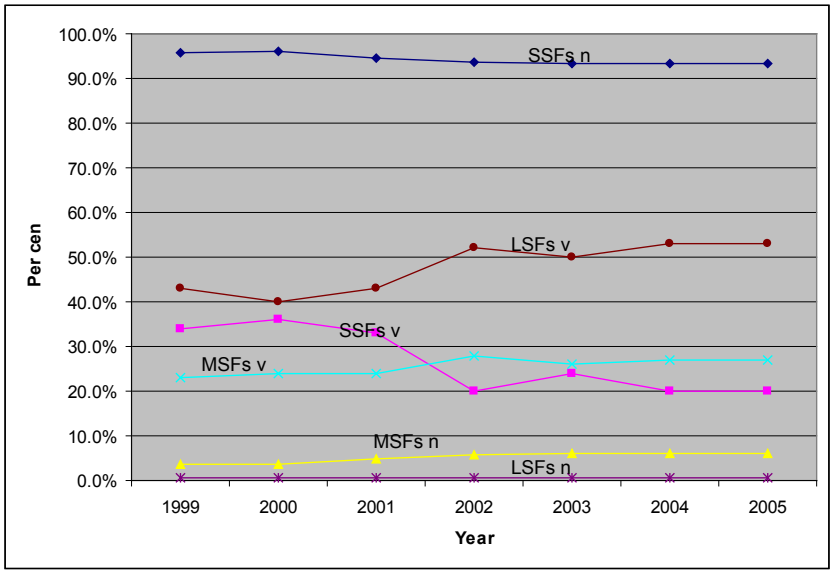

Figure 5. Number firms and their value of work done (in £ Million) along the size of the firm from 1999 to 2005

These specialists engaged in different trades from demolition to plastering, flooring, roofing, painting, glazing, plumbing, heating and ventilating, insulating activities etc. The statistical data reveals that between 1999 and 2005 scaffolding firms grew by 40%, installation of electrical wiring and fitting by 28%, joinery installation by 81%, and roofing firms have grown in number from 5,636 to 7,086 about 26% increment. However, painting firm has reduced in size from 8,921 in 1999 to 7621 in 2005 and the plant hire firms reduced in size by 27%.

The value of work done by each of the specialist has grown considerably from 1999 to 2005 supporting their active involvement and fragmentation of the industry. For instance, Table 2 shows that demolition firms increase from £126.2 to £207.7 million, plant hire decreased by 4% due to lack of personnel and operatives, insulating firm increased by 67%, and installation of electrical wiring and fitting increased by 63%. Other firms that recorded increment in their value of work done between 1999 and 2005: plumbing 361%, plastering 75%, joinery 174%, glazing 136%, painting 1%, and roofing 61%. The statistical data supports the notion of growth, independence and interdependence in the industry with subsequent implication on fragmentation of the industry rather than integration.

Figure 6 presents the percentage share of operatives for the main trades and specialists firms from 1999 to 2005. The number of operatives in main trades fluctuates from 45.88% in 1999, noise dive to 27.52% in 204 to 36.77% in 2005. Conversely, the number operatives in specialist firms' increase from 54.11% in 1999 hit its highest peak in 2004 with 72.48% to 63.23% in 2005.

Table 2. Value of work done by selected specialist trade of firms from 1999 to 2005 in £ Million

By trade of firm	1999	2000	2001	2002	2003	2004	2005	Total Value
Demolition	126,2	88,8	249,2	205,3	226,2	212,8	207,7	1316,2
Roofing	290,9	363	367,1	457,4	466,3	459,7	468,8	2873,2
Installation of electrical wiring and fitting	1 439,20	1 370	1 611,50	1 841,70	2 194,50	2 203,10	2 344,90	13004,9
Insulating activities	101	122,9	126,6	106,6	105	134,8	169,1	866
Plastering	105,7	97,3	106,1	141	161,1	149,3	184,8	945,3
Plumbing	380,5	574,5	1 027,50	1 163,10	1 488	1 493,40	1 756	7883
Joinery installation	336,4	305	627,3	670,4	727,2	697,6	930,3	4294,2
Painting	374,8	400,8	365,4	390,4	382,4	400,5	379,2	2693,5
Glazing	153,7	196,6	173,2	288,9	414,1	362,7	362,1	1951,3
Plant hire	239,5	207,6	193,3	190,6	249,6	259,4	229,2	1569,2

Source: Construction Statistics Annual 2006

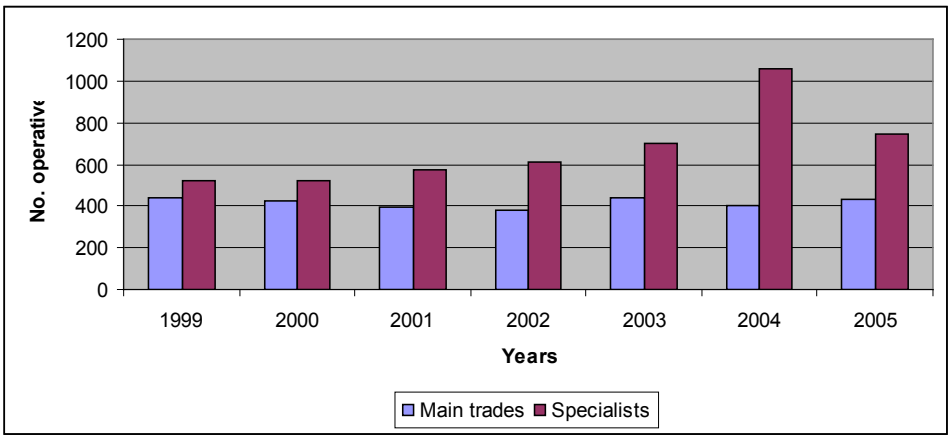

Figure 6. Difference in the number of operatives between main trade and specialists trades

METHODOLOGY FOR THE CASE STUDIES

The UK construction statistical data on the structure of the industry was used above as a general frame of reference. Another feature of economic integration according to Gort (1962) is the presence of major and auxiliary activities within a firm and their ratio of employment. In the above sections, the number, the value of work done and number of operatives along some selected specialist trades is used. In contrast, specialist trade firms carry out only major activities along their specialist trade which denotes lack of integration. Theoretical analysis of procurement routes along point of responsibilities was also presented to support the earlier mentioned argument. Procurement route was chosen because it serves as an organisation setup and defines inter-firm relationships. Three major types of procurement routes design bid build or lump sum (Dorsey 1997), traditional design and build (Akintoye 1994), and management for fee (construction management, Haltenhoff 1999) were used in analysing the points of responsibilities. The analysis utilises the work of Lawrence and Lorsch (1967) on organisation type based on integration and fragmentation within the UK construction industry.

In order to support the above discussion, two case studies from a recently completed research projects are now presented. The research project looked at the changes occurring within the industry, the introduction of innovative ways of procuring the construction works, the potential benefits and bottlenecks experienced during the whole process, and changes within organisational cultures and personal attitudes. Here the focus will be to demonstrate that the upstream supply chain participants within a project are socially integrated and the rest of the downstream supply chain is fragmented.

The case studies attempted to uncover the perceptions of firms within the construction industry with regard to the existing partnering arrangements they currently undertake. The research used multiple methods to collect qualitative and quantitative data. Basic quantitative data and company documentation were used to provide research context while qualitative data, collected in the form of a number of unstructured interviews, sought to understand how innovative procurement was viewed by different supply chain partners.

The case study approach followed the protocol developed by Yin (1994) in order to improve the validity of the research. As a result, the research included a number of key elements such as clear and concise research objectives, research propositions, case study selection criteria, unit of analysis, a structured questionnaire, unstructured questionnaire for interview, a predetermined case study procedure, and an interview guide (Yin, 1994). The study involved multiple visits to each organization involved, including an average of three interviews with the Managing Directors of these companies and other staff and a few other interviews their supply chain members in North West of England. All interviews lasted for at least 1 hour. An assumed name for each company has been adopted for the purpose of confidentiality, when reporting the case studies.

Case Study 1: Fusion 21 Partnership

Fusion 21 was established five years ago with a goal to implement a £225 million housing improvement programme across Merseyside (UK) and generate efficiencies by tackling two common issues; Rising construction contract prices; and Skills shortages within the construction industry. Fusion 21 has a growing number of housing association partners. The success of Fusion 21 has been based on working collaboratively to deliver efficiencies within the construction supply chain, by adopting new approaches to procuring both materials and labour as a strategic procurement partnership as aggregated demand, for a wide variety of work in tenanted properties. On the other hand, Fusion 21 partners, contractors and suppliers show willingness to participate in collaborative activities and share common values and vision. They have aspiration to change with Fusion 21 for being more effective and efficient and therefore, work as an integrated supply chain on the framework agreements.

The case study looked at gas central heating (GCH) installation work stream. It revealed that the direct and continuous employment opportunities offered to the local labour and subcontractors by the main contractors and installers working for Fusion 21 were highly attractive and beneficial. All the parties involved in the supply chain were in win-win situation because of the guaranteed continuous work load from the Fusion 21 for their future activities. Skills development within the local community through Apprenticeship and Training schemes was innovative achievement through the procurement. Contractors working for Fusion 21 have to take on board trainees as part of clauses in their contract and give them both on the job training and flexibility for attending courses at college.

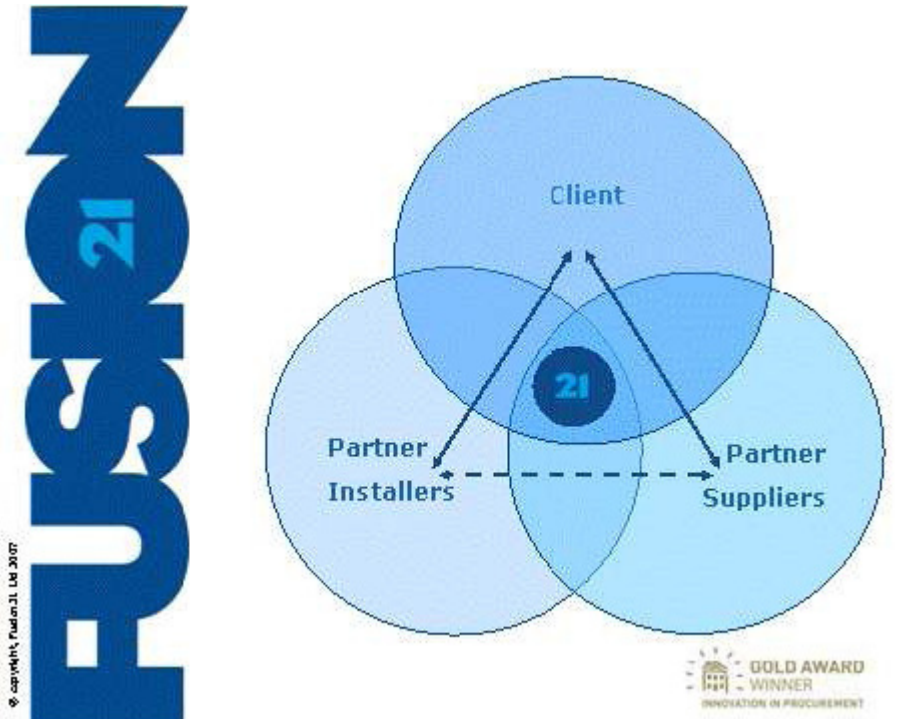

Figure 7. Fusion 21 Procurement Model

Figure 7 shows the Procurement Model adopted by Fusion 21. All four parties, the client organisation, the material supplier (manufacturer), the installer (subcontractor), and Fusion 21 as management consultants (and further their consultants for e-procurement) are socially integrated once work is started on site. But, before the work is awarded, the Fusion 21 team, who is representing the client organisations has a list of pre-qualified list of installers and suppliers for each of their specialised work steam, including GCH, bathrooms, kitchens, doors and windows. The next step within the process is the selection of appropriate supplier and installers' team for a specific site and work stream from the list. Therefore, Fusion 21 moves from fragmentation to socially integrated team for their projects, and yet retains the list of specialist subcontractors and suppliers to take advantage of competition, the salient feature of traditional fragmented procurement process.

Case Study 2: Local Authority Framework Agreement

A Framework was developed by the local authority, i.e. the client to construct educational buildings in the value range £500,000 to £5M. The three Constructor Partners were appointed in December 2003, which would result into knowledge retention and passed on from one project to another over three year period. The developers are referred as Contractor A, B and C in this paper. The authority's vision is that the Framework partnership will deliver good quality school buildings that will lead to: Better educational results; Greater inclusion within the community; Better safety and environmental performance; and Reduced demand on future school budgets by addressing whole life cycle costing at the inception of the projects. This confirms the argument presented earlier that the upstream supply chain participants are socially integrated.

The following sections present the a brief account of fragmentation and integration observed during the case studies with the context of those three main contractors, which were working with the local authority as part of the framework agreement resulting in the move from traditional contracting, one-off project team to an innovative procurement (Khalfan and McDermott, 2006a,b), and knowledge-based long-term integrated supply chain partners. It confirms the second half of the argument that the downstream supply chain is still fragmented and traditional in nature, which only becomes part of the supply chain through competitive one-off tendering.

Contractor A

Contractor A believes in the best value procurement with their suppliers and subcontractors and has around 12 – 13 key strategic goals for supply chain management. For the following trades, Contractor A has developed a long term partnering relationship with one company per trade in the North West (NW) of England in order to provide services to the local authority as part of the framework agreement: brick layers; carpentry; plastering; painting and decoration; and scaffolding. In other words, social integration on a long term basis was observed for all the above trades, where contractor A makes sure that these trades are involved at the initial stage of project development so that the best price could be achieved, and also the issues related to the build-ability are resolved by contributing towards value engineering exercise. For other trades and products, contractor A goes for a list of 3 selected suppliers/subcontractor for each trade/product, practicing the same old notion of most competitive in price.

Contractor B

Contractor B usually goes for few sub-contractors for each trade, based on their resources and based on the contract size, confirming the full fragmentation at the downstream level. For the framework agreement with the local authority, the architectural team, the M & E team, and pre-cast concrete team, all are part of integrated supply chain of contractor B in providing services confirming the socially integrated team on the upstream level. The contractor B would argue that the list of preferred suppliers and subcontractors for each trade is an evolving list and new subcontractors get on the list as well. For the school projects as part of framework, drawings and BOQ were sent to the subcontractors on the list for pricing. Selection was done based on resource capacity; value of work; locality (location of subcontractor); flexible start and finish time; price; quality; etc. with greatest weighing on the price.

Contractor C

The current experience of the contractor on this framework agreement is regarded as a very good learning opportunity by the senior management. The contractor has also worked with the local authority before this framework agreement using JCT 98, where the scenario was that everybody on the project was struggling for the information from each other; problems related to extension of time; and increased cost for client; etc. Now the contractor C has moved on from all the above mentioned problems to long term partnering relationship with the authority. But on the other hand, has exactly the same story as of contractor B for the rest of the downstream supply chain participants.

CONCLUSIONS

It was observed that all three contractors came with their integrated supply chain for the 1st tier including the Design team and M & E Contractors. They all involved with the client to develop the plans for the school development, proving the socially integrated notion as presented earlier. For rest of the supply chain partners in other tiers, all contractors were using a preferred subcontractors and suppliers list, as done in traditional fragmented environment. Selection is then done based on quality-price mechanism. Despite all efforts, *lowest cost* plays primary role in the selection.

On the other hand, the outlook of the construction industry from the statistical data shows that the industry is vital to the UK economy and the gross value added has been on increase. Theoretically, it has been established that the measure of integration in a practice is based on the level of integration within a firm rather than between firms or within an industry. This assertion has been proven by referring to the work of Gort (1962) and Lawrence and Lorsch (1967). However, for a firm to be integrated there must be separable activities (major and auxiliary) under a single ownership. The appropriate procurement method that falls into this category is the design and build (traditional) route which combines both design and construction capabilities under single ownership. There is *no* evidence that the UK practice is moving towards traditional design and build practice (i.e. *no* evidence that the UK practice is moving towards economic notion of integration).

