Leadership Logic Replaces Technical Knowledge in Best Value Structure/Process

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For the past twelve years, a best value Performance Information Procurement System (PIPS) process/structure has been successfully tested and implemented. Attempts to duplicate the results of the process through other alternative models have been unsuccessful. This paper asserts that PIPS, unlike other management structures, embeds leadership principles within the structure to duplicate the results of leaders. The foundation of the PIPS process is based on the principle that management and control are related to inefficiency, and decision making occurs due to a lack of information, which inherently brings risk. This paper identifies a structure embedded with a leadership culture as a necessary component for practicing leadership theories and producing efficiency within an organization. It identifies contemporary leadership theories, and uses deductive models and logical concepts together for validation. It discusses the alterations made to the PIPS model over time to better reflect the leadership theories as well as the results due to these changes. Over the past 14 years, this process has been successfully used to optimize the delivery of construction services. It is currently being used as a leadership enterprise structure in information technology (IT), food services, and facility management sectors.

Keywords: Leadership environment, minimization of management, information measurement theory, and best value procurement

Introduction

The Performance Information Procurement System (PIPS), a best value procurement process, was developed in 1991 as the Performance Based System (PBS) by Kashiwagi and tested by the Performance Based Studies Research Group (PBSRG) at Del E Webb School of Construction, Arizona State University. It was named PIPS in 1996 to differentiate it from the myriad of procurement processes that claimed to be based on performance and value. Over the past 14 years, documented results (98% on time, minimized contractor change orders, and high customer satisfaction) identified PIPS as a pure best value process (PBSRG, 2007). Attempts were made in the State of Utah, State of Hawaii, University of Hawaii, State of Georgia, and the Federal Aviation Administration (FAA) to create processes that mirrored the results of PIPS. However, none of the groups were successful in sustaining value based procurement, and eventually returned to awarding price based contracts (Kashiwagi 2004). Analysis of these processes revealed major differences from the PIPS. The failed processes:

1. Expended a high degree of resources for communication and information flow.
2. Identified the experts in the delivery of construction services as the client's professionals (engineers, designers, and procurement personnel).
3. Focused on client personnel to make decisions, while making the contractors responsible for the results of those decisions.

4. Gravitated towards price based awarding by assuming contractors were commodity items which could be forced to perform.
5. Required a larger number of client representatives/professional functions (designers/engineers/contracting personnel).

In contrast, the PIPS delivered higher performance for the same or lower price, transferred decision making, risk and accountability to the outsourced entity, and resulted in an environment where management was severely minimized (up to 80% of construction management)(State of Hawaii, 2002). During construction, it increased efficiency by minimizing the flow of excessive information and communication, and detailed construction specifications (minimum standards, construction directions, and general conditions), while maintaining accountability of the contractor's team. The PIPS identified best value by differentiating the capabilities of different contractors, personnel or options. The process results revealed no relationship between vendor cost and performance (Guo, 2006). However, with the PIPS model, contractor profit margins increased. The simplicity of PIPS was to identify the best value based on price and performance, and then allow the experts do their job, minimizing the need for directions, management, and inspection (Sullivan et al, 2006).

This paper proposes that the difference between the PIPS model and other procurement models is the fundamental leadership principles required in the system. While best value processes attempt to train the organization's managers to exercise leadership principles within a management-control structure, the PIPS structure/process exercises leadership-like principles to transform the management-control system to a leadership structure that enforces the manager's application of the principles. The leadership principles are embedded into the structure and processes rather than with the user's managers. It is proposed that high performance and best value results require a different culture and environment than the customary management-control system. It requires a change to a leadership based structure. It is also proposed that without this structural change, managers of a process are unable to sustain the application of leadership principles and often revert back to a decision making and management mode. This paper will explore this theory through the examination of logic models (including the Information Measurement Theory [IMT]), deductive reasoning, accepted leadership principles, and actual testing and application. This research has been developed in order to identify a systems solution in assisting managers to overcome their current culture and inherent need to manage and control, in order to achieve high performance through successfully applied leadership principles.

Information Measurement Theory (IMT)

IMT is the logic and foundation of PIPS. It is the measurement of information to predict the future outcome. IMT is composed of simple, deductive logic models that are readily acceptable to the majority of client professionals in the construction industry (Kashiwagi, 2004). IMT and PIPS were developed for the delivery of construction. A brief review of the IMT models offers a deductive explanation of the intrinsic differences between a management and leadership culture, as well as the difficulties associated with adopting foreign characteristics. It addresses the flaw in imposing leadership theories on a manager thriving in an existing environment, absorbed with control. The authors hypothesize that the comprehension and awareness of these models affects

the approach in which leadership principles are implemented. The next section briefly reviews the IMT deductive models.

