Case Study of Sustainability of the PIPS Best Value Program at the University of Minnesota

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This is a case study testing the hypothesis that the best value PIPS process is a sustainable process/structure. The best value PIPS process has been tested 450 times over 13 years. However, the process/structure has not been sustainable, meaning that users have been successful at individual tests, but unable to imbed the system into their organization and standard operating procedures. It has been resisted because it minimizes the need for construction management, simplifies the delivery process and transfers both risk and control to the contractors. The University of Minnesota approached the Performance Based Studies Research Group (PBSRG) to test and implement the process. Unlike other research clients, they agreed to meet the requirements for sustainability: implementing a long term strategic plan, using and instructing a core team, running tests before full implementation, and implementing continuous education to both client professionals and contractors. This study shows the results of the hypothesis testing.

Key Words: Best value, Sustainability, PIPS, Risk management

Introduction

The Performance Information Procurement System (PIPS) is a best value selection program that was created in 1991 and developed at Arizona State University, Del E Webb School of Construction's (DEWSC) Performance Based Studies Research Group (PBSRG).

PIPS is a best value selection process that identifies a high performing vendor, forces the vendor to minimize risk that they do not control, and self regulates through risk management. The PIPS differs from other processes in the following ways (Kashiwagi 2008):

1. Minimizes the client's decision making and need for expertise and decision making.
2. Contractually forces the vendor to minimize risk that they do not control.
3. Selection concentrates on the ability of key personnel and critical subcontractors to minimize risk.
4. Requires the selected vendor to perform specified preplanning activities before the contract is awarded.
5. Transfers risk and control of the project to the vendor before contract is awarded.
6. The vendor manages, controls, and documents the project including change orders and reactions to unforeseen conditions.
7. Measures the performance before and after a project of all critical elements, which affects the competitive nature of the vendor in future projects.

The PIPS best value selection process is based on the following assumptions drawn from results of the traditional delivery of construction (CMAA 2004, Cottrell 2006, Hwang and Liang 2005; Gordon and Akinci 2007, Post 1998):

1. Construction nonperformance is caused by an inefficient delivery system.
2. Inefficiency and nonperformance are congruent principles.
3. The client dictates the level of performance of the contractor.
4. Client management, control, direction, and inspection of a contractor is inefficient and ineffective.
5. Management should be minimized by all participants in the delivery of construction.

Over forty different organizations have tested the PIPS best value selection process on 531 projects, including:

1. State of Hawaii (194 projects, $63M, 3 years)
2. State of Utah (12 projects, $81M, 2 years)
3. United Airlines (34 projects, $16M, 3 years)
4. Federal Aviation Administration (55 projects, $14M, 2 years)
5. Motorola, IBM, State of Georgia, State of Wyoming (21 projects, $56M, 1 year)

By 2002, the PBSRG had run the PIPS best value selection process on system installation, renovation projects, and new construction. The results were significantly different from the traditional delivery of construction (56 percent On time, 41 percent On budget) (Post 1998). The program had documented the following results:

1. 384 projects, $234 M of construction services delivered, and 98 percent performance (on time, on budget, and meeting client expectations).
2. Client project managers could handle up to ten times the number of projects they were able to handle in the past (State of Hawaii 2002).
3. Contractors were able to do twice as much work and make 5 percent more profit when compared to low-bid work (State of Hawaii 2002).

Despite the outstanding results, the clients testing the PIPS process could not sustain the use of the program for reasons listed below.

1. *State of Hawaii:* When a new governor took office, the newly appointed comptroller ignored the successful results of the program and terminated the program. The program was also implemented much faster than was advised by the PBSRG.
2. *State of Utah:* One of the preconditions of using PIPS was that the State of Utah would not use the pre-award period. The results on five new construction projects was 100 percent on time, no contractor generated cost change orders, and high customer satisfaction. However, the State decided to modify the system due to political pressure.
3. *United Airlines:* United Airlines used PIPS for maintenance and repair of their facilities. They finished all of their projects before UAL declared bankruptcy and stopped doing maintenance and repair.

4. *Federal Aviation Administration*: Procurement/contracting office stopped the use of PIPS due to the increased amount of construction work (33 percent) with no assistance of manpower.
5. *State of Georgia*: Stopped using PIPS when two test projects were overdesigned, and the State found out that they were the biggest risk in the delivery of the two projects (and not the contractors).