On the contrary, the statistical data signifies that the consulting practice is fragmented and it shows a further trend toward fragmentation via specialisation within the existing disciplines. The statistical data also shows that in contracting spectrum for instance, there has been tremendous growth in specialist trade firms both in number of firms, value of work done, and in number of operatives. At the same time, the number of the main trade firms have declined considerably, and their value of work done have increased due to economic boom but not at the same proportion as the specialist firms. The number of operatives working for the main trade firms have also declined. The implication is that there is a high level of specialisation on major activity, the firms have no auxiliary activity, and under different ownership. This indicates that any device to bring this company together is social rather than economic integration. Another major implication is that there is high level of collaboration between main contracting firms and specialist firms, which can serve as evidence supporting the workability of Egan (1998) recommendation for team building.

The authors have demonstrated that the upstream supply chain participants on a specific project under an innovative procurement route are socially integrated, but downstream participants are still fragmented. The authors point of view is not that the above is wrong but authors emphasis that this the industry structure with project specific context, and it seems working and look healthy as its bringing revenue to service providers (both socially integrated partners and fragmented supply chain specialist organisation) and satisfaction to the clients and end users. Hence, the UK construction industry is fragmented and socially integrated, therefore, the UK construction industry cannot be categorised as fully integrated in nature.

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SUPPLY CHAIN INTEGRATION THROUGH INNOVATIVE PROCUREMENT

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Abstract
Recent innovative procurement initiatives by the public sector construction clients within the UK are challenging the traditional ways of procuring construction projects. The new concepts and practices are intended to empower clients to exercise more control over the supply chain and generate more co-operation among project participants. The initiatives aim to: bring project members closer together; integrate the supply chain; create greater trust; develop relationships on a long term basis; introduce a pain and gain culture; and reuse the knowledge on succeeding projects. This paper, with examples from the UK construction industry, presents the procurement initiatives of public sector clients to integrate the downstream supply chain members through innovative procurement strategies. This paper particularly highlights the benefits of, and the motivation towards innovative procurement resulting into integration of supply chain members through four case studies, conducted as part of a supply chain integration project at the SCRI research centre. The paper defines the construction procurement and recent initiatives through policy documents within the UK. Then the methodology and case studies are presented followed by the findings. The paper concludes that, through clients' innovative initiatives, there is a great potential to integrate supply chain participants at the outset of a project, in order to achieve effective planning and delivery of the whole project, as well as greater collaboration among supply chain members working on the project. The findings also reveal that there is need for more efforts especially from the contracting organisations to integrate their key suppliers and manufacturers, which are still operating through the traditional procurement process.

Keywords: *Procurement Strategies, Supply Chain Integration, Construction Industry, Public Sector Clients.*

INTRODUCTION

The traditional concept of working together with new characterization as an integrated supply chain, is among one of the hot research topics in the recent years within construction management. Researchers have looked at the traditional ways of procurement within construction and identified the problems, and solutions in terms of better ways of working. Similarly, practitioners have informed the researchers their initiatives within the industry to bring improvements within the industry through construction procurement process. Supply chain integration project at SCRI research centre was one of the projects, which combined both the research and the practice within the UK construction industry in order to look at the effects of the newer ways of procuring construction projects, especially by the public sector clients. The paper will present a brief literature review on construction procurement and how it is used to integrate the supply chain within construction industry, through four case studies, as part of the above mentioned research project. Each case study will provide details with the background of the procurement route selected along with the findings from the studies. Conclusions will be drawn towards the end, which would highlight the positive outcomes of the adoption of the innovative procurement methods within the UK construction industry.

CONSTRUCTION PROCUREMENT

Construction procurement has been defined as a "*framework within which construction is brought about, acquired or obtained*" (McDermott, 1999) and is considered as the key to improving construction performance (Ofori, 2006). It determines the overall framework and structure of responsibilities and authorities for guiding the participants within the construction process (Love et. al., 1998). Many researchers have argued that procurement method is largely irrelevant in itself and that the real issue is how the adopted procurement form enhances or inhibits team members in achieving project goals (Walker, 1998; Love et. al., 1998). The interaction and participation in the various phases of a project delivery process by the client, design and construction teams, working together as a cohesive group, have been shown to have direct impact on the quality of their relationships and subsequent project outcomes (Smith and Wilkins, 1996; Soetanto and Proverbs, 2004). Whilst it can be argued that traditional procurement approaches inhibit positive interactions (Latham, 1994; Egan, 1998), there are many other social, political, technological or environmental factors that impact upon the performance of non-traditional procurement choices (Goodier et. al., 2006). Nonetheless, Walker and Hampson (2003) argued that 'partnering can facilitate the required positive interactions and provided sufficient evidence of its applicability' in various procurement paths, except in the traditional route because of its adversarial environment exacerbated by its fragmented nature that restricts the integration of the design and construction teams. Bennett and Jayes (1995) defined 'partnering' as a "management approach used by two or more organisations to achieve specific business objectives by maximising the effectiveness of both parties. The approach is based upon mutual objectives, an agreed method of problem resolution, and active search for continuous measurable improvements". However, a trend towards a more holistic, integrated and relationship-based systems view of procurement has now become apparent (Gyles et. al., 1992; Latham, 1994; Egan, 1998; McDermott, 1999; Grove, 2000; Tang, 2001; Walker and Hampson, 2003; Khalfan et. al., 2006). Importantly, the trend is away from standard forms of contractual arrangements towards bespoke approaches aligned with the objectives of all the project participants.

UK GOVERNMENT POLICIES

According to Department of Environment, Food and Rural Affairs (DEFRA) (2007), the UK Government and wider public sector spends £150 billion annually on procuring a wide range of goods and services, from every day items such as pens and paper, to major construction such as schools and hospitals. The procurement of goods and services by public authorities in the UK is governed by European Union Directives, designed to promote and encourage transparent and fair competition between contractors in EU member states through OJEU notices. Changes to these Directives have been implemented in UK law from 31 January 2006. Prominent among the changes is the new procurement procedure of Competitive Dialogue for complex projects (Ibrahim et. al., 2006a,b).

A variety of methods have been used by UK public clients for procuring and funding construction. Successive independent reviews of UK construction performance have been carried out over the years and have identified the need to tackle the adversarial and inefficient

working practices that have characterised the UK construction industry. The reviews have also emphasised the need for further action to promote integration and environment for sustainable innovation in order to improve construction performance and wider value for money benefits through continuous improvement of processes, products and services. Dickinson and McDermott (2006) examined the key conceptual and methodological designs issues that are central to studying the implementation of policy innovations in public construction procurement. They argued that emphasis should be given to both the process of innovation and the contextual factors that influence implementation. Some of the key reports whose conclusions and recommendations have resonances for construction procurement have been summarised in Table 1.

Table 1: Key reports on the UK construction industry between 1994 and 2007 (taken from Ibrahim et al., 2006a,b).

Author	**Title and year report published/initiative launched**	**Key messages**
Sir Michael Latham	Constructing the Team: Final Report of the Government/ Industry Review of Procurement and Contractual Arrangements in the UK Construction Industry, 1994	This comprehensive review of the UK construction industry proposed a clear action plan for improvement, asserting that implementation must begin with the client and made ten recommendations, in particular: partnering as a way forward to improve efficiency and profitability in this sector; and that the Government commit itself to becoming a good practice client.
Peter Levene	The Levene Efficiency Scrutiny into Construction Procurement by Government, 1995	This report concluded that Government bodies were partly to blame for the poor performance of the industry and made recommendations to improve the structure and management of construction projects, including more realistic budgets and timetables, better communication with the construction industry to reduce conflict, adoption of a more commercial approach, negotiation of deals justified on value for money grounds and the skill level of Government clients.
Sir John Egan	Rethinking Construction: Report of Construction Task Force, 1998	This report on the scope for improving the quality and efficiency of delivery of UK construction recommended substantial changes in the construction industry's culture and structure, replacement of competitive tendering with long-term relationships based on clear performance measurements and sustained quality and efficiency improvements, and established quantified targets for improvements in construction costs, delivery times and defects.
Her Majesty Treasury	'Achieving Excellence in Construction' initiative, 1999	This initiative was launched in response to Egan report, and set out an action plan and targets for implementation and achievement of the Egan recommendations across Government through the basic principle of collaborative relationships with suppliers so that all parties work in an open and mutually productive environment whilst ensuring full involvement of an integrated supply chain in attaining maximum value for money and continuous improvement of construction products and services performed therein.

Office of Government Commerce	Modern Government, Modern Procurement, 1999	This report sets out the key recommendations of the Gershon Review of Civil Government Procurement and the Second Bates Review of the PFI and PPPs, and the Government's plans for their implementation; rehearsing the need for the achievement of value for money and continuous improvement of products and services procured by the public sector.
National Audit Office	Modernising Construction, 2001	This report, together with the report of the Committee of Public Accounts HC 337 '*Improving Construction Performance*', identified the need for further action to improve central government departments' construction performance and the scope for significant financial savings and wider value for money benefits, and made a series of recommendations to achieve: better coordination of industry improvement initiatives by sponsoring departments, better dissemination of good practice by OGC, better performance measurement by line departments and greater use of innovation by the whole supply chain in improving the quality and cost-effectiveness of public sector buildings.
Strategic Forum for Construction – Egan Report 2002	Accelerating Change, 2002	This report reviewed the progress against the Egan recommendations and targets for the industry and assigned clear responsibility for their delivery, predominantly to Constructing Excellence – a DTI and industry sponsored body. The report highlighted the need for radical improvements in construction sustainability and the responsibility of the entire industry for delivering this.
Office of Government Commerce	'Building on Success' conference and the launch of the Achieving Excellence strategic targets, 2003	This conference reviewed progress made against the original three year Achieving Excellence action plan and announced a future strategy designed to improve the cost and time predictability and quality of construction projects and reduce average timescales for procurement.
National Audit Office	Improving public services through better construction, 2005	This report assessed the progress that departments and their agencies had made in improving their construction delivery performance since the *Modernising Construction* report, in part by examining data on 142 construction projects delivered between April 2003 and December 2004, as well as the impact of relevant OGC initiatives. The report highlighted good construction practices drawn from across public and private clients and projects which other organisations can learn from.
Strategic Forum for Construction	2012 Construction Commitments, 2006	This report, developed by industry with the strong support of Government, is aimed at maximising the opportunity to showcase the very best of UK construction practices, using the 2012 Olympics as a live example. The report covers six key areas of the construction process and is designed to promote collaborative working and best practice, ensuring the successful delivery of the Games infrastructure, buildings and subsequent legacy. The report does not involve any new initiatives but strives to make the most of existing initiatives, tools and talents in the industry.

Department of Environment, Food and Rural Affairs	UK Government Sustainable Procurement Action Plan - Incorporating the Government response to the report of the Sustainable Procurement Task Force, 2007	This report, together with the HM Treasury's report '*Transforming Government Procurement*' is the UK Government's response to the report of the Sustainable Procurement Taskforce, *Procuring the Future*', and highlights the action that need to be taken through policies, performance frameworks and procurement practice, working with the supply-chain to provide the innovative eco-technologies and solutions that will be needed to satisfy the sustainable development targets set out in '*Securing the Future'*. The report also highlights the need for Government departments to focus on increasing the level of procurement professionalism, raising the status and standard of procurement practice and ensuring rapid progress towards achieving targets for Sustainable Operations on the Government Estate.

BACKGROUND TO THE RESEARCH PROJECT

In order to study the changes occurring within the industry, the introduction of innovative ways of procuring the construction works, the motivation to adopt these new procurement models, the potential benefits and bottlenecks experienced during the whole process, and changes within organisational cultures and personal attitudes, the SCRI Research Centre carried out a research project the Supply Chain Integration Project.

The project was to investigate the changes that are occurring in the supply of consultancy and contracting services in response to innovative client procurement initiatives. The public sector clients are now being driven towards partnering and the wider Egan Agenda (1998, 2002) through the policies set out by the central government. The main aim of this research proposal was to determine if there were ways of integrating the supply chain that would ensure service and product quality whilst still supporting the government and client initiatives, aimed at increasing the competitiveness of the construction sector.

CASE STUDIES

The case studies attempted to uncover the perceptions of firms within the construction industry with regard to the existing partnering arrangements they currently undertake. The research used multiple methods to collect qualitative and quantitative data. Basic quantitative data and company documentation were used to provide research context while qualitative data, collected in the form of a number of unstructured interviews, sought to understand how innovative procurement was viewed by different supply chain partners. The case study approach followed the protocol developed by Yin (1994) in order to improve the validity of the research. As a result, the research included a number of key elements such as clear and concise research objectives, research propositions, case study selection criteria, unit of analysis, a structured questionnaire, unstructured questionnaire for interview, a predetermined case study procedure, and an interview guide (Yin, 1994). The study involved multiple visits to each organization involved, including an average of three interviews with the Managing Directors of these companies and other staff and a few other interviews their supply chain members in North West of England. All interviews lasted for at least 1 hour. An assumed name for each company has been adopted for the purpose of confidentiality, when reporting the case studies.

All four case studies from the project are reported here. All case studies explore the initiatives taken by public sector clients to integrate their supply chain participants in order to adopt innovative ways of working within a project team. They also examine other supply chain organizations including contractors and sub-contractors, which under a proactive leadership from client organizations, had fully subscribed to the innovative procurement methods resulting into supply chain integration.

The senior management of each of the above-mentioned organisations was interviewed. Soft System Methodology (SSM), along with case study research method, is being used to analyse the interviews, used for organisational analysis. For the social and organisational aspects, the research draws on contextually rich modelling techniques of SSM (Checkland, 1981) with its emphasis on a stream of cultural analysis within construction organisations, and the industry overall. The SSM is selected because the research is dealing with the softer social issues and phenomena such as changes in the behaviour of people and companies in response to the changed in procurement routes. The whole idea to adopt soft system methodology to carry out this qualitative research revolves around the advantages of using SSM. Once the interviews were carried out, the rich pictures were developed and these pictures helped us to identify the issues and areas which have been affected by the change in procurement strategies. The root definitions and CATWOEs were then developed from the rich pictures which helped us to understand the transformation of past situations and circumstances to the present scenarios. Some of the results are reported in this paper as observations of changes due to the innovative procurement, and motivational issues affecting the adoption of innovative ways of working.

Case Study 1: Housing Market Renewal Pathfinder Project

As a means of resolving the imbalance within the housing market, the UK government has made a major policy decision to support the housing sector. This mode of intervention extends beyond the provisions of section of the Town and Country Planning Act 1990 and include a range of activities concerning the development of sustainable communities. These were led by the Office of the Deputy Prime Minster, now superseded by its replacement, the Department for Communities and Local Government. The decent homes concept has been a prime driver for the public sector housing market that followed as fresh initiative. To achieve the investment in housing, the local authorities have been allowed to used a range of actions to generate the financial capital necessary, including the transfer of stock to a nonprofit housing association (RSL), who can borrow money from the banks; by creating an Arm's Length Management Organisation (ALMO); a company owned by a council or by entering into a Private Finance Initiative (PFI); a partnership between the private and public sector, with funding provided by the government. A further means of improving local housing stock has been via the activities of the housing market renewal pathfinders (ODPM, 2005). Low housing demand and abandonment have affected many towns and cities in the North and Midlands. Economically this situation makes house removal extremely difficult to achieve. The dichotomy is such that although these areas are often situated close to or even within cities, where the economy is growing, these neighbourhoods remain disconnected from the new jobs, with residents experiencing low skills levels, worklessness, high levels of crime or fear of crime, and poor facilities. The

programme which includes nine pathfinder projects has been established to renew failing housing markets with funding provided via partnerships of two or more local authorities, who work together with local partners. The case study was carried out with one of the above mentioned pathfinder scheme, based in the North West of England with partnership of five local authorities.

The pathfinders are charged to develop strategic approaches to dealing with the problems that exist within their areas. The pathfinders draw on a wide range of funding streams from local authorities, the Housing Corporation and other public bodies, as well as maximising investment from the private sector.

The main challenge, which was observed during the case study, was to introduce community benefit/regeneration agenda within the contract with main contractors. The suggestion was to measure the above through key performance indicators (KPI), developed within the context of the pathfinder, and developing a framework of incentivisation and penalising based on the results from the KPIs. The other option was to use clauses within the contact to achieve the above. A tailor-made KPI system was introduced and communicated to all the supply chain participants. The supply chain participants were selected to part of a framework agreement based on two stage procurement method with emphasis on both the quality and the cost. But in order to show the progress to ODPM towards the end of last year, the first phase of work consisting of face lifting programme was contracted out in traditional way, which shows that the understanding related to the concepts framework agreement was still new for the participating clients (five local authorities) and the plans for implementing the framework agreement were being developed with consultation of experts.

