Getting it Right! Selecting the Right Contractor for the Right Job

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Introduction

The predominate procurement process in construction over the last 20 years has been the competitive "low-bid" procurement process. The following factors have affected the construction performance:

1. Price pressure. The worldwide competitive price pressure has forced facility owners to reduce costs.

2. Dwindling supply of trained craftspeople. In a "low-bid" environment, maintaining a high level of craftperson skill was not a requirement.

3. Increased dependence on minimum standards. Manufacturers constantly redesigned systems to meet minimum requirements.

4. No performance information. There was no performance information that identified relative contractor performance (the meeting of customers' expectations, performance of facilities and facility systems, and the contractor's value added capability on completed construction projects which had unique challenges).

The combined effect of the price pressures, low level of craftperson skill, minimum standards, and no competitive advantage given to high performance, has reduced the low-bid delivery system to a "lose-lose" situation which has resulted in the following:

1. Designers are forced to produce regulatory documents that direct the contractor on how to do construction.

2. Inspectors are forced to manage contractors.

3. Contractors are forced to make a profit by providing the "cheapest" possible construction.

4. Manufacturers constantly modify their facility systems to be more competitive.

5. Owners are forced to take the lowest priced contractor.

In the last five years, owners have searched for procurement processes to minimize the risk of contractor nonperformance. These potential solutions include design-build, prequalification, construction management at risk, and job order contracting. To minimize the risk of nonperformance, the following must be accomplished:

1. Win-win environment. The expectations of the owner must be met by the capability of the contractor. The minimization of the difference leads to a "win-win" environment.

2. Maximize value. Performance must be considered along with price.

3. Contractor motivated to increase performance. Contractors must be motivated to do better construction on every job.

4. Competition and opportunity. Contractors must compete based on price and capability or performance.

5. Communication. Communication between the owner, designer, and contractor must improve to minimize risk.

6. Minimized control. Management theory has proven that external control, changing contractor capability (false expectation caused by bias), and attempting to force a contractor to perform is ineffective, costly, and increases risk.

Performance Information Procurement System (PIPS)

PIPS was developed in 1991 (Kashiwagi, 1999), and tested 250 times from 1994 to the present. PIPS is composed of:

1. Theory. The Information Measurement Theory (IMT) states that past performance will identify future performance. It also states that experience can be measured in terms of being able to predict rather than react. It states that processing speed, ability to perform and improved performance can be measured in relative terms. IMT also states that risk is minimized by the owner by listening to and differentiating between contractors. All data is subjective, it is a perception that is biased. IMT states that bias that does not predict a future outcome should be minimized.

2. Process. PIPS is composed of the following steps: past performance identification (contractor identification of differentiating criteria, contractor identification of past project references, collection of performance data, compilation of past performance barcodes), request for proposal (full design or system requirements and the owner's requirement in terms of relative weighting of the performance criteria showing past performance, current capability, future capability), prebid meeting,

submission of bids and management plan, interview of key personnel, prioritizing the alternatives based on differential of barcode data by an artificial intelligent processor (past performance data, ability to identify risk and how to minimize the risk), the review of all documentation by the top prioritized contractor, a preaward meeting where the contractor agrees to perform the construction on budget, on time, meeting the quality expectation of the owner, award of the contract, construction, rating of contractor's performance (performance of the project is worth 25% of the future performance line).

3. Past performance barcodes. Past performance of critical elements of the general contractor's team including the general contractor and key personnel (project manager and site superintendent), and critical subcontractors such as mechanical, electrical, and roofing.

4. Artificial intelligent decision maker. A modified Displaced Ideal Model (DIM) (Zeleny, 1984) is used. It prioritizes performance based on distance from the best value in each performance criteria, multiplied by an information factor (clarity of differential which would be zero if there was no differential), and a weighting factor (subjectively set by the owner) that is included in the RFP. The modified DIM compares subjective and objective data without translation (changing the values to a common point system).

Performance information is generated by the DIM by comparing the relative data points of the contractor's barcode. In generating the data, the following rules are used:

1. Allow the party with risk to make the decisions. For example, the contractors should identify the criteria and pick their own references to differentiate and show their capability.

2. Subjective decision-making by others should be minimized. The people with the most information should generate data that predicts the future relative performance of the contractor.