The first model (Figure 1) submits that all laws which predict future outcomes exist at all times, all locations, independent of people's understanding of the laws. Events governed by laws have only one possible outcome. Laws are discovered and not created. Before gravity was understood, objects still obeyed the laws of gravity.

The second model (Figure 2) identifies any event that takes time as having initial conditions and final conditions. The following deductive concepts apply to this model:

1. Each event has unique initial conditions (time, location, participants, resources, constraints).
2. A change in initial conditions alters the final conditions.
3. If all information is perceived, the outcome can be perfectly predicted.
4. The less information that is perceived, the more decisions are made, and the more the expectation can differ from the actual outcome (risk).
5. The less information a person perceives about the initial conditions, the more likely that person will believe in chance or randomness, and have a feeling of fear and lack of control.
6. If the event is analyzed from the final conditions back to the initial conditions after the event has taken place, a relationship can be drawn between the final conditions and the initial conditions. This has been described by the axiom "hindsight is 20/20" or Monday morning quarterbacking.
7. The less information a person has on the initial conditions, the more likely they will be to do stochastic analysis to try to minimize the risk or optimize the event.
8. Once the unique set of initial conditions is fixed, the final outcome is also fixed.

Figure 1. Laws (Kashiwagi, 2004)

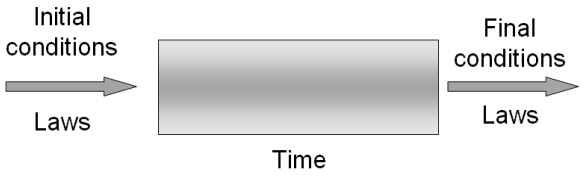

Figure 2: The Event (Kashiwagi, 2004)

Assuming that the two models ("Laws" and "The Event") were valid, PBSRG next researched a simple model to explain how people change in an environment constrained by laws, where events are the application of laws. This concept developed into the third model, entitled the "Cycle of Learning" (Figure 3).

The Cycle of Learning uses the concepts of the first two models. It assumes that everyone starts off with an initial level of understanding or degree of perception of reality. At some point, every person will perceive a law that they did not previously perceive, and will try to process the operation of the law. Once the law or principle is understood, the person can apply the principle. If a person has applied a newly perceived principle, they have changed. This change always

leads to the perception of more laws or principles. The following deductive logic applies to the understanding and operation of the model:

1. The more times a person cycles through the process, the faster the speed of the cycle (Figure 3).
2. There are many different perceptions of how efficiently and effectively people perceive and process. Difference of opinion is caused by a lack of quantifiable information.
3. If the process is indeed cyclical, the rate of change and application of concepts which can be measured are relative to the perception and processing capability of the individual.
4. People who perceive more, process faster, apply more correct concepts, and change faster.

People who are very open to change are therefore usually more visionary, more perceptive, and more efficient and effective. These are identified by IMT as "Type A" people or people who are more likely to exhibit leadership characteristics. IMT identifies those who are less perceptive, with slower processing speeds, less likely to apply new concepts, and less likely to be comfortable with change. "Type C" people are more management/control oriented people (Figure 4: Rate of Change/KSM).

The Kashiwagi Solution Model (KSM) is a tool that uses extreme characteristics in order to differentiate the qualities correlated to a "Type A" and "Type C" entity. The KSM is a two way chart which places the relative "A" characteristic on the left hand side, and the "C" characteristic on the right hand side, the "A" and "C" characteristics being opposites. By not considering the relative degree of characteristics in the middle section, the KSM model ignores the identification of the slope of the dividing line. The sole objective of the KSM is to identify "Type A" or leadership characteristics and "Type C" or management characteristics. KSM's also identify that each person has a relative amount of all characteristics. Therefore no characteristic can be defined as good or bad (it is just a decision by someone with a relative level of information).

Characteristics of both Types are listed in Table 1.