The procurement process also got a draw back because of the changing brief from the clients (five local authorities). Since each authority wanted to achieve hard targets and quantities to justify the funding from ODPM, therefore soft issues during procurement stage were not given priority. There was also a gap between client's requirements and locally available services of both supplies and labour. Therefore, the need to build the capacity within the region was realised the main hindrance to promote sustainable procurement, which emphasises on hiring local companies and local labour. Despite outsourcing the work to the companies outside the region, savings have been identified through adopted procurement method, including the aggregation of demand approach.

Another Challenge now for the participating authorise were that some of the developers, who used to work for the authorities for many years previously were not selected as party to the new framework agreement for the upcoming work. The reason behind the above was that they did not fulfil the procurement criteria set by the pathfinder which was based on the quality-price mechanism. These contractors were now arguing that despite being local they were not able to become part of the supply chain since the ground rule was changed. On the other hand, there was also a resistance to change within all the parties to work in an improved manner including: the local construction companies, local community and all the local authorities. This has resulted into an obstacle to make people buy in to the procurement process and framework agreement concept, resulting into an emerging need to plan strategically in order to communicate and underpin the concepts so that these become part of the construction culture within the region as well as improve the trust between the project supply chain participants (Khalfan et. al., 2007).

Case Study 2: Fusion 21 Partnership

Fusion 21 was established five years ago with a goal to implement a £225 million housing improvement programme across Merseyside (UK) and generate efficiencies by tackling two common issues; Rising construction contract prices; and Skills shortages within the construction industry. Fusion21 has a growing number of housing association partners. Fusion 21 members are committed to working together to generate sustainability within the housing and construction sectors by:

1. Maximising efficiency by developing strategic procurement partnerships;
2. Supporting industry and local communities by providing training and employment opportunities for local people; and
3. Developing increased environmental awareness and performance systems.

The success of Fusion 21 has been based on working collaboratively to deliver efficiencies within the construction supply chain, by adopting new approaches to procuring both materials and labour as a strategic procurement partnership as aggregated demand, for a wide variety of work in tenanted properties. On the other hand, Fusion 21 partners, contractors and suppliers show willingness to participate in collaborative activities and share common values and vision. They have aspiration to change with Fusion 21 for being more effective and efficient and therefore, work as an integrated supply chain on the framework agreements. The most important characteristic of the partnership is the trusting relationship among the involved parties.

Fusion 21 also recognises the link between labour shortages and procurement costs. Fusion 21 Skills provide sustainable construction training and employment for hundreds of unemployed. In the last five years Fusion 21 has delivered some outstanding results; Skills Training and Job Creation resulted into 404 into permanent jobs and 531 local people into training; and Delivering Cashable Efficiency Gains e.g.; and Increased resident satisfaction: Customer satisfaction @ 95%. Due to all the efforts mentioned above, the Fusion 21 was also the inaugural winner of the Housing Corporations 'Gold Award' in 2006 for 'Innovation in Procurement'.

Over the last five years the members of Fusion21 have been working to develop a supply chain model within which efficiencies and competencies can be shared (see Figure 1). With a combined maintenance programme worth at least £305m over four years, Fusion's partners have combined their procurement activities to directly benefit the communities they serve. The Fusion 21 model operates as follows:

The Fusion 21 model uses e-procurement systems to minimise administrative costs, optimise efficiency by forecasting, managing and evaluating contracts and allows clients to specify, agree and pay for materials directly. This makes the whole procurement process far more transparent and guarantees the best product, supplier and price for every job. Key benefits of this model:

1. Allows standardised high quality material to be procured and directly paid for by the landlords;
2. Minimises administration costs and allows visibility to all involved parties within the supply chain; and
3. Order to invoicing system, creating an efficient and measurable system for raising and paying invoices against agreed payment terms.

Fusion 21 enters into Framework Agreements to provide a single point, one stop procurement solution across the UK, to carry out planned repairs and maintenance on social housing, sheltered accommodation, and other properties as owned or managed by current (and future) Fusion 21 Partner Organisations. Fusion 21 members currently collectively manage over 135,000 properties throughout the UK. The number of organisations working closely with Fusion 21 (and their associated stock) is expected to increase significantly over the next 4 years.

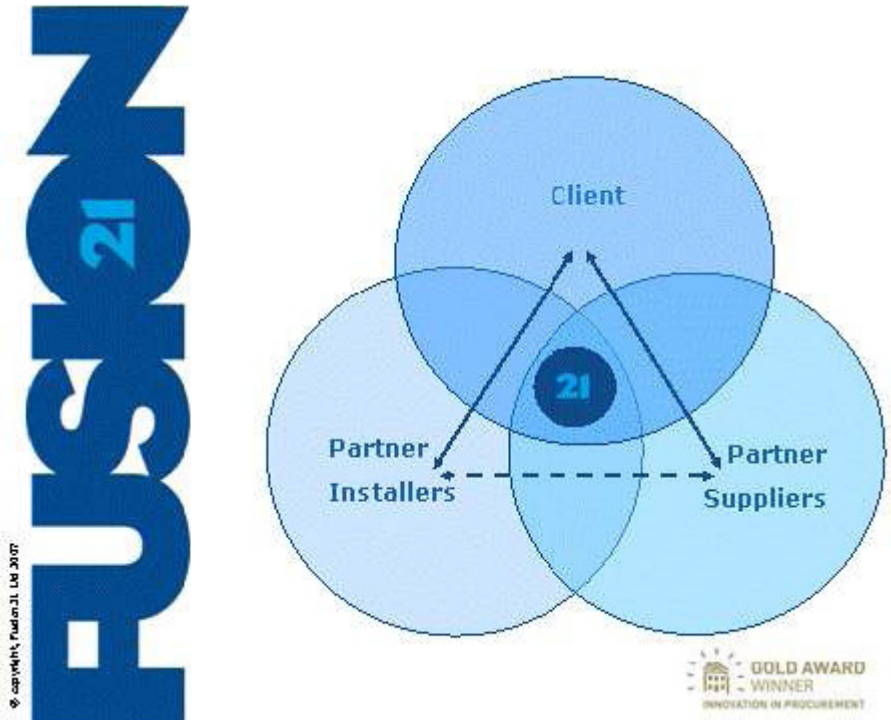

Figure 1. Fusion 21 Procurement Model

The case study looked at gas central heating (GCH) installation work stream. It revealed that the direct and continuous employment opportunities offered to the local labour and subcontractors by the main contractors and installers working for Fusion 21 were highly attractive and beneficial. All the parties involved in the supply chain were in win-win situation because of the guaranteed continuous work load from the Fusion 21 for their future activities. Skills development within the local community through Apprenticeship and Training schemes was innovative achievement through the procurement. Contractors working for Fusion 21 have to take on board trainees as part of clauses in their contract and give them both on the job training and flexibility for attending courses at college.

Fusion 21 saw an increase in tenant satisfaction through their survey, based on the feedback on the services provided. At the same time, the supply chain partners' satisfaction was significantly improved. This was due to the fact that the procurement for labour and products was done independently, and therefore it was a less headache for contractors, also less paperwork, no responsibilities for faulty product. On the other hand, wages for employees and subcontractors were above average. The contractors, installers and suppliers usually get three weeks lead time in all cases and are very loyal to the involved partners. For the suppliers, fewer margins on their products but the commitment of buying the product continuously over next few years was an innovative way of paying off. The relationship of suppliers and contractors was also observed changing on Fusion 21 projects because there was no money involved between them.

The concepts such as Work force smoothing (including hiring direct work force) within involved organisations as part of their supply chain, and aggregation of demands of involved local authorities and registered social landlords (RSLs), where they all are working together in one area, and have no conflicts or problems getting labour and products, went highly successful with Fusion 21 framework agreement. One thing which has always been a bone of contingence between clients and contractors is the payment, and Fusion 21 recognising the fact and committing to pay within three weeks was remarkable effort to raise motivation of the supply chain participants.

Case Study 3: Local Authority Framework Agreement

The EU Utilities Directive defined a framework agreement as "an agreement with suppliers, the purpose of which is to establish the terms governing contracts to be awarded during a given period, in particular with regard to price and quantity. In other words, a framework agreement is a general term for agreements with suppliers which set out terms and conditions under which specific purchases (call-offs) can be made throughout the term of the agreement. The framework agreement may, itself, be a contract to which the EC procurement rules apply. This would be the case where the agreement places an obligation, in writing, to purchase goods, works or services for pecuniary interest (more commonly referred to as 'consideration' in the UK). For this type of agreement, there is no particular problem under the EC rules, as it can be treated in the same way as any other contract" (OGC, 2006a).

The Framework was developed by the local authority, i.e. the client to construct educational buildings in the value range £500,000 to £5M. The three Constructor Partners were appointed in December 2003, which would result into knowledge retention and passed on from one project to another over three year period. The developers are referred as Contractor A, B and C in this paper. Since their appointment a number of Educational Projects have either been started or are in the early stages of design. The authority's vision is that the Framework partnership will deliver good quality school buildings that will lead to: Better educational results; Greater inclusion within the community; Better safety and environmental performance; and Reduced demand on future school budgets by addressing whole life cycle costing at the inception of the projects.

The Framework Management Group (FMG) is the overarching management group to steer the project towards its' high level and corporate objectives. It is a representative group that addresses high level issues for the Framework. The core FMG values are: Trust; Honesty; Openness; Commitment; Co-operation; and Respect. There are also different Special Interest Groups (SIG's) within the framework. They are designed to address issues that are impacting framework and project delivery across a global basis, i.e. impacting all or many projects within the framework. The special interest groups cover the following areas: IT; Contracts and admin; Design; Procurement and materials; and Operations.

The following sections present the a brief background about three main contractors, which were working with the local authority as part of the framework agreement resulting in the move from traditional contracting, one-off project team to an innovative procurement (Khalfan and McDermott, 2006a,b), and knowledge-based long-term integrated supply chain partners.

Contractor A

Contractor A believes in the best value procurement with their suppliers and subcontractors and has around 12 – 13 key strategic goals for supply chain management. For the following activity streams, Contractor A has developed a long term partnering relationship with one company in the North West (NW) of England in order to provide services to the local authority as part of the framework agreement: brick layers; carpentry; plastering; painting and decoration; and scaffolding. For all the above trades, contractor A makes sure that they are involved at the initial stage of project development so that the best price could be achieved, and also the issues related to the build-ability are resolved by contributing towards value engineering exercise. For other trades and products, contractor A goes for a list of 3 selected suppliers/subcontractor for each trade/product. But in NW region, this list of three is now reduced to one for suspended ceiling and ceramic tiles as well.

Contractor B

Contractor B usually goes for few sub-contractors for each trade, based on their resources and based on the contract size. For the framework agreement with the local authority, the architectural team, the M & E team, and pre-cast concrete team, all are part of integrated supply chain of contractor B in providing services. There are three preferred subcontractors for the ground works and are used for the framework agreement. The list of preferred suppliers and subcontractors for each trade is an evolving list and new subcontractors get on the list as well. For the school projects as part of framework, drawings and BOQ were sent to the subcontractors for pricing. Selection was done based on resource capacity; value of work; locality (location of subcontractor); flexible start and finish time; price; quality; etc. Selected sub-contractors then had a pre-order interview, which was basically the invitation to discuss the project. Feedback is also given, most of the time verbal, to the unsuccessful subcontractors if they approach the contractor.

Contractor C

The total turnover of contractor C is around £ 350 m and has an aspiration of around £ 100 m from their activities in the NW. Around 3 – 4 years ago, the contractor decided to go for 100 % Partnering throughout their business activities. Before that, most jobs were based on traditional contracting rather than partnering. Now around 90% of the work is done either by partnering arrangements or by negotiations from the companies, which have worked with the contractor C for a long time. The current experience of the contractor on this framework agreement is regarded as a very good learning opportunity by the senior management. The contractor has also worked with the local authority before this framework agreement using JCT 98, where the scenario was that everybody on the project was struggling for the information from each other; problems related to extension of time; and increased cost for client; etc. Now the contractor C has moved on from all the above mentioned problems to long term partnering relationship with the authority.

It was observed that all three contractors came with their integrated supply chain for the 1st tier including the Design team and M & E Contractors. They all involved with the client to develop the plans for the school development. For rest of the supply chain partners in other tiers, all contractors were using a preferred subcontractors and suppliers list. Selection is then done based on quality-price mechanism. Despite all efforts, *lowest cost* plays primary role in the selection. The reason being, regardless of partnering, main contractors have to show the most economical solution to their clients. But once subcontractors and suppliers were selected and work was started on a site, all participating organisations work as one team to deliver value to the client.

The client has confirmed in cost savings (tendering cost) for both main contractor and subcontractor, who are part of a framework. At the same time, performance was improved, which was measured through KPIs both during and end of the project. These improvements were due to all parties devoting time upfront to resolve design and buildability issues, resulting in saving time on subsequent projects.

Client driven above initiative, which has brought all the parties involved including three main contractors, has resulted into sharing of knowledge and experiences on different platforms including FMG and SIGs meetings. Real Knowledge Sharing through FMG meetings where all three contractors sit down together for selecting the standardised material e.g. windows, doors, etc. At the same time, client was also involved with their requirements and contractors trying to select the suppliers both from their existing supply chain and from outside as well to fulfil the requirements.

Working in framework has resulted into good relationship building between the client, main contractor, and other supply chain participants. Learning from one project within the framework is also taken back to the new projects through capturing the experiences and feedback of the people involved.

Case study 4: NHS ProCure21

The NHS ProCure21 scheme was launched nationally in October 2003 following the appointment of 12 Principal Supply Chain Partners (PSCPs), each in a five year framework agreement with the Secretary of State for Health for projects of estimated capital costs of up to around £1.4 billion per annum. According to Contract Journal (2007), the programme is being used by 133 Trusts, and 38% of these have more than one scheme in the programme. Of those Trusts progressing to more than one scheme, 83% continued to use the same PSCP – showing an impressive rate of return. As at March 2007, 278 active schemes (at all stages) had been registered with a total value of just under £2 billion, 121 projects each with capital cost of over £1 million and 33 projects each with capital cost of under £1 million had been completed, with 54 projects currently on-site (NHS Estates, 2007). While the original five year frameworks are due to end by September 2008, the DoH recently announced their extension by two years till September 2010.

NHS ProCure21 was developed as a direct response to a number of challenges that were facing the UK construction industry but principally the government report, *Achieving Excellence* (OGC, 2006b). The scheme was developed by NHS Estates following comprehensive consultation from within the NHS and with experts from the private sector, industry and academia to improve the performance of public sector clients in capital procurement. This procurement method is recommended by HM Treasury and is compliant with OGC Common Minimum Standards. The scheme is targeted at cutting out waste and duplication of effort in the tendering process, but also to bring the best of the construction industry together to deliver better value for money and better clinical facilities for patients (NHS Estates, 2007).

It was intended that ProCure21 would negate the need for traditional adversarial procurement and tendering by using pre-agreed supply chains and long-term framework agreements managed by the PSCPs. Under NHS ProCure21, it was recommended that the PSCPs are involved in the project from the outset to contribute to the planning and design phases, encouraging long term, collaborative working to achieve quality. The PSCPs are very different to traditional contracting organisations as their supply chains are more structured, pooling together the wealth of expertise from construction professionals through to other specialist members of the supply chain. This provides NHS Clients with the unique opportunity of engaging the PSCP to undertake a wide variety of duties from service strategies, estates strategies, business planning, developing the brief and design development through to major and minor construction works. ProCure21 is based upon a long-term framework agreement (five years with provisions for extension) between the Department of Health and a number of framework partners and is operational only in England. NHS clients may select any one of the PSCPs based on their proven performance and track record.

Case study was conducted with one of the Trust, building an extension for one of their hospitals. It was observed that ProCure21 partnering ethos and principles were very evident prior to commencement of construction work on site. As soon as construction is started on site, same old issues were reported. Researchers were challenged if a subcontractor who worked on our ProCure21 scheme would work differently than he does within traditional procurement methods.