Harvard University

In 2003, the PBSRG hypothesized that "an information-based risk management decision support system can be successfully implemented and sustained in an organization that optimizes individual functions and organizational structure by minimizing construction management and delivering higher performance (on-time, no contractor generated cost change orders, and high quality and customer satisfaction) by 30 percent for the same price (Kashiwagi 2008)." The objective of the PBSRG was to create and test sustainability requirements to allow users to implement and sustain the PIPS best-value program. Harvard University went ahead with the research tests based on the documented results of PIPS. The difference between the Harvard University tests and previous tests, was that the procurement office, not the construction/facility group, directed the tests. The tests were on time, with minimized change orders, and the users were highly satisfied. The biggest surprise to Harvard was the lack of construction management, direction, and control required by Harvard project managers.

The test results were so unexpectedly successful (Table 1), the Harvard University procurement office with PBSRG/ASU as a partner submitted for and won the 2005 CoreNet Global Innovation of the Year Award (CoreNet 2005). However, the procurement project manager and procurement director left Harvard University soon after, and did not leave enough expertise to sustain the program. The lack of funding precluded further education to train Harvard personnel and establish a second core group.

Table 1

Harvard results with initial eight projects using the PIPS system (Faigenbaum 2005)

Project Name	Number of Proposals	Awarded Contractor	Past Performance Rating*	Proposal Rating*	Awarded Cost	% Below Average Bid
26 Church Street	8	Columbia	9.4	5.2	$ 425,200	36%
William James Hall	14	Gloucester	9.6	7.5	$ 114,000	30%
Sackler Museum	10	Gloucester	9.6	7.3	$ 411,000	24%
Dunster & Mather	13	Shawmut	9.4	7.6	$3,900,000	18%
8 Mellen Street	7	Pyne	9.4	5.9	$ 146,000	32%
Loeb House	10	Shawmut	9.4	7.5	$4,700,000	17%
Paine Hall	3	JBM	9.6	7.8	$ 810,000	27%
Memorial Church	5	Consigli	9.5	7.8	$2,615,000	13%

*Ratings are on a scale of 1-10, 10 being the highest and 1 being the lowest

The PBSRG continued its efforts to search for a client to implement and sustain the PIPS program. Based on previous experiences, the PBSRG identified the following requirements for sustainability (Kashiwagi 2008):

1. The client must have a large, on-going construction program.
2. The client needs a visionary who understood PIPS, was very high on the client's organizational structure, and had sufficient support from lower level managers and project managers.
3. The client needs to have an organizational goal to be efficient, to minimize management activities, to transfer risk and control to contractors, and to hold all participants (inside and outside of the organization) accountable.
4. The client must not be susceptible to political changes.
5. The client must be willing to implement PIPS slowly and correctly, over 3 to 4 years, using the PBSRG team to ensure a successful and sustainable structure.
6. The client would need to establish a long-term strategic plan.

One of the major problems for clients in implementing PIPS is underestimating the difficulty in changing the organizational paradigm to:

1. Turn over risk and control to the contractor.
2. Minimize decision making, direction, and inspection by the client's representative.
3. Turn over documentation to the contractor.
4. Use performance information to regulate contractors.
5. Minimize the use of relationships.

In the past, the ease of the process and great results in test projects lulled clients into thinking that the process could be modified or the process could be run by client representatives who were not properly educated. In 530 tests, very few projects have been unsuccessful. In this handful of projects, all of the nonperformance issues were caused by client decision making or deviation from the process as outlined by the PBSRG.

The University of Minnesota – Capital Planning and Project Management

The University of Minnesota (UMN) is one of the largest universities in the United States, servicing over 50,000 students. The Capital Planning and Project Management (CPPM) group is responsible for the procurement and delivery of all new and existing facilities on the Minneapolis Campus. On average, the CPPM group procures 300 projects a year on $40M in services.

The University of Minnesota (UMN) was first introduced to the best value program in 2003. A new Associate Vice President for CPPM, Michael Perkins, contacted the PBSRG after attending best-value conferences in 2004 and 2005, to implement and test the best value program at UMN. The objective of the pilot program was to transform the entire CPPM organization. The goal was to provide value and maximize the efficiency of the group (both internally and externally to maximize the performance for the University), and ultimately, the taxpayers.

Based on the lessons learned from previous clients, establishing a long-term strategic plan was a vital function to the long-term success of the program. The UMN established a four year implementation plan as outlined below:

Year 1: Testing
- Establish long term strategic plan and deliverables
- Identify and educate core group
- Run best-value procurement on 5-10 pilot projects (roofing, mechanical, electrical)
- Analyze pilot projects to identify impact
- Clarify roles and responsibilities within UMN

Year 2: Continued Testing / Refinement / Measurement
- Evaluate skills of core group – refine as needed to better support the growth of the program
- Continue testing the PIPS best-value process
- Expand test to different trades (General Construction)
- Educate additional internal CPPM staff
- Implement weekly project tracking system
- Refine list of qualified vendors on IDIQ list (add and/or delete)
- Identify support and educational needs for qualified vendors
- Identify performance of UMN organization (annual review)

Year 3: Transformation From Pilot to Standard Program
- Educate and allow other CPPM personnel to test the system
- CPPM acquire and perform all PIPS functions
- Core group provide all education / training
- PBSRG provide assistance on analysis and areas of weakness
- Track and monitor all UMN projects (including low-bid projects)
- Identify internal UMN areas to improve
- Identify performance of UMN PM's, Procurement, Permitting, etc.