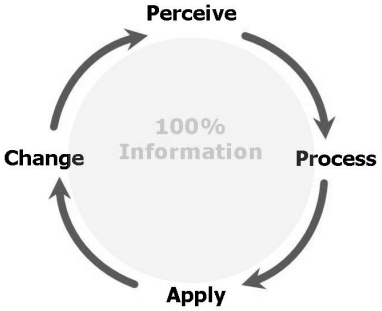

Figure 3: Cycle of Learning (Kashiwagi, 2004)

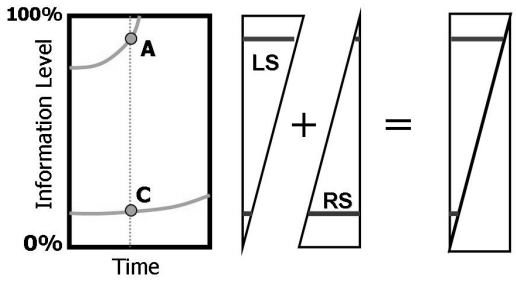

Figure 4: Rate of Change / KSM (Kashiwagi, 2004)

Table 1: "Type A" vs. "Type C" Characteristics

Type A	Type C
1. Perceives and uses information	1. Does not perceive information
2. Minimizes the flow of information	2. Maximizes the flow of information
3. Identifies the differences	3. Cannot identify differences
4. Envisions the future event and final conditions.	4. Cannot see into the future event.
5. Minimizes decision making	5. Makes decisions based on what little they know
6. Aligns personnel where they can succeed	6. Poor alignment of personnel
7. Creates a win-win for everyone	7. Creates "win-lose" environment
8. Makes people accountable	8. No accountability but based on relationships
9. Does not do the work	9. Works and directs work
10. Allows everyone to do their own job	10. Does not allow everyone to do their job effectively and efficiently
11. More readily will admit that they "do not know" and find the expert who does	11. Think that they know almost everything and make decisions based on what they know
12. Understands that they understand very little and what they don't know is far more important than what they do know	

From the above four models, the authors propose the following hypotheses that will be further discussed in the following section:

1. Leaders or "Type A" people are more likely to recognize how little they know. This is a natural occurrence. As one learns more, it is increasingly evident how little one knows and how much exists that one doesn't know.
2. When faced with a problem, Leaders or "Type A" people are much more likely to identify experts, delegate responsibility, and release control, than "Type C" people.
3. Because Leaders or "Type A" people know how little they know, they are far more likely to use logic to solve problems rather than the technical knowledge they know.
4. "Type C" personnel or managers who are focused on control, are more likely to try to use their technical knowledge or what they know to solve problems with unknown conditions.

Rate of Learning and Amount of Knowledge Models

In the previous section, the fundamental IMT principles of the PIPS were discussed and outlined. A methodology based on IMT principles for identifying, analyzing and understanding an individual's constraints in learning, aptitude for leadership principles, and ability to process information was presented. The next step in the investigation was to address and explain the difficulty in applying sustainable leadership principles to the majority of entities within a management-control structure. This is presented through further deductive reasoning and application of the IMT principles.

Based on the IMT Principles (Figures 1, 2, 3, and 4), a person's amount of perceived knowledge, processing speed, application of newly perceived ideas, and change rate, increases as time goes on. Therefore, Type A individuals who realize that as they continue to learn that the amount

they learn becomes exponential, but at the same time the more they learn, the more they learn that they don't know. This leads to the following conclusions:

1. A person does not learn 50% of what they will learn in life until late in life (Figure 5a).
2. A person knows very little of all existing information (Figure 6a).

IMT states that the opposite "Type C" person will more likely perceive that very early in life they learn a majority of what they will learn throughout their life (Figure 5b). This is due to the following:

1. They think what they know is universal and can be applied to almost any case.
2. They do not see the subtle differentials that make each event unique, and think that each case can be handled the same (management).
3. They perceive a cursory knowledge as sufficient to solve complex problems.
4. They do not learn to differentiate from others or from their experiences.
5. They solve problems with the limited information they have, not with logic.
6. This is commonly known as a person with a little information and a large ego.
7. These individuals are usually insecure, depend on relationships to avoid liability and feel threatened by anyone who is actually an expert.
8. This type of person enjoys making decisions.

Based on these characteristics, a Type C person is likely to view the ratio of knowledge known to knowledge still unknown as shown in Figure 6b.

Figure 5a and 6a result in a "Type A" person knowing how little technical knowledge they have, and know it is impossible to apply the meager knowledge to so many different cases. Because they are "Type A", they usually use the logic of how they know what they know rather than what they know (technical information) to solve complex problems. They are more likely to understand and apply principles to a solution than a "Type C" person. The "Type C" person on the other hand, is far more likely to use their limited technical expertise to solve a complex problem than to use logic. They believe that they have adequate knowledge to make decisions to solve complex problems. If the problem is not perceived as complex, the person is an expert at what they are doing, and the application does not apply, because decisions do not have to be made for simplistic issues.