It was also reported that despite the careful procurement, ProCure 21 is just giving us satisfactory outcome, and it would have been very nice to have a fabulous outcome of such scheme. One of the reasons highlighted during the case study for the above problem was because the knowledge / experience / expertise related to 'how to procure work using ProCure21' is not managed efficiently by NHS Trust, therefore, there was a limited access of information for individual Trusts to leverage upon during the whole procurement process.

Some of the PSCPs were very successful; one contracting organisation recruited new staff to match skill sets required for ProCure21, and did hard work in order to engage themselves with the market and NHS. But other organisations only went for the work for which they thought they had some expertise within the group. Those organisations thought that they can deliver the requirements using existing skills within the group without assessing the readiness of their organisation to bid for the work under ProCure21 scheme.

One of the biggest challenges is the need to improve the design of the facility (e.g. hospital) on regular basis as part of continuous modernisation in design because the technology is changing rapidly. And above all, the greatest challenge for NHS is to bring changes and improvements within the ProCure21 framework in order to come up with the solutions for the highlighted issues and problems.

CONCLUSIONS

'People in the industry, used to be opportunistic! Used to take advantage of each other's situations in the past. Councils used to put pressures on subcontractors to reduce prices if they saw that we need work desperately, and during booming period, subcontractors used to ask for high sums. But now, things are changed. They focus now more on performance and quality of workmanship and products and not on price/cost…'

A quote by a Construction Subcontractor, part of a supply chain within one of the case studies.

The findings from the research project show that there are savings in time and cost in the whole process to the integrated supply chain partners working under innovative procurement, as well as changes in the behaviours as highlighted in the above quote. To maintain the momentum of these gains there must be a continuation of the positive attitude amongst the supply chain partners in sharing their knowledge and experiences on future projects, resulting in development of a knowledge-based supply chains. By this approach further benefits will be passed onto the client and end users.

Additionally, there needs to be better continuity of workload in each of the procurement strategy. The Constructor Partners within each case study have unanimously stated that there initial submissions to be part of the supply chain were based on a certain level of turn-over. At this point, however, it is fair to say that there is a positive approach by all partners to take their respective Framework agreements forward to achieve the set targets.

The CATWOE in Figure 2 shows the transition from traditional contractual arrangements to partnering arrangements among the supply chain participants. The major actors for this activity are clients, main contractors, and consultants. Main contractors then have similar arrangements with their sub-contractors, material suppliers and manufacturers.

The researchers observed that working in partnering arrangements for a longer period will not only improve the relationship among the partners but also improve the overall construction process. The partnering arrangement requires trust, and transparency of the processes among the participating organisations and their staff. The assumption was put on test during the above mentioned case studies and the responses matched the assumption in terms of the benefits stemmed out of the partnering arrangements within the newer forms of procurement and being part of integrated supply chains.

A partnering arrangement to enable supply chain participants to work closely with each other over a longer period in order to improve the overall construction process and delivery mechanism.

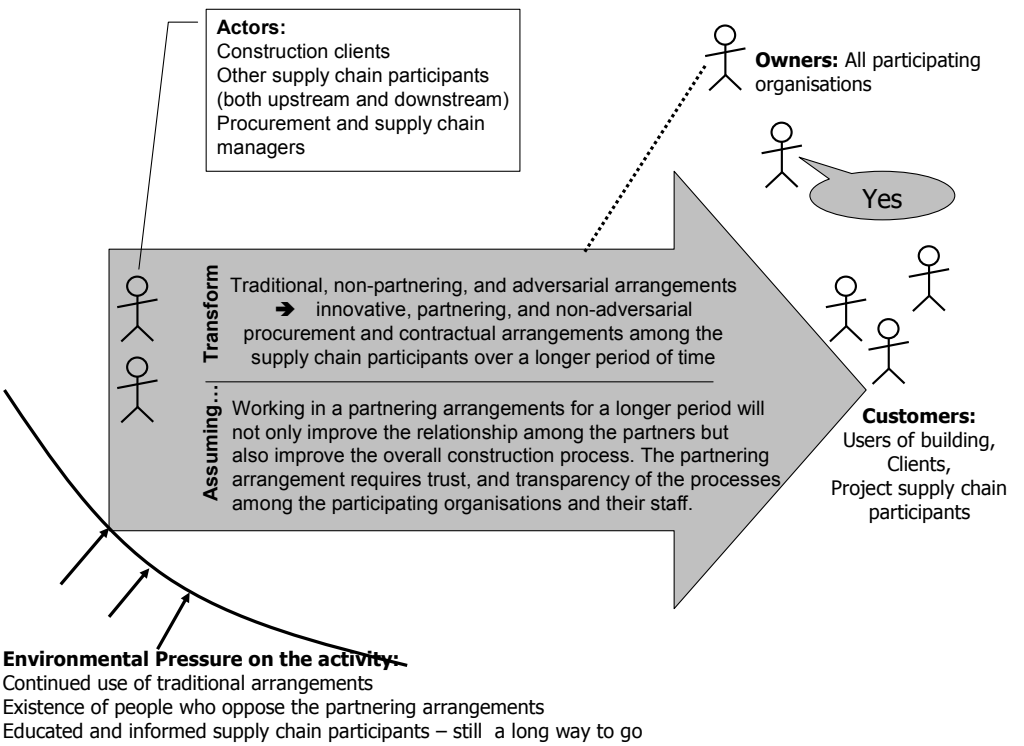

Figure 2. Transition from non-partnering to partnering arrangements

In Figure 3, the move by clients, especially public sector clients as observed during the case studies, from accepting the lowest bids to awarding contracts which shows best value. This is termed as price-quality mechanism, where tenders are judged based more on the quality than price. This has enabled the clients to look at previous or ongoing works

of the contractors to verify the quality, on top of the references. This is one of the major findings from the project, which shows that more and more clients, and contractors for their supply chain, use pre-qualification questionnaire (PQQ), which includes questions related to quality, health and safety, turnover, references, etc.

A selection process for supply chain participants to enable the best value for client rather than lowest price in order to bring more value for money and better quality facilities for the client and end users.

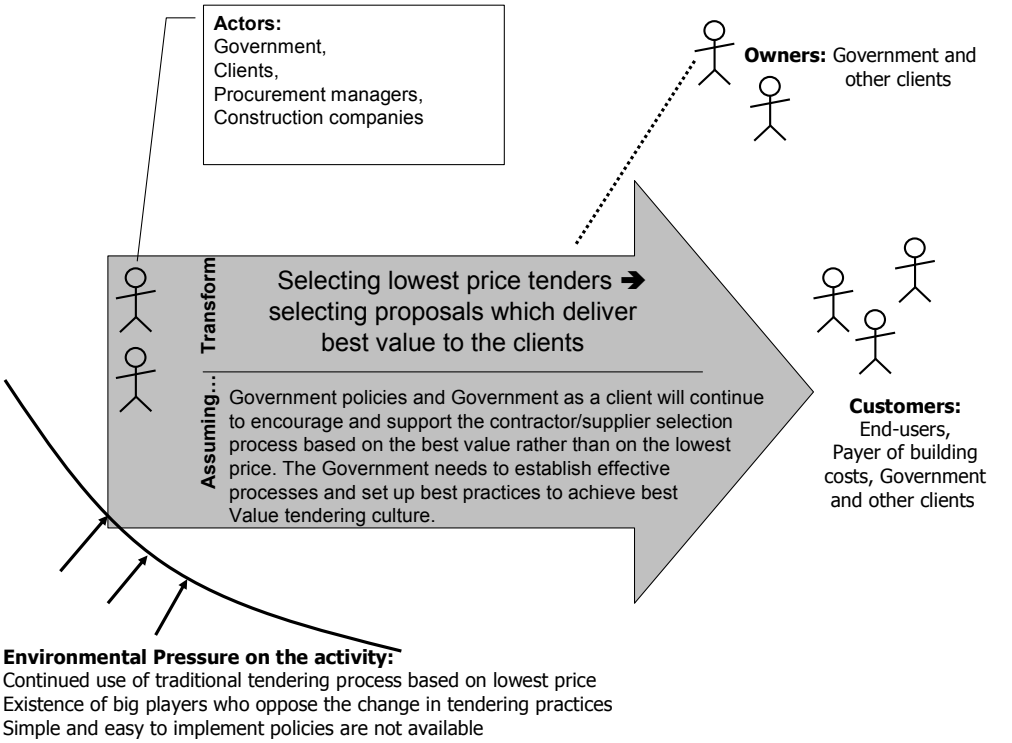

Figure 3. Transition from lowest price selection to selection of best value proposals

The major benefits that are being achieved in the following broad area by adopting the strategic and innovative partnering frameworks and development of integrated supply chains in the above mentioned case studies: Improved design; Less waste and duplication; Improved delivery; Greater certainty of cost; and Better whole life cycle costing. The following gives a representation of the gains in developing integrated supply chain for long-term period, which are not present in traditional "one off" projects: Savings on Tendering / Procurement Costs; Time Savings on Programme; Lesson learned and rolled forward within the delivery team; Benefits of Performance Management Systems; Fewer Delays; Added Value to the client; Knowledge retention, capture, use, and creation; Building of Trusting relationship; etc. Communication and Trust are two most important elements highlighted by people interviewed for partnering.

The process of putting into place a Framework Partnership has also provided the clients an opportunity to take note of where there are lessons to be learnt for future agreements. This includes the process required to achieve the appointments of supply chain partners, and methodologies which had to be developed to assist in the selection of these partners. It has also been a feature that new procedures and mechanisms have had to be put into place to deal with the ongoing developments of schemes and Frameworks. This need has been necessary on both the early stages and the on-site stages. Working in partnership is proving to be much more productive than the more traditional approach of working in separate camps. It is building trusting relationships, bringing all "project knowledge" together at the inception of a project, and achieving a "better value" output in terms of cost, time, and quality. At the end of the day, what we want is clearly defined by one of the Senior Managers of one of the subcontracting organisations, whom we interviewed as part of the case studies:

'Construction world is now changed; I do enjoy getting up in the morning and going to work'.

The paper presented a brief literature review on construction procurement and how it is used to integrate the supply chain within construction industry, through four case studies, as part of supply chain integration project. Each case study was detailed with the background of the procurement route selected along with the findings from the studies. Conclusions were presented towards the end supporting the adoption of the innovative procurement methods.

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DEVELOPMENT OF PROCUREMENT STRATEGY FOR INFRASTRUCTURE IN NIGERIA: CASE OF PRIMARY HEALTHCARE FACILITIES

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Abstract
Procurement has been established as an important process for realising projects and programmes. In infrastructure sector, it determines the overall framework and structure of responsibilities and authorities for guiding the participants within the development process, and is considered as the key to performance improvement. This paper develops a procurement strategy for primary health care (PHC) facilities in Nigeria based on public-private partnership (PPP) principle, in line with the macro-economic policy adopted for growth and the health reform agenda of the present government. These policies have variously emphasised the expansion of the approach to improving healthcare delivery through increased private sector participation, whenever feasible. The developed procurement strategy is responsive to the peculiar needs of the host community and has adequate accountability structure for sustaining PHC facilities in Nigeria. One of the key objectives of the strategy is the idea of bringing together the various local stakeholders, interests and users that comprise the local health economy. This way, it is expected that the active community participation will offer considerable social and economic benefits such as social inclusion, employment and training opportunities for the members of the host communities in addition to the attainment of other fundamental aspects of PHC provisioning. The procurement strategy advocates national outlook for consistency but with local control to be responsive to actual needs.

Keywords: *Primary Health Care; Ward Health System; Procurement; Nigeria*

BACKGROUND

'Procurement' has become an important process for realising projects and programmes, including those related to construction, and the nature of its scope is increasingly changing and expanding. It determines the overall framework and structure of responsibilities and authorities for guiding the participants within the construction process (Love et al., 1998), and is considered as the key to performance improvement in the construction industry (Ofori, 2006). According to The United Nation Commission on International Trade Law UNCITRAL (1994), procurement is "the process used for the acquisition of goods, works and related services (i.e. transport, insurance, installation, training, maintenance and other similar services) required in the execution of a project, excluding consultancy services". By extension to construction, the UNCITRAL definition suggests procurement is a process of acquiring the inputs (resources) required to deliver a finished facility. Many researchers have argued that the procurement method is largely irrelevant in itself and that the real issue is how the adopted procurement form enhances or inhibits team members in achieving project goals (Walker, 1996; 1997a; 1998; Love et. al., 1998; Rowlinson, 1999a; Chan, 2007). Ibrahim (2007) further argued that there is neither an "off-the-shelf" nor a "one-size-fit-all" procurement strategy for all infrastructure type. Consequently, McDermott (2006) maintained that the scope of procurement should include not only the method used to design and construct a facility but also the cultural, managerial, economic, environmental and political issues raised by the implementation of the procurement process. Therefore,

procurement encompasses all the activities involved in the whole-life cycle process of acquiring goods, services or works.

Ibrahim (2007) argued that the nature, type and environment of any proposed development should be taken into consideration in designing the procuring strategy and advocated bespoke strategies as against a generic and universal strategy. For example, the procurement of Primary Health Care (PHC) facilities would require the understanding of the specific goals and drivers of the sector. PHC has been described as a philosophy that emphasises the movement of health care out of large institutions, such as hospitals, into community-based settings, thereby bringing it closer to the people and making it more responsive to their needs (Baggot, 2004). The concept of PHC as a 'level' in the management of illness can be traced back to the Dawson (1920) report, which identified three levels of service: primary care centres, secondary health centres and teaching hospitals. The PHC level has been identified as the appropriate setting to tackle most of the major causes of morbidity and mortality because in many countries, at least 90 per cent of the patient's contact with the healthcare system is at this level (World Health Organisation (WHO), 1978; Nwakoby, 2004; National Audit Office (NAO), 2005a). The World Health Organisation (WHO) (1978) also identified PHC as "the first level of contact of individuals, the family and community with the national health system". At the PHC level, preventive, promotive and community development activities are integrated as the core services (Egwu, 2004).

Starfied (1992) identified associations between availability of PHC and health outcomes (including reduced hospital use), patient satisfaction and reduced health-care costs. Gesler *et al*. (2004) have also established a direct relationship between PHC and social care. These sectors (PHC and social care) have been described as one of the most complex and rapidly changing organisational and technical environments involving: multiple stakeholders that participate in care delivery and characterised with convoluted funding mechanisms and rapidly changing patterns of demand and use as well as government policies (Health and Care Infrastructure Research and Innovation Centre (HaCIRIC), 2010). The PHC and social care sectors are also heavily influenced by rapidly changing demographies; clinical technologies and innovations; fashions; expectations; and increasing opportunities for different ways of working offered by advances in information and communication technologies and process redesign (Ibrahim and Price, 2005a; 2005b; 2006a). However, investments for providing efficient PHC facilities have been historically inadequate and piecemeal in many countries including Nigeria (National Primary Health Care Development Agency (NPHCDA), 2004) and the UK (National Audit Office (NAO), 2005a).

In Nigeria, the Ward[1] Health System (WHS) was introduced in 2001 with the aim of facilitating the provision of sustainable and integrated PHC services by revitalising the principle of community co-ownership and co-management of PHC facilities. The evaluation of the planning and implementation of the WHS procurement strategy revealed that the strategy as being ineffective and unsustainable. The constraints observed include structural (in terms of weakened referral system) and legislative problems as well as lack of institutional capacities. It was observed that the involvement of diverse stakeholders was *ad-hoc*, grossly inadequate and unsystematic. Accordingly, this paper aims to develop a procurement strategy that will facilitate the attainment of PHC goals of community co-ownership or co-management of facilities in Nigeria.

PROCUREMENT OF P.H.C. FACILITIES IN NIGERIA

Prior to 1991, the organisation of PHC services was such that each LGA had a comprehensive health centre (CHC) serving as a referral centre for four primary health centre (PrHC) and with each PrHC serving as a referral centre for five clinics. In 1991, the organisation was modified with a recommendation that each village should have a health post, a group of villages to have a clinic, each district to have a PrHC while each LGA was to have a CHC.