Year 4: Continuous Improvement and Sustainability
- Identify performance of Best Value Program
- Identify performance of UMN departments / individuals
- Educate other UMN groups (Energy, Zones, Permitting, Codes, etc.)
- Implement best-value on a larger scale and other areas (A/E Services)
- Develop automated project management tool (track all projects, online, from identification of scope to final payment)

Preliminary Results of PIPS Testing/Implementation

Over a two-year period, the University has documented significant performance results as outlined below. The details of the PIPS tests are divided into participating vendor information, award information, and post project results analysis.

1. Vendor Information:
   - Number of contractors rated in the performance database: 68
   - Average performance rating of vendors (on a scale of 1-10, 10 being highest): 9.5
   - Average number of customer responses: 13
   - Types of contractors: Roofing, Mechanical, Electrical, General

2. Award Information:
   - Total number of procurements: 44 (2005-0, 2006-23, 2007-21)
   - Average size of projects: $300,000 ($50M high, $31K low)
   - Cost Analysis (awarded projects only):
     a. Allocated Funds: $10.9M
     b. Awarded Cost: $10.1M (-7.1 percent)
   - Percent of projects where the best value is also the lowest price: 50 percent
   - Average number of proposals per project: 3

3. Post Project Analysis
   - Number of completed projects: 23
   - Overall cost increases: 4.9 percent (Client) / 0.4 percent (Contractor)
   - Overall schedule increases: 48.6 percent (Client) / 4.1 percent (Contractor)
   - Number of projects with no contractors cost increases: 21 (91 percent)
   - Average PM satisfaction of best-value process: 100 percent
   - Average PM satisfaction of Contractors (on a scale of 1-10, 10 being highest): 9.4
   - Average increase in contractor profit: 4.5 percent

Two projects incurred cost increases. In the "Smith Hall" roofing project, there were delays caused by errors and omissions in the architect's design. In the "Parking Ramps" project, the contractor was directed to install new security equipment. However, after the equipment was installed, the manufacturer stated that the equipment room was too hot, and that an additional fan would need to be installed. This was categorized as a contractor change order. In both of these cases, the risk was not under the contractor's control. The changes were client driven and unforeseen, resulting in a contractor change order rate of 0 percent.

Three projects had schedule increases. The "Akerman Hall" renovation project was delayed due to a light supplier not delivering material on time. The "Social Sciences" renovation project was delayed due to a pump supplier not having the proper material on hand. The "Tate" project was delayed for additional testing of the equipment. These conditions could easily have been categorized as unforeseen events.

In summary, the UMN tested the best value program on 44 pilot projects, with allocated funds of $10.9 Million in construction. Documented results include over 7 percent savings in initial project award costs, 100 percent customer satisfaction, and less than 1 percent change order rate due to vendor delays or cost increases. A survey of 11 awarded contractors showed that the average profit increase by 4.5 percent on best-value projects. This confirms the theory that best-value increases efficiency, since the client received higher performance at no cost increase (50

percent of the best-value awards were also the lowest priced), and the vendors maximized profit margins. The positive conditions of the UMN environment for implementing PIPS include:

1. The Vice President (VP) of CPPM was a change agent, visionary, and held views that were inline with the leadership concepts based on logic and efficiency (Kashiwagi et al. 2008).
2. The VP of CPPM was hired by a senior vice president whose mantra was efficiency, value, and change.
3. The VP of CPPM was able to put together a small group of visionary implementers to run the pilot program.
4. The CPPM group had buy-in from upper management, project managers, and procurement agents.
5. The VP of CPPM understood their organization's limitations, spent the necessary time to understand why the previous users of PIPS were not able to sustain the structure, and used a strategic plan.
6. The CPPM has taken the necessary time to educate and train both internal staff and external vendors.

These conditions aligned well with the requirements identified by PBSRG for a client to create a sustainable PIPS structure.

Examining the Hypothesis

The UMN test case supports the hypothesis that a client must understand the importance of having a strategic plan, creating a core team, implementing the change slowly, and by continuously being educated on the PIPS process, the underlying theoretical foundation of Information Measurement Theory (IMT).

A strategic plan is essential to the long-term success of a best-value program. No other user group has established in writing what their objectives are and their measurements to achieve their goals. The research performed with the CPPM has shown that users have a greater chance of success if they have a measureable strategic plan.