The "Perception Type" and "Amount of Technical or Expert Knowledge" in Figures 5a and 6a identify that it is much more efficient for a leader to use known logic (outsourcing, past performance measurement, preplanning, risk identification/minimization, quality control, the constraints of cultural change, and ineffectiveness of controlling or changing other people) to solve problems than the technical information they possess due to the physical constraint which limits the amount of information they can use. It supports the KSM's that illustrate that technical knowledge is used by the "Type C" in order to manage and control, or to perform narrow, focused tasks.

In order for an organization composed of both "Type A" and "Type C" managers to integrate leadership principles into their role, technical information must be filtered from their role. By

using a culture or structure that results in managers refuting the usage of technical information and demands the use of logistic and leadership principles, managers are transformed into pseudo-leaders. It motivates and encourages all types of managers to utilize available experts and focus on using "how they know what they know" rather than depending on "what they know" to maintain the system (Figure 7). The people involved are able to operate within an environment that enables them the opportunity to exercise leadership principles despite having management and control oriented leadership. It provides a leadership guide to the management type of managers. Through this type of culture, the process or system is able to produce leadership results, whether or not the individuals involved are capable of exercising these principles outside of the provided leadership structure.

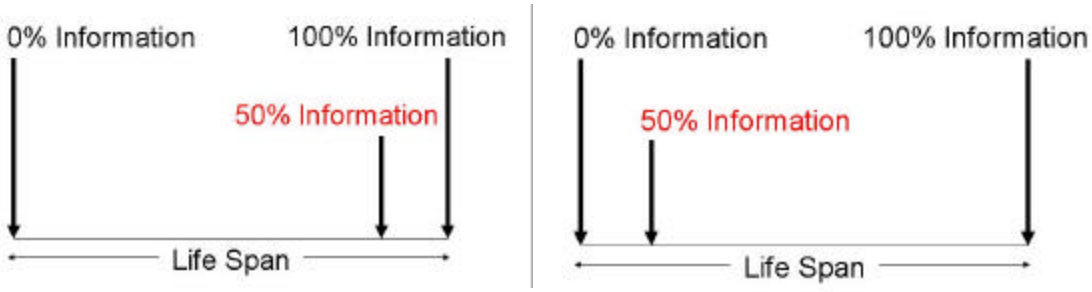

Figure 5a: Type A Perception

Figure 5b: Type C Perception

Figure 5: Perception Type

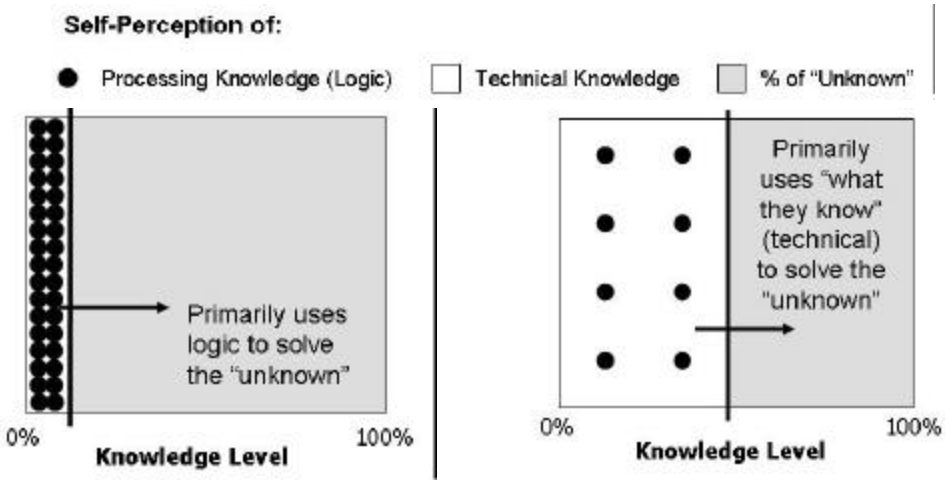

Figure 6a: "Type A" Perception

Figure 6b: "Type C" Perception

Figure 6: Amount of Technical or Expert Knowledge

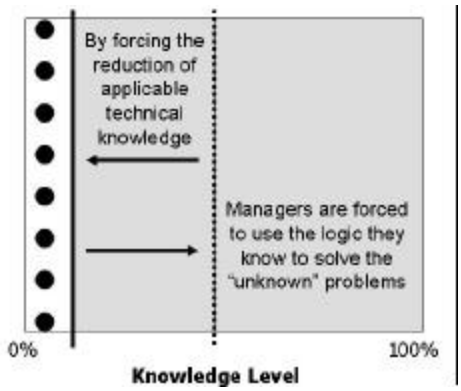

Figure 7: Implementation of a Leadership Environment or Structure

Application of Learning Rates/Amount of Knowledge Models to Leadership

Best business practices or leadership theories support this deductive reasoning. Leaders of companies often do not have any technical knowledge of the companies they lead (Collins, 2001). Successful leaders delegate and give freedom to their followers to optimize their functions (Maxwell, 1998). Leaders are able to accurately assess people. It is their alignment of the people with the proper position that empowers the followers to be successful (Trout, 1996). This matches the "Type A model" which emphasizes that knowing what one doesn't know is the most critical information; the objective is to properly align available resources with the necessary technical information to the "risk." The leader realizes that an organization's greatest asset is the people, and capable people do not have to be managed and directed. It is reasoned that this is also the most efficient model because of the following:

1. People who are hired for a job should be competent enough to do their job without detailed directions and control from their manager (Welch, 2004).
2. Communication or flow of information and decision making can be minimized when management is minimized and when leaders work with expert personnel (Buckingham).
3. It is most efficient when management is minimized, and people know what they are doing (Drucker, 2003).
4. People should be motivated to personally raise their level of performance (Deming, 1982).

"Type A" leaders are the most effective. They maximize efficiency, avoid duplication, and transfer risk to those can minimize the risk. The leader uses logic rather than the technical knowledge they possess. "Type A" leaders know:

1. That people who have been successful in a specific job can document their past performance.
2. People who are experts can simplify what they are doing and explain it in non-technical terms (Womack, 1990).
3. People who are experts are self confident, visionary in the task, and can explain what they are going to do before they do it.