The NPHCDA, set up through Decree 29 of 1992, announced the WHS in 2001 to replace the old district system (NPHCDA, 2004). The WHS scheme was initially targeted at constructing 200 Model PHC centres in selected wards across the six geopolitical zones of Nigeria (NPHCDA, 2001). However, further approval was granted to provide a total of 740 Model PHC facilities targeted at providing access to basic health services for 15 million Nigerians. While this target is insignificant in itself, the extent to which the scheme is achieving its objectives remains abysmal and mixed, and a strong case for further re-examination of its structure, process and function, including its overall place in the PHC subsystem has been made by Nwakoby (2004), Uzochukwu et. al. (2003; 2004a; 2004b). According to NPHCDA (2004), the objectives of WHS are to:

- facilitate provision of integrated PHC services;
- provide opportunity for NPHCDA to mobilise political support for PHC; and
- revitalise the principle of community ownership and co-management of the facilities.

Prior to the introduction of the WHS initiative, community participation, which is an important component of PHC (Newell, 1975; UNICEF, 1988), had been encouraged in the procurement of PHC facilities in Nigeria through a variety of district health committees (DHCs) and village health committees (VHCs) under the district system (DS) (FMOH, 1996). While a DHC was responsible for a particular district and the management/supervision of the health facilities within the district, a VHC was responsible for a particular village/community and the management/supervision of the health facilities and volunteer health workers within that village/community. The membership of these committees comprised a *person in charge of the health centre* (link between the government and the community)*, the primary school headmaster* (secretary)*, representatives of religious and women's groups/associations, representatives of the Red Cross and Boys Scout organisations, a representative of the town union, and some drawn from age group and pensioners associations*. Each committee, made up of 8–12 persons, had a chairman appointed by the other members of the committee and were required to meet at least once every month in their various villages and districts.

The functions of the DHCs and VHCs included: deciding health activities in the community; supervising the activities of traditional birth attendants (TBAs); selection, supervision and payment of village health workers (VHWs); control and management of revenue and profits from drug sales; management of drugs income and expenditure in the context of community financing and mobilization; priority setting of health activities in

the health centre; identifying those to be exempted from user fees; and remuneration of health workers. Other functions outside the core areas included health education of the community, monitoring performance of health facilities, and provision of waste disposal system (FMOH, 1996). The shortcomings of the past (DS) and current (WHS) strategies were articulated by Ibrahim and Price (2006a) and include:

1. *The strategies were not linked to any target community*. The health facilities were built without taking into consideration the needs of the target community and were thus ineffective (FMOH, 1996).
2. *Inequality in access to health care services*. Only few health centres provide daily or routine immunisation services (Nwakoby, 2004), and great disparity in access to public health exist between the poor and the rich (Uzochukwu et. al., 2003), between the rural and urban areas (Uzochukwu et. al., 2004b) and between geographical areas (Nwakoby, 2004). Human resources for health is skewed in favour of urban public health facilities and allocation of resources is skewed in favour of curative services at the expense of preventive services (Nwakoby, 2004).
3. *There was no agreed pattern of service delivery*. The past strategies for implementing PHC in Nigeria neither had any well formulated pattern of service delivery nor a system for managing them and for ensuring the attainment of the desired quality of service delivery (FMOH, 1996).
4. *Lack of involvement of local communities in the planning and implementation*. In Nigeria, despite willingness to participate, communities are rarely involved in health activities due to resistance of the health workers (Uzochukwu et. al., 2004a). An important issue in community participation is that of remuneration of the committee members (Uzochukwu et. al., 2004a) as well as the Village Health Workers (Nwakoby, 2004). This has implications for the sustainability of community participation within the context of PHC since there are personal costs of time and sometimes income associated with participation.
5. *Inequitable and misdistribution of PHC facilities*. NPHCDA (2001) reviewed the national pattern of distribution of PHC facilities and stated that a good number of communities did not have functioning PHC centres, majority of the health workers did not posses the appropriate skills or conceptual understanding of the PHC approach as their training orientation often emphasised clinical as opposed to working within communities, remuneration and conditions of service were considered punitive by the workers.
6. *Conversion or non-existence of Community Health Centre (CHC²) component*. In recent years, under combined political and administrative pressure, a number of CHCs have been converted to general or cottage hospitals. In other cases, CHC may have been planned for but not implemented. In either case, the structural void created by eliminating the CHC component either due to conversion or non-existence has a number of implications:

    i. weakening or total breakdown of the fragile health referral network as general hospitals are suppose to serve as first-line of referral to the LGA health sub-system via the CHC and so the conversion or non-existence of a CHC introduces operational and functional complications;
    ii. ownership problems as LGAs are not suppose to run or own hospitals;

iii. destruction of the World Health Organisation's concept of comprehensiveness of PHC services (WHO, 1981) as these cannot be provided by a hospital;
iv. dismantling of the CHC promotes unemployment and wrangling amongst the displaced health workers who may be forced to take positions in other health centres lower than the CHC; and
v. reduced utilisation of services, as hospitals will cost more than the CHCs and the economic situation will not permit the desired patronage on need basis.

Ward Health System (W.H.S.) Procurement Process

The procurement process of the WHS is represented below in Figure 1. Under the scheme, a consortium of design consultants were commissioned by the NPHCDA to prepare a prototype design and tender documents for use across the country, and prospective contractors compete for the projects in open competition on a site-by-site basis so that local conditions and peculiarities are highlighted in each package. The design consultants alongside the representatives of the NPHCDA supervise the successful contractors on all the sites.

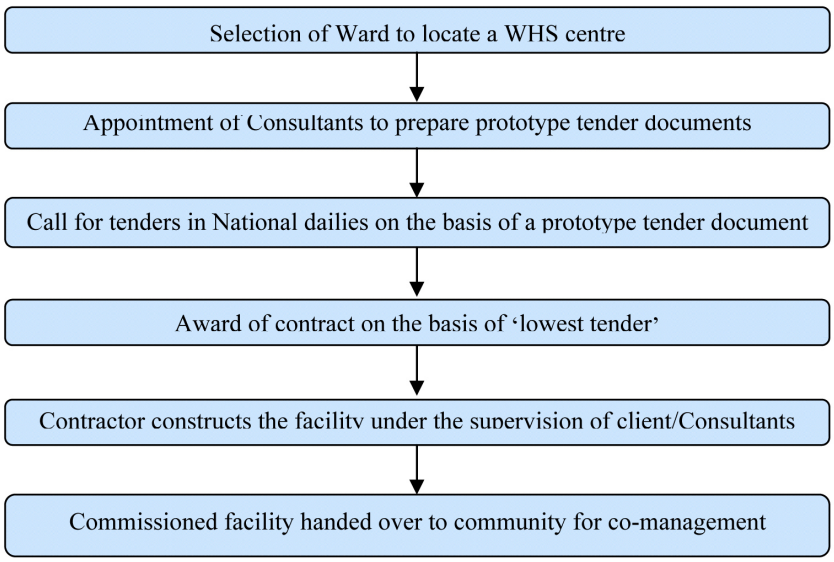

Figure 1. WHS procurement process

Each completed Model PHC facility is subsequently handed over to the host Ward Development Committee (WDC) to implement community co-ownership work plan. However, these sums have been criticised to be inadequate and the work plan is both scanty and unsystematic, and hence the concept can hardly be sustainable (Ibrahim and Price, 2006a). To date, the extent to which the WHS scheme has achieved its objectives remains abysmal and mixed, and a strong case for further re-examination of its structure, process and function, including its overall place in the PHC subsystem has been made by Nwakoby (2004), (Uzochukwu et. al., 2003), (Uzochukwu et. al., 2004a) and (Uzochukwu et. al., 2004b). In addition, there has been an increasing debate for the involvement of communities, private and not-for-profit sectors in a way that will not fundamentally change the welfare nature of healthcare philosophy.

CONCEPTUALISING A PROCUREMENT STRATEGY FOR P.H.C. FACILITIES IN NIGERIA

The applicability of the concept of community co-ownership or co-management of public health facilities in Nigeria has been questioned (Ibrahim, 2007; Adogbo et al., 2010). Ibrahim (2007) affirmed the importance of engaging with wide groups of stakeholders to achieve the objectives of PHC philosophy and identified essential areas in which communities can add value and facilitate the satisfaction of the unique requirements of the diverse members of host communities; thereby encouraging their effective participation in the management of the completed PHC facilities. These include:

- undertaking of research to investigate and understand the dominant preferences, customs, beliefs and values of the communities;
- effective communication through traditional institutions to promote community education on both health and non-health related aspects of PHC philosophy;
- increased capacity of communities to nurture the skills and talents required in making meaningful contribution;
- transparent and clear allocation of roles, responsibilities and accountabilities;
- collaborative and partnership working between local organisations from public, private and not-for-profit sectors to aggregate competences and resources; and
- joint identification of risks associated with each project and the potential mitigation measures.

The adoption of long-term collaborative procurement strategy that involves the allocation of responsibilities for construction, operating and maintenance to one party whilst imbibing local patronage concept through employment of local skills, materials and components has also been recommended (Ibrahim, 2007; Adogbo et al., 2010). Other key factors that influence a procurement strategy have been identified to include (OGC, 2003):

- project objectives – expressed in terms of capacity, such as the number of patients or bed or delivery of specific services;
- project constraints - such as budget and funding, the timeframe in which the facility is be delivered and exit strategy;
- cultural factors – such as considerations about workspace environment that will best support the way people work;
- risks – such as late completion of the facility and innovative use of materials;
- the client's capabilities to manage a project of this type; and
- the length of operational service required from the facility.

Overview and philosophy of the procurement strategy

Having established the need for a new PHC facility for a community, the procurement strategy being presented in this paper is built on the procurement model developed by Ibrahim (2007), and represented in Figure 2. The model was targeted at bringing the diverse local stakeholders, interests and users together to plan and implement community-targeted strategies. The premise of the PHC facilities procurement strategy revolves around the desire of various tiers of government to use private sector, where feasible, to increase healthcare investment as enshrined in the operative macro-economic framework (NPC, 2004) and the health sector reform programme (FMOH, 2004b). The underlying philosophy of the strategy is that focus should be less on whether the provider is public or private and more on identifying what roles the different actors can play most effectively in improving health and wellbeing of the people. It is a collaborative and standardised approach where the public sector retains responsibility for funding, setting of quality and performance standards and enforcement of corrective actions if performance falls below targets.

The proposed arrangements are aimed at providing a powerful combination of the different elements in the communities to deliver significant innovations in PHC facilities and sustainable improvements in health and wellbeing of the Nigerian citizens. The strategy is based on long-term relationships with pre-selected supply chains from the private sector (preferably from within the host communities) whilst engaging with diverse stakeholder groups from within the host communities to empower the people and motivate them to contribute to both health and non-health components of PHC. This will involve the formation of a number of local development partnerships (LDPs) between private, public and not-for-profit organisations within each community to leverage the competences and resources in order to satisfy the components of PHC and boost the overall wellbeing of the community. It is also important that provisions are made for facilities required for other community services such as conference facilities, banquet hall, internet café, restaurant, indoor games and fitness centre. These facilities can be leased out to tenants and the rents charged.

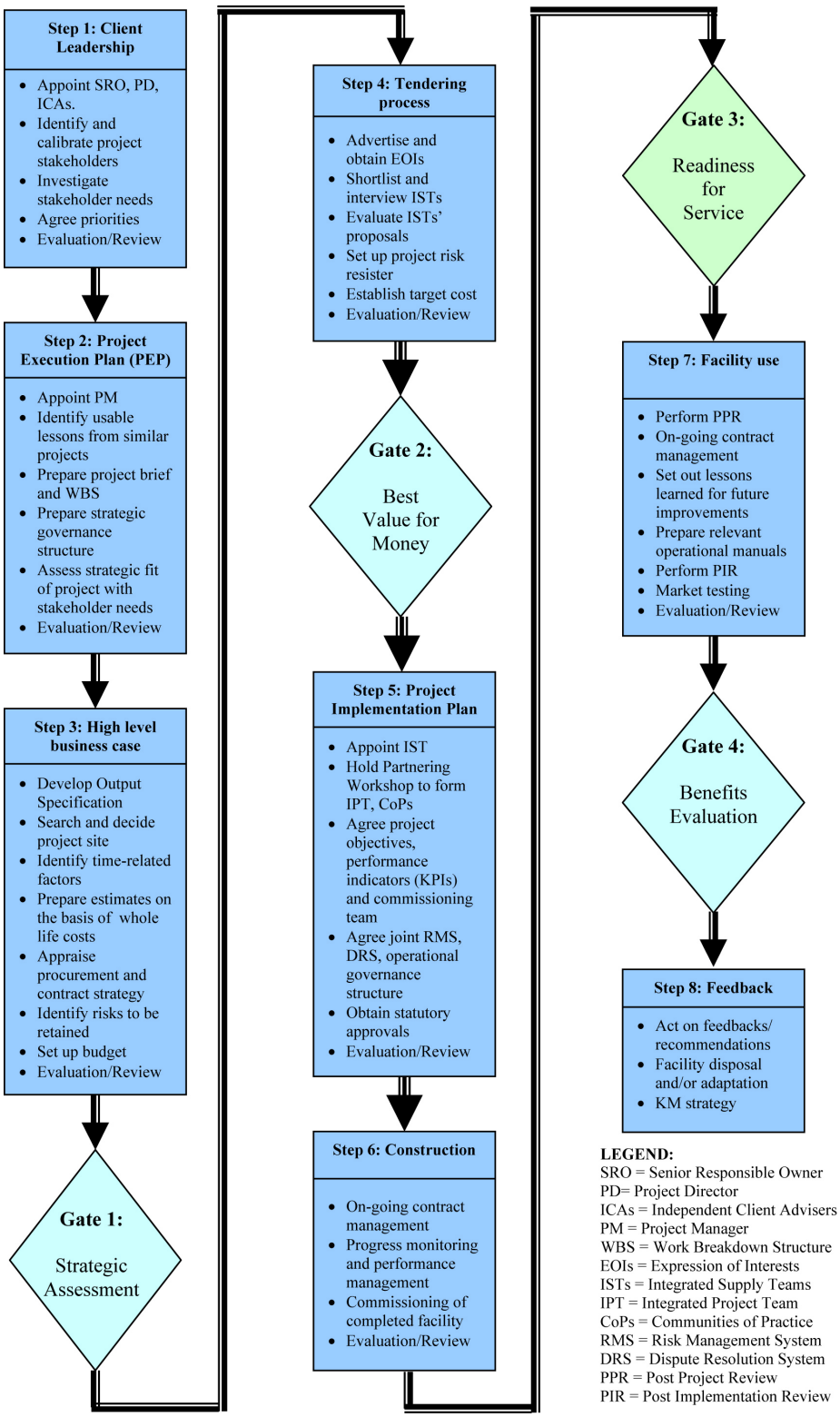

Figure 2. Procurement life cycle framework (Ibrahim, 2007)

The introduction of the four gateway review points in the framework was aimed at ensuring that the project is critically evaluated and a decision to proceed obtained at the stipulated stages. Within the PHC sector, it should be noted that although the upgrading of existing facilities are highly encouraged, the strategy being developed supports the adoption of prototype design solutions to be used across the country, wherever new facilities are inevitable. These standard designs can be incorporated into the procurement of new PHC facilities in the form of standard output specifications. Design quality has been shown to be critical to the success of construction projects and the operations undertaken within them over their whole lives. For example, better designed healthcare facilities have been shown to help in improving the ease and efficiency of care process and could promote faster recoveries and patient safety (Ulrich, 2004). According to CABE (2000), a good design should:

- make a positive addition to the location, the environment and the community;
- add value and reduce whole-life costs;
- create built environments that are safe to construct and safe to use;
- create flexible, durable, sustainable and ecologically sound environments for the community;
- minimise waste of materials, energy and pollution both in construction and in use;
- be attractive and healthy for users and the public;
- contribute to construction that is quick, safe and efficient; and
- produce facilities that are easy and cost effective to manage, clean and maintain.

Hamilton (2007) had shown that the time of greatest human decision-making impact on a project's cost is during the early stages of a project. Hence, the project brief, on which the design solutions are based, should reflect the specific project circumstances and should be expressed in output terms as specifications to promote innovation; such as:

- the scope of use to which the facility will be put;
- the number of people it will accommodate, both in terms of staff, patients and visitors;
- the type of clinical and support equipment that will be used in the facility and the operational environment that these require;
- the sorts of other services (such as social and community services) that facility has to support; and
- performance criteria in terms of components and outputs.