There are two main categories of activities that may jeopardize the sustainability of a best-value organizational transformation. These areas are "performance risk" and "political risk." Performance risk is the risk of the vendor not completing the project on time, within budget, or to the satisfaction of the user. Political risk includes resistance from both internal and external parties, including; procurement personnel, upper management, project management, and the vendors. The CPPM took steps to minimize both areas of risk. Performance risk is easily avoided by simply implementing the PIPS best-value process as suggested by the PBSRG. Political risk is more difficult to contain because the greatest obstacle is the owner themselves. To minimize political risk, a long-term plan was established which outlines how quickly the user will implement change, how they will do it, and how they will measure their success. The strategic plan regulates the rate of change and minimizes decision making that could cause risk.

As documented by the research performed at the State of Hawaii, having a core team is another critical component of an organization's long-term success. The CPPM has achieved great success due to the buy-in from all critical parties (upper management, procurement/contracting, and project management personnel). The core team members cannot be changed or controlled. All members must have the capability and perception to understand efficiency, value, and the transfer of risk and control.

Every construction group is pressured to complete construction as quickly as possible. The CPPM initially set aggressive procurement schedules to make their awards as soon and quickly as possible. However, they later realized that this mentality was faulty. By spending more time upfront, they found they were able to save time and effort once the project began. Instead of rushing the award and dealing with issues during construction, most issues were resolved during the pre award period. This increased the total time to make an award, but saved time during construction. The CPPM project management also documented that there was a 90 percent decrease in overall construction management requirements. The lesson learned at the CPPM is to set a slow schedule that can be met by all parties.

Continuous education has been provided for both the contractors and the client's personnel. The client's personnel are heavily educated prior to running any pilot project. Project managers that are willing and feel comfortable with the process are allowed to run tests. Once the pilot projects are completed, documented, and analyzed, the program can be shifted towards the client's other project managers. "Training the core team who are conducive to the leadership based PIPS process" and "training of the rest of the personnel" should be treated as two entirely different stages. The second implementation requires detailed documentation, rules, and the presence of highly trained core team members. The vendors should receive continuous education periodically throughout the implementations, with debriefings at the award of projects and completion of projects.

Current Status of UMN PIPS Implementation

The UMN is now in their third year of running/implementing the best value PIPS structure. They are currently renewing for a fourth year. They are also attempting to implement the best value structure to the following design/construction functions:

1. Implement the best value PIPS structure to the planning, design, and procurement of construction. Their goal is to make the client and designer more accountable.
2. Implement the PIPS structure to change the way designers approach their design function, adding risk management, accountability for schedule, and making them manage their design with a quality control plan and a weekly risk report.
3. Using the PIPS structure to compete facility managers and their facilities to determine prioritization of funding of projects.

Conclusions

For over 13 years of research, the PBSRG has documented that the PIPS best-value selection process is capable of producing high performance results. However, the greatest challenge to the PIPS program has not been with the performance risk, but rather the political risk which has threatened the sustainability of the best value PIPS structure. The political risk has prevented many organizations from sustaining the program over an extended period of time. The results/impact of the best-value program at the UMN has shown that:

1. Best-Value does not cost more (currently awarded 7.1 percent below allocated funds and also below the average proposal cost).
2. Best-Value is not always the most expensive option (best-value was the lowest bidder on 50 percent of projects).
3. It takes an additional 10 days (on average) to procure a project using the PIPS best-value process.
4. The Pre-Planning phase makes the entire project more efficient. 21 out of 23 projects had no contractors cost increases.
5. High performing vendors are capable of accepting accountability and minimizing risk.
6. The PIPS best-value process can reduce project management by up to 90 percent on a project, allowing the project managers to manage more work with less effort.
7. Vendors documented that they increase profit margins by up to 10 percent (average rate of 4.5 percent) by minimizing the amount of time and effort spent on non-value added functions (management, meetings, etc).

These results could not have been documented without a carefully laid out strategic plan that allowed the University to gradually educate and train their internal staff and external vendors. The program documented success on both the client side (higher performance) and the contractor side (maximized profit), and was used as an example of how well best-value could work within a public organization (which allowed the State to pass the State Best Value law for all public organizations).

The UMN program also validates that the best value PIPS structure can be a sustaining permanent system. This validates that:

1. PIPS concepts work. This includes transferring risk and control to the contractor, minimizing client construction management functions, forcing contractors to preplan and minimize the risk that they do not control, and hold the contractors accountable by continually measuring their performance.
2. PIPS concepts can be permanent.
3. The source of the construction problems are the client's delivery system.
4. The most efficient and effective delivery system is one where management is minimized, and the contractor controls the project in an environment that measures performance and risk.

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