4. Experts can also easily identify risk that they do not control.
5. Experts can tell you how they know they are going to be successful (quality control).

Leaders can identify experts through logic and do not require in-depth technical knowledge of what the personnel or company is doing. This concept of outsourcing is practiced by performing companies in every industry except the construction industry.

Modification of Best Value PIPS Using Leadership Concepts

Although the PIPS process initially produced high performance results, there were still areas of improvement. In mapping out the system, technical based activities were identified as activities that supported a management-control structure rather than leadership environment. In order to discourage the management, direction and control mentality, reduce the ability for the managers to use technical information, and promote leadership application in the PIPS Best Value process, the following changes in the Performance Information Procurement System (PIPS/Best Value) were made:

1. The review and rating of the risk management plans submitted by the various competing contractors became a non-technical review. The objective of the review was not to determine which was technically competent (which forces the client to be the expert and make decisions), but which could identify risk that they could not control (outside of their technical expertise or non-technical) and how they would minimize the risk. The prioritized best value contractor is later forced to technically validate the proposal and is required to address the minimization of technical risk by the specification, releasing the reviewers from making technical decisions.
2. Contractors are requested to address the identification and minimization of risk that they do not control. This approach forces the contractor by default to identify what they do control. Whatever is not identified as the risk that they do not control is, by definition, what they do control. This minimizes the communications and required documentation of the technical work.
3. The best value contractor is requested to identify the source of each risk. By identifying what they do and do not control, the contractor can also identify who controls the risk. By identifying the source of risk, the contractor can now make parties outside of their control, accountable.

The impact of the changes shifts the importance for technical performance even more to the contractor. By using the leadership models discussed, professionals representing the client can now turn their technical expertise toward the client's issues (programming, planning, and communicating the client's intent to the best value contractor). Instead of managing, directing, and controlling a high performing contractor (who is technically skilled,) the owner's representatives can be more leadership oriented, minimizing the flow of information and minimizing the owner's decision making. They will exercise a leadership structure, transferring the risk and accountability to the best value contractor who is minimizing risk by preplanning and quality control.

By accurately understanding how little they know (Figure 5b and 6b), and by using logic instead of what they know (forcing the contractor to document their previous performance, to preplan, identify and minimize risk that they do not control, and minimize the flow of information that

defines performance [on time, on budget, and the risk that they could not control]), PIPS turns the previously inefficient, management, directed and controlled delivery of construction into a leadership based, outsourcing, and optimal delivery process. By transferring the risk to the contractors, it forces them to minimize the risk that they control. It also forces them to identify risks that they do not control, how they will attempt to minimize that uncontrolled risk, and identify who is the source of the risk. Many times it is the client's representatives. The contractor will now control the construction project, and regardless of who the other participants are working for, their performance in terms of cost and time, are now documented by the contractor.