It is also important that in defining design quality, consideration is given to the specific facility and the use to which it is intended to be put. To achieve a good design that will adequately represent the specific project needs and context, an open design competition of innovative solutions by each Independent Supply Team (IST) is proposed whilst using 'inclusive design' and 'lean' principles. Effective client leadership (with help from necessary ICAs) to develop a clear brief, appoint senior project leaders, identify and engage with relevant stakeholders are critical to success. It is believed that design ideas developed alongside knowledge of construction options and anticipated changes in the operational activities during the whole-life of a facility will provide better long term value. Each of the

designs should be subjected to evaluation by an independent team using adapted versions of relevant UK healthcare-based best practice toolkits such as Achieving Excellence Design Evaluation Toolkit (AEDET) Evolution, A Staff Patient Environment Calibration Toolkit (ASPECT) and NHS Environmental Assessment Toolkit (NEAT), whilst demonstrating adequate future-proof tolerance for cost-effective adaptability in the future. These toolkits are aimed at facilitating sustainable construction and whole life cost consideration whilst ensuring facilities management planning based on lean principles that will avoid wasteful long-term expenditure on maintenance. The existing facilities can also be subjected to the same evaluations and that should serve as a systematic basis for identifying areas or components requiring improvements and for benchmarking of PHC facilities.

It is also argued that because no matter how elaborate or innovative the design of a facility may be, a construction project will be judged ultimately on the quality of the finished product over its whole life, it is recommended that emphasis be placed on front-end engagement of the members of the design, construction and facility management teams in an integrated manner. This will ensure the best use of their combined skills and conveyance of information that cannot easily be translated into documents, such as architectural aspirations. In the integrated project team (IPT) concept proposed by Ibrahim (2007) as shown in Figure 3, the procuring authority in consultation with all the key stakeholders within the host community (with the support of necessary independent advisers) partners with an integrated supply team (IST) (preferably from within the host community) that offers the best VfM solution during the tendering stage.

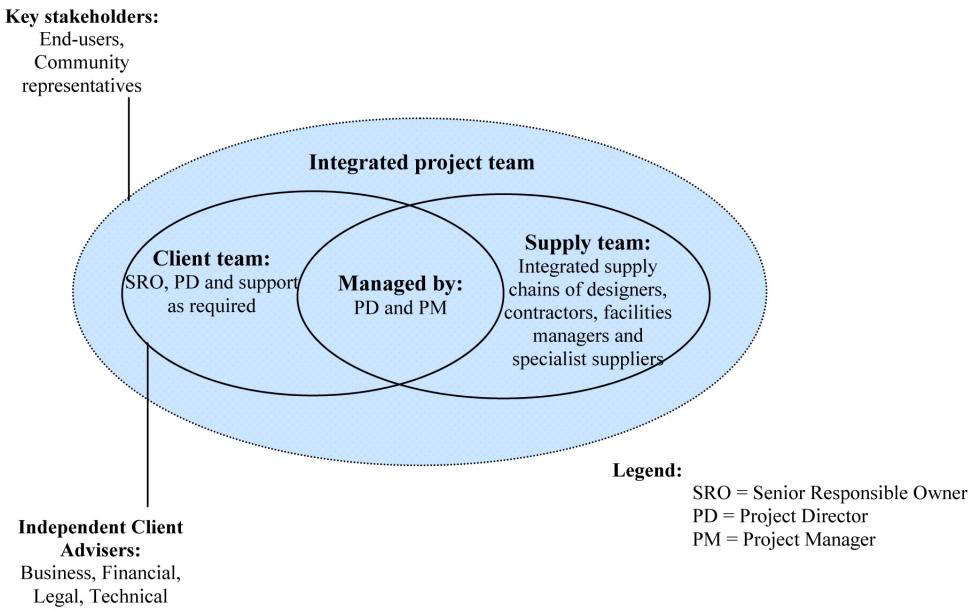

Figure 3. Integrated project team concept (Ibrahim, 2007)

Appropriate strategies are essential for dealing with the inevitable diversity of interests and influence between and within different stakeholder groups. An Integrated Project Team (IPT) is subsequently formed between the selected IST and client to work together to reduce waste, improve quality, innovate and deliver the project. This integrated governance structure requires clear identification and definition of the roles, responsibilities and accountabilities as well as the management mechanisms to support decision making and the day-to-day activities with clear lines of communication and reporting.

It should also be noted that keeping these diverse stakeholders together successfully over the whole life of these facilities is not easy; thus requiring effective and on-going management of relationships and expectations through the use of alignment mechanisms as part of formal or informal partnering arrangements. To cater for macro-economic changes and other developments, it is recommended that market-testing be carried at the beginning of the long-term agreement and at five yearly intervals. This testing should cover not only performance standards but also rents and fees.

Proposed project organisation for procuring PHC facilities

A project organisation is being proposed in order to provide details of funding and contract strategy. In implementing the proposed model shown in Figure 2, a generic downstream delivery vehicle in the form of an integrated project team (IPT) akin to the NHS LIFT (Local Improvement Finance Trust) scheme under the British health sector is necessary. Some of the fundamental differences between the proposed project organisation and LIFT are in funding and asset-ownership arrangements. Like the current WHS regime, it is recommended that government retains the funding responsibilities through a Build Transfer Operate (BTO) structure in which the PSPs will be responsible for delivering and sustaining the facilities to agreed performance standards in exchange for one-off payment at commissioning and regular payments during the facility use. The reason for proposing this financing style is hinged on the argument that ownership change at the microeconomic level alone may not be sufficient to guarantee enterprise efficiency. The premise for this argument is that since the theoretical basis for privatisation success has been linked to competition (and its regulation), weaknesses in these fields explain why privatisation is negatively related to sustainable developments in developing countries where only few members of the society are able to participate. Recent reviews of competition policies in developing countries indicate fundamental weaknesses in implementation at the expense of effective and affordable service delivery that is accessible to the greater number of the citizens (Kirkpatrick et. al., 2004; Metcalfe and Ramlogan, 2005; Uchida and Cook, 2005; Cook et. al., 2007). It is therefore argued that other reforms more directly related to enterprise development, rather than private ownership, may play more crucial role in developing countries, especially in the social infrastructure sectors. This type of financial arrangement has been recommended by Sohail et. al. (2006) for concession contracts for providing sustainable water services that is suited to the needs, resources and aspirations of local impoverished communities in Asia, Africa and Latin America.

In addition, the contribution of not-for-profit organisations such as youths and women clubs can be harnessed in the Facilities Management processes in order to reduce the financial burden on government. The *modus operandi* at both strategic and operational levels will involve the formation of communities of practices (CoPs) from amongst cross-functional organisations aimed at feeding back lessons learnt in order to improve future phases and projects. One delivery mechanism is proposed for each of the 774 LGAs in Nigeria to provide and maintain the PHC facilities built across all the wards within each LG.

The strengths and weaknesses of the proposed strategy, the adequacy and relevance of the model components; the underlying logic between the model components; and the efficacy of the model in facilitating the objectives of the WHS procurement in Nigeria were assessed during validation workshops involving two focus group discussions. Each of the two focus groups involved four participants and were both facilitated by one of the researchers. Of the eight participants, four participated in the initial interviews. The remaining four included one from the public sector, one from the private sector and the remaining two are researchers with extensive expertise in healthcare planning in Nigeria (and both currently serve advisory roles to the NPHCDA on healthcare system planning and strategic capital investment programme).

On the basis of the largely positive feedback obtained from the focus discussion, a more simplified version of the proposed IPT was produced as Figure 4.

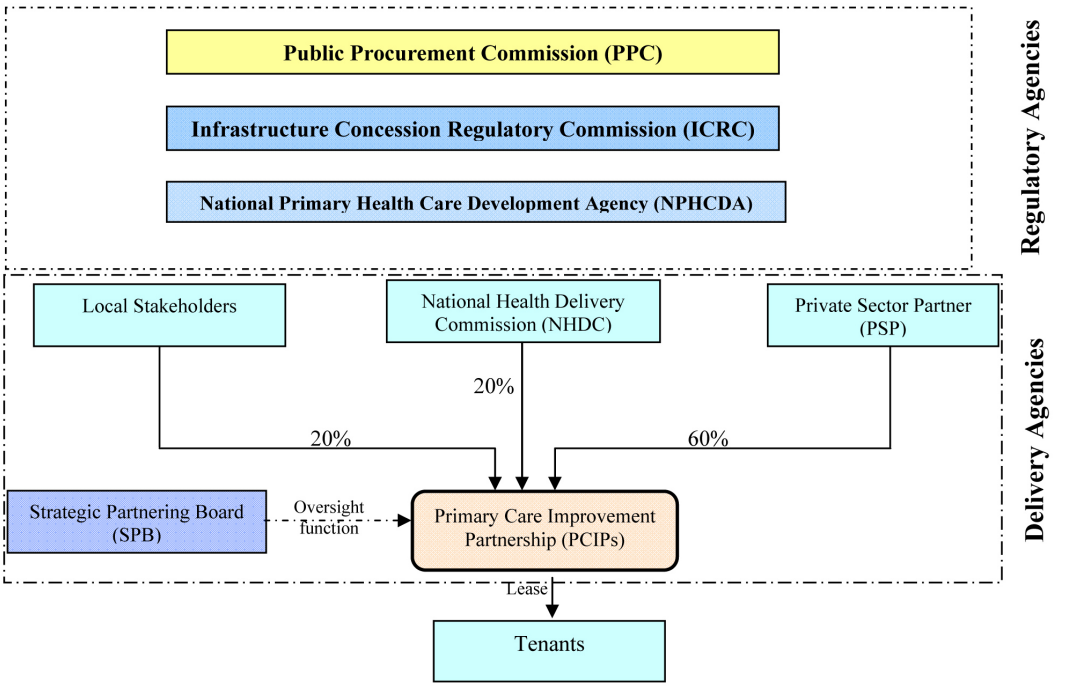

Figure 4. I.P.T. structure

On the basis of the outcome of the validation workshops also, the key components of the delivery vehicle were ascertained to include:

1. The establishment of local joint ventures (LJVs) in the form of IPTs at each LGA level, between a *private sector partners* (PSPs) - consortia of diverse specialties (the ISTs) identified through competitive procurement, the local stakeholders (comprising of Local Government Health and Social Services Departments, Medical and Para-medical professionals, Voluntary/Community organisations) and the National Health Delivery Commission (NHDC). Each LJV (*Primary are Improvement Partnership - PCIP*) should benefit from a long-term partnering[3] agreement to deliver investment and services in local care facilities of agreed performance standards over contractual period of between 15 to 20 years.
2. The PCIPs should be set-up as public-private partnerships in the form of limited liability companies and each should be run by a management board comprising of directors nominated by the major parties; the PSP, local stakeholders and NHDC through strategic partnering agreement[4] with the procuring authority.
3. The functions of each PCIP would include the development of strategic service development plans[5] that incorporates local primary care service needs, the management and implementation of agreed investments and services, the planning of future estate and services requirements to meet the local health economy's needs, and the development of opportunities identified by the PSP.
4. A Strategic Partnering Board[6] (SPB) should be formed between the core statutory bodies and the representatives of each local healthcare community (including the Ward Development Committee). The SPBs should be responsible for monitoring the performance of the PCIPs and for identifying their future workloads.

A summary of the proposed functions of the various components of the model are presented in Table 1 below.

Table 1. Basic functions of model components

Component	**Proposed function**
Bureau for Public Procurement (BPP)	The BPP is designed to act as the clearing-house for all FG contracts and procurement of goods and services, and has the goal of ensuring full compliance with laid down guidelines and procedures.
Infrastructure Concession Regulatory Commission (ICRC)	The agency created by law to facilitate the participation of private sector in the financing, construction, operation and maintenance of public development projects in Nigeria.
The National Primary Health Care Development Agency (NPHCDA)	The agency within the Federal Ministry of Health (FMOH) responsible for providing policy direction relating to primary care services in Nigeria. Its role under this proposal is provision of health-related regulations to PHC implementation and as the procuring authority across Nigeria.
National Health Delivery Commission (NHDC)	The formation of this body is being considered by the National Assembly to coordinate and facilitate private ownership and control of public healthcare institutions in addition to serving regulatory role for all the PCIPs across the country, in line with the overall PPP regulatory framework that will be developed by the ICRC. Because of their proposed involvement in all the schemes across the country, other roles that can be effectively discharged by the NHDC is facilitating utilisation of lessons learnt from previous projects in future schemes, sharing of experiences and good practice across schemes and standardisation of procedures, processes and documentation.

Local Stakeholders	The local stakeholders comprise Health and Social Services Departments of Local Government Authorities, Primary Care Departments of the State Ministries of Health, Medical and Para-medical professionals, the Ward Development Committees, Voluntary/Community organisations, etc. The role of local stakeholders under this proposal is to invest alongside other stakeholders in establishing the PCIP for each locality and holding 20% composition.
The private sector partners (PSPs)	The PSP for each locality is a consortium of diverse specialties, identified through competitive procurement, to form the PCIP for each locality. Under the proposal, the PSP controls 60% of the PCIP.
The Primary Care Improvement Partnerships (PCIPs)	Each PCIP is formed as a public-private partnership (PPP) in the form of a limited liability company. The responsibilities of each PCIP include the development of strategic service development plan (SSDP) for each locality, management and implementation of agreed investments and services; planning of future estate and services requirements; and the development of opportunities identified by the PSP.
The Strategic Partnering Boards (SPBs)	Each SPB is formed from the core statutory public sector bodies in the locality and representatives of the local health community. Each SPB enters long-term strategic partnering agreement (SPA) with PCIP, and has responsibilities of agreeing the SSDP; monitoring the performance of each PCIP and identifying their future workloads.
Tenants	The tenants occupy the facilities and have the responsibilities of paying rents (under tenancy agreement) and contributing to the process of capturing user requirements during the pre-construction stage.

CONCLUSIONS

For successful realisation of projects and programmes, procurement has been established as an important component and a key to performance improvement. In infrastructure sector, procurement determines the overall framework and structure of responsibilities and authorities for guiding the participants within the development process. Many researchers have argued that the procurement method is largely irrelevant in itself and that the real issue is how the adopted procurement form enhances or inhibits team members in achieving project goals. As a result, it has been recommended that there is neither any "off-the-shelf" nor "one-size-fit-all" procurement strategy for all infrastructure type thereby necessitating the development of bespoke strategies for different developments as against a generic and universal strategy.

This paper has presented a procurement strategy for PHC facilities in Nigeria based on public-private partnership (PPP) principle, and in line with the macro-economic policy adopted for growth and the health reform agenda of the present government. These policies have variously emphasised the expansion of the approach to improving healthcare delivery through increased private sector participation, whenever feasible. The developed procurement strategy is responsive to the peculiar needs of the host community and has adequate accountability structure for sustaining PHC facilities in Nigeria. One of the key objectives of the strategy is the idea of bringing together the various local stakeholders, interests and users that comprise the local health economy. This way, it is expected that the active community participation will offer considerable social and economic benefits such as social inclusion, employment and training opportunities for the members of the host communities in addition to the attainment of other fundamental aspects of PHC provisioning. The procurement strategy advocates national outlook for consistency but with local control to be responsive to actual needs.

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(Endnotes)

1 A ward is a geographical constituency with a population of about 20,000 people in groups of villages or urban areas, from which a councillor is elected to represent them at LG level. Each LGA has about 10 wards and there are 774 LGAs in Nigeria.

2 The CHC is the apex healthcare centre at the PHC level from where referrals are made to the General Hospitals at the secondary healthcare level.

3 Development of sustainable relationships between two or more organisations, to work in cooperation for their mutual benefit in the requisition and delivery of works, goods and/or services over a specified period to achieve continuous performance improvement (ECI, 2003).

4 Standard document which establishes the long-term strategic partnering between PCIP and other participants relating to the delivery of healthcare services in the area.

5 Document that forms the basis of the PCIP strategy for primary and community-based health services, reviewed and approved annually by the SPB. It defines the local health needs and prioritise development of facilities and services.

6 Board established by the core public sector bodies in local healthcare community and the representatives of the host community, and responsible for monitoring the performance and identifying the future direction of the PCIPs.

THE IMPACT OF CLIENT ATTITUDES ON THE SELECTION OF CONTRACTORS

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Abstract
This research is concerned with identifying prequalification criteria that both clients and contractors believe are good indicators of future construction performance. Criteria used in the past have been developed by clients in a largely idiosyncratic manner with little or no consultation with the contractors affected. The methodology chosen for the research was a survey which probed stakeholder attitudes to commonly used prequalification criteria. This was carried out via a postal questionnaire involving contractors and clients across Australia. The data was analysed using Discriminant Analysis, which is a multivariate statistical approach that determines the differences between groups. The research is structured around 39 criteria that were developed as part of a whole-of-government task force into best practice in procurement. The findings identified the most important criteria from both a client's perspective, and a contractor's perspective. The purpose was to discover if those differences reduce the effectiveness of the procurement process. This paper contributes to a more clarified understanding of the impact or contrasting views between the stakeholders involved in the prequalification process. This work is innovative because it is one of a few pieces of research that showed that clients and contractors do actually have divergent opinions on the importance of some criteria currently relied upon in the decision making process. The most important prequalification criteria are identified and possible reasons for these differences are discussed.

Keywords: *Procurement; prequalification; tendering; contractor; multi-criteria selection*

INTRODUCTION

Contractor pre-qualification is a commonly used process for identifying a pool of competitive, competent and capable contractors from which tenders may be sought. It can aid public and private owners in achieving success by ensuring that a only qualified contractor are selected to execute the work. Prequalification has become an important part of most procurement processes used by large client organisations, particularly in the public sector.

In the past most research work in this field has concentrated on criteria that clients believe are important, (Drew and Skitmore 1993; Holt, Olomolaiye et al. 1994; Liston 1995; Ng and Skitmore 1999b; Palaneeswaran and Kamaraswamy 2001; Mahdi, Reily et al. 2002; Cheng and Li 2004; Singh and Tiong 2005) but very little attention has been given to the views of other stakeholders. In many respects this is an understandable situation, because clients are in the best position to judge their own needs. In addition, the client is the project proponent and is seeking firms that it believes is qualified to undertake the upcoming project. The axiom "he who pays the piper calls the tune" neatly sums up that principle.

In the past when prequalification criteria have been researched the underlying assumption has been that only clients can affect the process. (Russell, Hancher et al. 1992; Ng and Skitmore 1999b). However, Contractors are also stakeholders in the construction industry, and their actions have an important impact on the success of construction projects (Jennings and Holt 1998; Ng and Skitmore 1999a; Akintoye and Main 2007). It is suggested that both clients and contractors have a significant understanding of the prequalification process. This research concentrates on the attitudes of clients and contractors, in order to reveal criteria that can contribute to the success of prequalification.

It is not surprising that clients use a vast range of prequalification criteria for deciding which contractors are rejected or accepted to bid for their projects. Past prequalification research by Holt, Olomolaiye (1993) agreed suggesting that prequalification and "selection experience appears to vary considerably from (client) organisation to organisation. The dissimilarity may result from the different organisational goals, or may simply be the result of the individual idiosyncrasies of diverse clients".

In a study of construction owners, the majority were found to be utilising various bespoke methods. This individualistic approach means that even the good outcomes of the prequalification process are not shared to the benefit of all (Holt, Olomolaiye et al. 1993). Past research into prequalification criteria has shown that there is a lack of universal approaches. In other words, there are considerable differences in the criteria used by clients.

According to Ng and Skitmore (1999b) "a crucial task in contractor prequalification is to establish a set of decision criteria through which the capabilities of contractors are measured and judged. However, there seems to be no nation-wide guidelines that govern the selection of decision criteria for contractor prequalification." Instead the decision criteria tend to be established on an ad-hoc basis. Moreover, Ng and Skitmore state that contractors are assessed differently by different clients, with over 90% of clients using their own idiosyncratic decision criteria in practice. In addition, Barda and Thompson (1996) indicated that most government agencies in Australia had not fully implemented the recommendations of the Construction Industry Development Agency (CIDA) recommendations with regard to the use of standard prequalification criteria. This also suggests that general application of universal criteria may be a difficult goal to achieve in practice.

Some clients do have well developed and sophisticated processes in making their decisions, while others use ad-hoc or informal methods. This has resulted in contractors having to accommodate a diversity of prequalification criteria. CIDA (1995b) suggest that universal criteria can provide contractors with the following advantages:

- Consistent basis upon which to tender or negotiate for work, and,
- A basis for marketing their abilities measured against an objective framework.

If a universal basis for prequalification can be found this may assist contractors in providing a more reliable way to market their abilities, and also this may assist clients compare contractors over time. The difficulty has been that although there have been many

calls for the adoption of universal criteria for the selection of contractors in Australia (CIDA 1993b; CIDA 1993a; CIDA 1995a; CIDA 1995a) and overseas (Holt, Olomolaiye et al. 1994a; Hatush and Skitmore 1997a; Hatush and Skitmore 1997b) but very little has been actually achieved in practice.

In significant research by Holt (2010) he reviewed the impact of prequalification research over two decades and goes on to stated that "many of the Contractor Selection (CSn) models (researched) exhibit as much complexity as the original "problem" they sought to resolve, while the reliability and longevity of suggested "cocktails" of CSn criteria (in practice), might be questioned. Holt then calls for future research that more closely consider end-user impact and the potential for "take-up" by industry.

It must be noted that clients are entitled to conduct prequalification in the manner that they see fit, and have the right to choose with whom they to do business. However, the issue to be investigated is whether existing criteria improve the success of contractor prequalification and whether they do so efficiently, without causing unreasonable costs to the industry (Lam, Hu et al. 2005). This research concentrates on the issue of the most significant criteria used for the prequalification of contractors for construction projects. The principal objective of this research is to determine if clients are using the best criteria during the contractor prequalification phase of procurement. The purpose is to discover if there are differences in the attitudes of contractors and clients, which may reduce the effectiveness of prequalification.

IDENTIFICATION OF SUITABLE PREQUALIFICATION CRITERIA

Anecdotal evidence suggests that each unsuccessful tender adds a little to the project acquisition costs of bids and the result is an industry cost which is ultimately be passed back to the clients in the form of increased tender prices on future projects. What is needed is some form of contractor procurement process that produces the most cost effective outcome. A number of past researchers have attempted to construct universal sets of prequalification criteria. This next section of the paper examines some of the research undertaken in the United States, United Kingdom, Hong Kong and Australia which have identified prequalification criteria.

There have been many studies into the importance of criteria in the prequalification decision from the clients point of view, including; Liston (1995), Russell et al (1992), Holt et al (1994b), CIDA (1995b) and Hatush and Skitmore (1997). Other research also identified criteria form a consultants point of view (Egemen and Mohamed 2005; Singh and Tiong 2006). Each author developed a list of criteria that they considered contained the most significant factors used for decision-making. After exhaustively compiling an aggregated list of all possible criteria, it was discovered that in many instances considerable overlap occurred between the criteria used by different authors. In addition, many of the criteria used by other researchers were based on local conditions, and were therefore, not appropriate to the Australian construction industry. Consequently, it was decided that the CIDA (1995b) model represented the most relevant and comprehensive set of criteria and this has been used in this research.

As a starting point, it may be helpful to consider the existing list of selection criteria by seeking the contractors' viewpoint. Asking contractors for their opinion on the usefulness of the criteria gives some measure of benefits and costs, albeit mainly to the contractors. The next stage is to compare these contractors' views with the clients. If they are of a like-mind, then the problem is greatly simplified as there will be a consensus between the groups. If they are not so like-minded, then it may be necessary to find ways of incorporating these differences into the process, or eliminating the criteria from the list.

As mentioned above, very few studies have considered non-client stakeholder views to date. Russell et al (1992) analysed the attitudes of three types of client organisations: public owners, private owners and construction managers with results that "... indicate a significant statistical difference among owners and managers". The study by Jennings and Holt (1998) compared the views of contractor's opinions of prequalification criteria. Their research concluded that contractors were dissatisfied with the frequency and adequacy of current prequalification regimes. The other study to include non-clients was that of CIDA, who developed prescriptive criteria that were "subject to a broad industry consultation" CIDA (1993b) and therefore can be assumed to incorporate some degree of stakeholder views.

The main aim of this research is to consider the views of other stakeholders in the process. It is suggested that by appreciating the attitudes of both client and contractor that it may be possible to reveal a better understanding of the suitability of prequalification criteria.. The use of universal prequalification criteria seems to be a widely researched "utopian" ideal, but at this stage it does not seem to exist in practice. The next section of this paper describes the research instrument that was used to measure the importance of commonly used prequalification criteria.

METHODOLOGY

It would be almost impossible to use every conceivable criterion available in any prequalification decision. Consequently, the 39 CIDA criteria have been chosen as the set that is the most relevant to the Australian industry. The purpose of standard prequalification criteria is to provide more consistency across the industry as a whole. The 39 CIDA criteria were used in this research as the basis for an attitudinal survey of clients and contractors. (see Table 1)

The research instrument was a postal questionnaire based on the CIDA criteria which was sent to a sample of contractors and clients. A pilot study was undertaken comprising three domain experts who where contacted and asked to examine the layout, order and intelligibility of the questionnaire. In addition, the questionnaire was sent to an expert on survey design for evaluation. All comments were then incorporated into the final questionnaires.

The survey comprised 39 questions (coded B301-B339) relating to prequalification decision factors. Respondents were asked to express their opinion of importance of each criterion on a Likert scale of Low (1) to High (7). The final questionnaire was sent to individuals with a cover letter and a stamped/self addressed envelope.

A sample size is largely dependent on the degree to which the sample population approximates the qualities and characteristics of the general population (Tabachnick and Fidell 1996). However, it is difficult and perhaps impossible to determine the exact number of organisations who are involved with the procurement of construction projects in Australia. Nevertheless, the Department of Infrastructure maintains a list of prequalified contractors for capital works. There are 450 prequalified contractors for general building works in Victoria, of that of approximately 200 have a turnover in excess of $1 million. The above mini-poll shows that the population of contractors involved with prequalification in Victoria is likely to be in the range of 400-500 organisations. Questionnaires were sent out to 158 companies in the construction industry throughout Australia. There were a total of 65 returned questionnaires giving a response rate of 41%. Survey responses were received from 65 contractors, which represent about 13% of contractors approved for large scale government work in Victoria.

Visual checks of the respondents' turnover showed that all turnover ranges were represented, and as such the sample was considered to be acceptable. This research assumes that Victoria is typical of other Australian states; hence the responses are likely to be a representative sample of contractors throughout Australia cities. Most of the respondents to the questionnaire occupy senior management positions within their firms. If contractors are considered, most firms (96%) have a turnover of greater than $AUD1M, and 43% exceeded $(AUD)5M and were in the medium to large range of construction firms in Australia.

The clients in the survey were approached based on personal contacts and by reference to a list of client organisations that was provided by the Australian Procurement and Construction Council (APCC). The APCC is an alliance of government public works agencies. Its role is to lobby and co-ordinate public sector procurement across all states. The Executive Director provided a list of government public works authorities that operate prequalification systems in each Australian state.

A total of 38 persons representing government agencies from across Australia were contacted. The survey obtained 15 responses from 9 agencies representing a 39% response rate. It has been assumed that the attitudes of all significant public authorities have been represented in the sample. All public sector agencies had capital works budgets that exceed $(AUD) 50M. Therefore it was assumed that all client respondents are in a good position to understand the prequalification process and the subsequent issues involved.

Discriminant analysis (DA) is the appropriate statistical technique when the dependent variant is categorical (nominal or non-metric) and the independent variables are metric. In many cases, the dependent variable consists of two groups or classifications, for example, male versus female or high versus low. In other instances, more than two groups are involved, such as a three-group classification involving low, medium and high classifications. Discriminant analysis is capable of handling either two groups or multiple groups (three or more). In this research the groups in the questionnaire comprised low value and high value projects.

Discriminant analysis involves deriving a variate, the linear combination of the two (or more) independent variables that discriminate best between a priori defined groups. Discrimination is achieved by setting the variate's weights for each variable to maximize the between-group variance relative to the within-group variance. The linear combination for discriminant analysis, also known as the discriminant function, is derived from an equation that takes the following form:

Z = W1Xl + W2X2 + W3X3 +---+ WnXn
Where:
Z = Discriminant score
Wi = Discriminant weight for variable i
Xi = Independent variable i

Discriminant analysis is the appropriate statistical technique for testing the hypothesis that the group means of a set of independent variables for two or more groups are equal. To do so, discriminant analysis multiplies each independent variable by its corresponding weight and adds these products together. The result is a single composite discriminant score for each individual in the analysis. The DA function is a simple linear equation that can be used to investigate the relative impact of each of the independent variables contained in the function. It often tempting to use the unstandardized weight to interpret the function but it is better to use the standardized weights. The justification for the use of standardized canonical function coefficients has been explained in Tabachnick and Fidell (1996).

The purpose of this section of the paper was to describe the methodologies chosen for answering the above research question. The next section describes the results of the questionnaire which measures the importance of prequalification criteria from the perspective of the each of the stakeholder groups. The section commences with a brief set of descriptive statistics, and then uses discriminant analysis as the main analytical instrument.

RESULTS

Different clients use similar but not identical information to prequalify contractors thereby creating unnecessary cost to contractors in the industry. This has led many researchers to recommend the development of standardized prequalification criteria. As previously mentioned the objective was to determine the relative importance of prequalification criteria to various stakeholder groups in the construction industry. It was assumed that government procurement practices were more formally administered. Consequently, the study group comprised; contractors working mainly for private clients (Private), contractors working mainly for public/government clients (Public) and prequalifier's undertaking assessments for government agencies (Clients).

The top five criteria for each group is shown in Table 1 (bold and in brackets). The results shows that Details of past projects is the most important factor in prequalification decision making by all groups, and that Success of completed projects, Past project time performance, and Bank reference also seem to be important considerations by all groups in the survey. However, the table also indicates that in many instances each group have quite

different views about the importance of some factors. For instance, Company organisation/ history was ranked second by public contractors and sixth by private contractors, but only twenty ninth by clients. This suggests that there may be some factors that have significantly differently levels of importance to each of the stakeholders in the prequalification process.

Table 1. Mean Score and Rank by Group

Ref	Decision Factor	Private	Rank	Public	Rank	Clients	Rank
B301	Company organisation/history	5.46	6	6.04	**(2)**	4.67	29
B302	Details of past projects-track record	6.04	**(1)**	6.16	**(1)**	6.20	**(1)**
B303	Current load	5.35	8	5.28	7	5.47	12
B304	Current directors	4.50	24	4.92	14	4.27	36
B305	Current management & administration	4.96	13	5.20	9	4.67	29
B306	Employee qualifications	4.75	16	5.08	12	5.00	22
B307	Major plant & equipment	4.04	37	3.84	37	4.00	39
B308	Success of completed contracts	5.58	**(4)**	5.76	**(3)**	6.13	**(3)**
B309	Geographic location of project	4.13	34	4.32	27	4.93	23
B310	Directors statement	4.36	27	4.56	19	4.16	37
B311	Asset and liabilities	5.01	12	4.92	14	5.86	**(4)**
B312	Profit & loss statement	5.08	11	4.56	21	5.79	7
B313	Movement of assets for year	4.35	28	4.32	27	5.29	17
B314	Cash flow forecast	4.68	17	4.36	24	5.29	17
B315	Bank reference	5.57	**(5)**	5.40	**(5)**	5.86	**(4)**
B316	Credit reference	5.35	8	5.16	10	5.71	8
B317	Turnover history	4.65	18	4.56	19	5.43	13
B318	QA certification	4.17	33	4.36	24	4.73	26
B319	Actual quality achieved in past	5.88	**(3)**	5.12	11	5.33	15
B320	Type of quality program	4.25	30	4.21	31	4.73	26
B321	OH&S key personnel	4.96	13	4.72	16	4.53	32
B322	Actual safety level achieved	5.46	6	5.32	6	5.67	9
B323	Type of safety program	4.21	31	4.60	18	5.20	20
B324	Past project time performance	6.00	**(2)**	5.60	**(4)**	6.20	**(1)**
B325	Management level utilized on past projects	4.58	21	5.04	13	5.67	9
B326	Reason for variance of time & cost in past	4.63	20	4.72	17	5.53	11
B327	Scheduled performance of past projects	5.33	10	5.24	8	5.80	6
B328	Human resources management process	4.54	23	4.30	29	4.80	24
B329	Labor relations statistics over last year	4.00	39	4.34	26	4.47	33
B330	Compliance with labor legislation	4.58	21	4.26	30	4.60	31
B331	Company training program	4.42	25	3.96	35	4.40	34
B332	expenditure on skill formation	4.08	36	3.80	39	4.13	38
B333	Skill formation policy & strategy	4.33	29	3.84	37	4.33	35
B334	No. of claims on previous projects	4.80	15	3.94	36	4.73	26
B335	Explanation of previous claims	4.03	38	4.01	34	5.20	20
B336	No. of claims referred to arbitration/litigation	4.21	31	4.44	22	5.33	15
B337	Record of conviction/non-compliance of law	4.65	19	4.16	32	5.40	14
B338	Reason for convictions/non-compliance of law	4.10	35	4.05	33	5.27	19
B339	Procedures to avoid futures breaches of law	4.39	26	4.42	23	4.80	24

Top five are bold and in brackets

The objective was to find criteria where the importance is significantly different between each group of respondents. A Discriminant Analysis was undertaken on the 39 prequalification decision-factors, for the three groups of respondents; ie. Private contractors, Public contractors and Clients. If differences exist, large function coefficients will indicate which group has a different response to the criteria used for prequalification.