Using the models discussed in this paper, education is now being given to the client's professional representatives showing that a design or engineering professional representing the client can be a professional by focusing on their technical expertise of programming, scoping, and design of the project, translating the client's intent to the high performing contractor, and recognizing that they are not trained in construction, releasing control to high performing contractors (research efforts with University of Minnesota, City of Miami Beach, Schering-Plough, Entergy, General Dynamics, US Army Medical Command, State of Washington and Missouri) (pbsrg.com).

The authors propose that designers and engineers can increase their professionalism by becoming "Type A" leaders when delivering construction. The understanding what they don't know (which only visionary, secure, and big-picture people can do), becomes an efficient and effective mechanism to identify the best performing contractor, because it forces the best value contractor to document past performance, identify and minimize the risk of a future project, provide Type A leadership, and preplan with a quality control plan that minimizes risk that they do not control, and manage the project by risk minimization. The understanding of who a leader is, how a leader operates, and how a leader brings value to any process, assists technically based designers and engineers to select the best value contractor, and assist the best value to become a high performance contractor.

Validation of the Leadership Concepts

The hypothesis of this paper does not agree with current best practices which are heavily management/control oriented. Practices such as specifications with minimum standards, performance based standards/specifications, partnering, negotiations, quality control inspections and client's representatives directives, are all espoused by management groups that has made themselves indispensable in an inefficient and ineffective construction industry (high turnover rate, training, education, and image issues, low profit, volume based, and growth in a non-commodity industry).

The validation of the discussed leadership concepts include the following:

1. The concepts proposed by PBSRG and Harvard University in 2003, were turned down by the National Science Foundation as having "very little intellectual merit", not producing a "conceptual breakthrough", and "audacious" logic. It also commented that, "If the proposed

work really did lead to an improved mechanism for delivery, it could have very significant impacts across a broad range of economic activities." The results of the prototype testing of the principles at Harvard University earned the 2005 CoreNet Global Innovation of the year award by delivering higher value and performance at a lower price and minimized management and control (2006, Sullivan). The University of Minnesota is now into its second year of implementing the leadership structure and processes (ASU ORSPA Contract CWS-0041, 2005-2006). The same process is also being used to procure $30M of food services per year at Arizona State University.

2. The prototype testing and implementation of the leadership concepts have resulted in a 14 year, $5.8M research effort of 458 tests of $488M of construction procurement, and resulted in over 100 refereed journal and conference publications.
3. The system is the only licensed, best value delivery concept developed in the academic arena and which has been successfully tested the process over a ten year period of time.
4. The system is the only concept developed and tested in the construction industry that has been tested in the contracting and project management of other industries. The process is being implemented to procure $30M/year (7-10 year contract with renewals) of food services at Arizona State University, an emergency communication system for police/fire/ambulance services for the City of Peoria, the procurement of services for the City of Miami Beach, and software programs/support at Arizona State University (Goodridge et al, 2006).
5. The concepts led to the identification of PBSRG as the worldwide leader in the use of performance information, and the assignment to direct the CIB TG 61 in the benchmarking of the use and impact of performance information by the International Council for Research in Building and Construction (CIB) (http://www.cibworld.nl/website/newsletter/index.php).
6. The testing has led to 98% performance at up to 80% less management/control (State of Hawaii, 2002).
7. The concepts have led to an increase in contractor profits without increasing the cost of the projects (Guo, 2006).

Conclusions and Recommendations

The authors propose that identified leadership principles/concepts cannot be sustained in a management-control environment. The Best Value/PIPS process uses a structure that has embedded leadership concepts which results in a leadership environment. It is also proposed that the PIPS process is more sustainable and efficient if the client's professionals running the system learn the leadership principles being used by the process. Through the application of IMT logic and leadership models, the professionals running the process can more successfully identify and remove technical components from the system in order to overcome their management tendencies and inefficiencies. The professional should:

1. Use the IMT logic and not personal, limited technical knowledge to minimize decision making about technical issues.
2. Minimize technical directives to contractors.
3. Allow the PIPS Best Value process to self regulate the performance of the best value contractor.

It is recommended that further research investigate the value and effectiveness of these concepts from the users who are testing the PIPS process. Also, further research should investigate the effectiveness of the various IMT/leadership models in assisting the professionals to change their function and behavior.

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