Discriminant Analysis (DA) is a statistical process that identifies variables that are important for distinguishing among groups and which can then be used to develop a procedure for predicting group membership of new cases whose group is undetermined. The concept underlying discriminant analysis is a fairly simple combination of the independent, or predictor, variables that can be formed into a linear function. This then serves as the basis for classifying cases into one of the groups.

The value of the coefficient for a particular predictor depends on the other predictors included in the discriminant function. The signs of the coefficients are arbitrary, but they indicate which variables result in large and small function values. The relative importance of the variables can be obtained by examining the absolute magnitude of the Standardised Discriminant Function Coefficients. Generally, predictors with relatively large standardised coefficients contribute more to the discriminating power of the function, as compared to predictors with smaller coefficients.

Table 2. Canonical Discriminant Functions

Function	Eigenvalue	% Variance	Canonical Correlation
1	3.434	56.5	0.888
2	2.642	43.5	0.852

The analysis was undertaken; the results (Table 2) show that it is effective in separating the groups. The Eigenvalues of 3.434 (Function 1) and 2.642 (Function 2) indicate that they are good discriminators. The purpose of the research is to discover if there are differences in the views of contractors and clients, the

The formula for Discriminant Analysis is similar to a simple linear equation, and it is sometimes tempting to interpret the magnitude of the coefficients as indicators of the relative importance of the variables. However, it is far better to use the standardised coefficients (See Table 3) which have been recalculated to a mean of zero (0) and standard deviation of one (1) (see Tabachnick and Fidell , 1996)

Table 3. Standardised Canonical Discriminant Function Coefficients

Variable	Function 1	Function 2	Variable	Function 1	Function 2
B301	-.941	.665	B321	-.742	-.841
B302	.097	.313	B322	.359	.609
B303	-.303	-.834	B323	.533	.795
B304	.090	.465	B324	.322	-.576
B305	-.842	.459	B325	.277	.616
B306	.531	.089	B326	.585	.917
B307	.183	.052	B327	-.614	-.585

B308	.222	-.141	B328	.410	.609
B309	.404	.699	B329	-.865	.534
B310	-.979	-.507	B330	.091	-.272
B311	1.260	.099	B331	.159	-1.361
B312	.022	-1.202	B332	-.645	.961
B313	-.173	.239	B333	-.211	-.303
B314	-1.040	-.274	B334	.048	-1.200
B315	.405	.462	B335	-.142	1.049
B316	.674	-1.224	B336	.563	.371
B317	.458	-.194	B337	-.344	1.101
B318	-.391	.637	B338	.705	-1.580
B319	-.029	-.556	B339	-.357	.583
B320	.789	.233			

As previously mentioned, the actual sign (+/-) of the Standardised Coefficients are arbitrary, the negative coefficients could just have well been positive if the other signs were reversed. By looking at the groups of variables that have coefficients of different signs, it is possible to determine the variable values that result in large or small function values. Thus, large positive coefficients will tend to increase the function score, and large negative coefficients tend to decrease the function score.

The results Table 3 Standardised Canonical Discriminant Function coefficients shows that B311 (1.260) had the largest absolute value for Function 1, and B312 (-1.202) had the largest value for Function 2. This suggests that the B311 criterion is the most divergent in the opinion of the groups. Function coefficients that are near zero are those where opinions are most similar. Thus large Function coefficients have good discriminating powers.

The final test of the effectiveness of the DA was the classification of group membership. Once the Discriminant Scores were computed each case in the data was assigned to a particular group, this was then compared to the actual group membership which was already known, and the accuracy of the classification can be determined. Classification of results indicated that the cases are well classified by the above two functions (ie 92%), the Discriminant Functions clearly identify the groups based on the responses in the survey.

The results show that in some cases clients and contractors have different views on the importance of prequalification criteria. The results (Table 4) shows the top-5 criteria that best discriminate between the views of clients and contractors. It can be seen that B311-Assets & Liabilities has the largest coefficient and therefore represents the most widely divergent view. For instance, from Table 1, both private (Rank 14) and public contractors (Rank 12) believe that Assets & Liabilities to be an unimportant technical indicator. Clients on the other hand, rank this criterion one of the most important (Rank 4) suggesting that they believe it to be a significant factor in their prequalification decision-making. This may indicate that clients believe that contractors with low assets and high liabilities represent a greater risk on future projects.

Table 4. Top-5 Discriminating criteria between clients and contractors

Variable Code	Decision Criteria	Function 1 Coefficient*
B311	Assets & liabilities	1.260
B314	Cash flow forecast	-1.202
B310	Directors statement	-.979
B301	Company organisation/history	-.941
B305	Current management/administration	-.842

* Standardised Canonical Function Coefficients

The opposite is true for B101-Companies organisation and history, clients consider it to be a relatively unimportant criterion (Rank 29, Table 1) while contractors give it a much higher ranking and therefore believe it to be a very important decision-making factor.

The next section of the paper discusses the impact of this finding including a list of criteria that should be used for future prequalification of contractors. The DA function has identified the criteria where the most divergent views occur; this highlights the differences of opinion between the groups. It should be noted that some of the differences occur in criteria that were lowly ranked by all groups; this suggests that the criteria may be redundant and could be excluded. However, some of the differences occur in criteria that have a relatively high importance to all groups, in these cases clients should examine the reasons why the criteria are used. The conclusion contains possible reasons for divergent views and closes by identifying important criteria that should be used for all prequalification decisions.

DISCUSSIONS

The aim of this research was to demonstrate that the views of contractors are in some circumstances quite different to those of clients. The criteria used for prequalification are known to be client oriented (CIDA, 1995b) and therefore are unlikely to reflect the views of contractors. This suggests that if the opinions of all prequalification stakeholders were solicited, the end result would highlight the criteria that could improve the practice of prequalification.

Past research indicates that universal criteria may provide contractors with a more consistent basis upon which to tender or negotiate for work, and a better basis for marketing their abilities CIDA (1995b). This view was also supported in work by Baker and Orsaah (1985) that identified factors that assist contractors in developing effective mechanisms for marketing their abilities to clients. As such, contractors are partial stakeholders in the process and should be entitled to have some input into the type of criteria used. Also, the benefits of the prequalification process as a whole may improve if the prequalification of contractors is based on criteria that contractors themselves believe are important.

The results of this research show that there is some agreement between clients and contractors on some prequalification criteria. Table 5 (**in bold) shows the top ten criteria that are ranked highly by both groups; these represent the most important criteria and should be included in all prequalification schemes. It can be seen from the average rankings that Details of past projects/track record was rated highest by contractors, and jointly highest by clients. As a result this is the most highly regarded piece of information and should be part of any prequalification scheme.

Table 5. Value of criteria for prequalification decisions

Variable	Description	Clients Rank	All Contractors Rank	Sum	Average Rank**	Function 1
B301	Company organisation/history	29	4	33	15	**-.941***
B302	Details of past projects-track record	1	1	2	**1**	.097
B303	Current load	12	10	22	**9**	-.303
B304	Current directors	36	18	54	28	.090
B305	Current management & administration	29	12	41	19	**-.842***
B306	Employee qualifications	22	13	35	16	.531
B307	Major plant & equipment	39	38	77	38	.183
B308	Success of completed contracts	3	3	6	**3**	.222
B309	Geographic location of project	23	34	57	31	.404
B310	Directors statement	37	23	60	34	**-.979**
B311	Asset and liabilities	4	11	15	**6**	**1.260***
B312	Profit & loss statement	7	16	23	11	.022
B313	Movement of assets for year	17	28	45	23	-.173
B314	Cash flow forecast	17	22	39	17	**-1.040***
B315	Bank reference	4	5	9	**4**	.405
B316	Credit reference	8	9	17	**8**	.674
B317	Turnover history	13	19	32	14	.458
B318	QA certification	26	32	58	33	-.391
B319	Actual quality achieved in past	15	7	22	**9**	-.029
B320	Type of quality program	26	31	57	31	.789
B321	OH&S key personnel	32	14	46	24	-.742
B322	Actual safety level achieved	9	6	15	**6**	.359
B323	Type of safety program	20	21	41	19	.533
B324	Past project time performance	1	2	3	**2**	.322
B325	Management level utilised on past projects	9	15	24	12	.277
B326	Reason for variance of time & cost in past	11	17	28	13	.585
B327	Scheduled performance of past projects	6	8	14	5	-.614
B328	Human resources management process	24	20	44	22	.410
B329	Labor relations statistics over last year	33	30	63	35	-.865
B330	Compliance with labor legislation	31	23	54	28	.091
B331	Company training program	34	35	69	36	.159
B332	expenditure on skill formation	38	39	77	38	-.645
B333	Skill formation policy & strategy	35	37	72	37	-.211
B334	No. of claims on previous projects	26	25	51	25	.048
B335	Explanation of previous claims	20	33	53	26	-.142
B336	No of claims referred to arbitration/ litigation	15	27	42	21	.563
B337	Record of conviction/non-compliance with law	14	26	40	18	-.344
B338	Reason for convictions/non-compliance with law	19	36	55	30	.705
B339	Procedures to avoid futures breaches of law	24	29	53	26	-.357

** Top ten most important criteria, shown in bold

A large DA Function Coefficient indicates that there are differences in the opinions of the groups. These criteria are effective discriminators and therefore suggest that divergent views exist on their value for decision-making. Therefore, clients may need to consult with their contractors in order to determine the reasons why these criteria solicit different responses.

For instance, it is known that clients consider that contractors should be able to maintain a reasonable level of capital to ensure that a project can proceed without undue financial encumbrance. This may suggest that clients consider contractors ought to have a strong balance sheet in order to reduce the risk of financial failure. It is not surprising that clients place importance on Assets & Liabilities as a prequalification criterion. Anecdotal evidence obtained by the author suggested that some of the financial criteria used by clients for prequalification is out-of-date and may not reflect the current financial position of the contractor. If this is true it may explain why Assets and Liabilities are ranked more highly by clients than contractors. (See Table 5**).

The study also showed that the Cash Flow Forecast is valued more highly by clients (Rank 17) than it is by contractors (Rank 22). The quality of the information provided under this criterion will always be uncertain. Contractors are not likely to be sure which projects they will win in the future, because the results of upcoming tenders will not be known. Consequently, the information they provided to clients is only be an unreliable guesstimate of future cash flows.

It is possible that in many cases contractors do not believe that financial information represents their best marketing approach. Instead, contractors often prefer to present themselves through indicators like Company organisation/history. Contractors want to give a positive impression of their own ability. This supports research into contractor marketing which demonstrates the importance of reputation and "clients' previous experience with a contractor", this has been well documented in past research (Jennings and Holt 1998; Baker and Orsaah 1985).

This may suggest why Company Organisation/History is viewed by contractors as an important indicator of their reputation and consequently they have a desire to promote this aspect of their firm. On the other hand, clients may not be sufficiently convinced that organisational history is a good indicator of future performance. The Company Organisation/History criterion is the most divergent criteria (See Table 5, Function 1) and contractors may need to recognise that clients do not appreciate this factor as important for prequalification decision-making.

Current Management and Administration criterion is relatively low ranked by clients (Rank 29), and yet contractors believe it is important (Rank 12). This is possibly due to the fact that contractors consider that company directors are in a good position to manage the dynamic nature of industry to the benefits of their clients. However, clients do not share this view and may not fully believe in the capacity of contractors to control external factors.

The results of this research suggest that there should be increased liaison between clients and contractors in order to gain a better understanding of the issues of the prequalification decision criteria. The next section of the paper discusses the results in context with other known issues and makes some conclusions.

CONCLUSION

This research suggests that contractors and clients do not share the same view on some important criteria. It is known that many clients are still using bespoke criteria (Holt et al 1994a; Hatush and Skitmore, 1997b) that have not been developed in consultation with other stakeholders. This research suggests that important criteria ranked highly by contractors and low by clients could be reviewed, this includes for instance; Company Organisation/History, and Current Management and Administration.

The justification for prequalification has been that it improves the quality and certainty of construction projects by allowing only firms to tender who have the capacity to successfully undertake the work. However, very little research has considered the attitudes of non-client stakeholders in the past. This research considers the choice of prequalification criteria in a more industry wide perspective by considering non-client views. The results of this research show that there is already a range of prequalification criteria where significant agreement exists. Table 5 contains the top criteria that were highly ranked by both clients and contractors; these should all be part of prequalification schemes. The top five are: Details of past projects/track record, Success of completed projects, Bank reference, Past project time performance.

There are also different views on the value of some of the other criteria. The objective has been to highlight contentious criteria and suggests that clients review their position when relying on this information. The criteria identified for review includes: Company Organisation/History, Current Management and Administration, Assets and Liabilities and Cash Flow Forecast.

This research has analysed decision-making criteria used for the prequalification of construction contractors. The importance of each criterion has been measured; the value of each factor to stakeholders was identified. The main theme of this research is based on the premise that both contractors and clients need to be involved in the ongoing development of the prequalification criteria.

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Articles submitted will be reviewed and accepted on the understanding that they have not been published elsewhere. The authors have to fill the Declaration of the Authors form and return the form via fax to the secretariat. The length of articles should be between 3,500 and 8,000 words or approximately 8 – 15 printed pages (final version). The manuscripts should be written in English. The original manuscript should be typed one sided, single-spacing, single column with font of 11 point (Times New Roman). Paper size should be of Executive (18.42 cm x 26.67 cm) with 2 cm margins on the left, right and bottom and 3 cm for the top. Authors can submit the manuscript:

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Heading 1: Arial Bold + Upper Case, 11pt.
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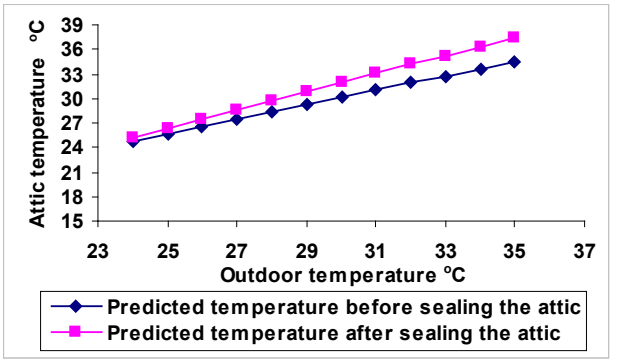

Figure 8. Computed attic temperature with sealed and ventilated attic

Tables: Arial, 8pt. Table should be incorporated in the text.

Table caption: Arial Bold + Arial, 9pt. Caption should be written above the table.

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Parameter	Raw Water Quality	Drinking Water Quality
Total coliform (MPN/100ml)	500	0
Turbidity (NTU)	1000	5
Color (Hazen)	300	15
pH	5.5-9.0	6.5-9.0

(Source: Twort et al. 1985; MWA,1994)

Reference: Times New Roman, 11pt. Left indent 0.25inch, first line left indent – 0.25inch. Reference should be cited in the text as follows: "Berdahl and Bretz (1997) found…" or "(Bower et al. 1998)". References should be listed in alphabetical order, on separate sheets from the text. In the list of References, the titles of periodicals should be given in full, while for books should state the title, place of publication, name of publisher, and indication of edition.

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