3. No one is disqualified. There are no minimum scores or number of references required. The system allows the contractors to every opportunity to do well. If a contractor has done good work and knows their customers, they will be able to prove a past performance. No contractors are prequalified or disqualified.

Risk Reduction Steps

There are six major PIPS safety nets that reduce the risk of nonperformance:

1. Past performance references. The requirement to identify past references will either eliminate a poor performer by low scores or a decision that their scores cannot compete.

2. Management plan requirement. Unless the contractor is qualified and experienced, they will not know how to identify and minimize risk. They will also have difficulty creating a detailed cost breakout and construction schedule.

3. Interview. The lack of capability of a contractor's key people becomes evident in the interview.

4. Prioritization. Only the best available option is selected. The system does not concern itself with the lower performing options. The score of the lowest performing option does not impact the system.

5. Preaward meeting. The top prioritized contractor is required to review the design with their critical subcontractors. They are required to identify all components of the construction which cannot be built, require clarification, or which can be improved to minimize risk. They are then required to sign a contract that they will only get financial relief if there are scope changes or unforeseen conditions.

6. Final construction rating. The general contractor is rated on the construction with all the critical subcontractors. It is recommended that the entire team get the same score. The rating is worth 25% of their future performance line and will be posted on the Internet.

The value of the six PIPS safety nets is that nonperformance of a contractor is identified through both relative data and an identification of poor performance. To win the bid, a poor performing contractor has to do everything that a performing contractor would usually do in a performing situation. The system creates an information environment that makes a non-performer feel uncomfortable or change to increase their performance.

Testing of the PIPS

PIPS was first tested on roofing systems. Roofing was picked due to the simplicity of roof installations and the opportunity to minimize the risk of leaking roofs by selecting contractors who did not install leaking roofs. By identifying the high performers, the controversy surrounding failures of different roof systems become a moot point. By competing the best of the different systems (contractors and manufacturers), the owner not only got performing roof systems but also the "best value" roof system based on competition (performance and price). The amount of paperwork with PIPS was reduced when compared to the traditional low-bid system. The owner's RFP included the legal contract documents, the requirements of the roofing project (moisture survey showing wet spots, core identifying existing membrane composition, and the identification of the roof deck.) The contractor's bid package includes their bid, a management plan (two pages—detailed cost breakout, means and methods), along with the past performance of the contractor and manufacturer of the roof system proposed. The alternatives are prioritized based on performance and price.

The maintenance personnel, who have been performing the maintenance on roof systems due to the inability to get the manufacturers to fix problems, have been very pleased with the PIPS results and want to change all roofing projects to PIPS. A roofing manufacturer's representative that is required to sign warranties on the PIPS roofs noted that there is no comparison between the contractors' previous performance and their current performance. The roofing warranties (full service, enforceable)

have been increased from two years to a minimum of 10 years. The use of performance information has made warranty length a moot issue, since the contractors and manufacturers are more interested in maintaining their performance numbers.

PIPS was also run on painting and waterproofing with similar results. Customer satisfaction of 60 roofing jobs is averaging 9.5 on a 1–10 scale. The comparable low-bid satisfaction number is 5.61.

PIPS was then run on the Federal Aviation Administration (FAA) storm damage repair projects in Hawaii and California. The projects were finished on time and on budget with no contractor generated cost change orders. The project manager stated that this was the first time all the projects had been designed, procured and constructed. PIPS was then run on facility renovation projects with scopes of $500K jobs at United Air Lines Maintenance Center at San Francisco.

There were two hurdles that PIPS had to clear:

1. Could PIPS be successful on large construction projects?
2. Could an owner run PIPS without the assistance of PBSRG and the author?

Up to 1998, PIPS had not been tested on large, complicated, general construction projects. In the spring of 1999, PIPS was tested on the University of Utah Phase II Housing Project (2002 Olympic Housing). The following describe the test results:

1. The entire process was implemented in two and a half months. This included education, registration, data collection, management plan reviews, interviews, and prioritization using the AI system.
2. The highest prioritized contractor who met the requirements was $5M under the budget.
3. The top prioritized contractor had outstanding project manager and site superintendents.
4. Despite being delayed up by Phase I (low-bid awarded contracts,) "unforeseen conditions," slow response from the designer, and no finished elevations for three months into the project, the general contractor finished the construction in the allotted time.
5. The PIPS test results were comparable or better than the design-build or the low-bid parts of the project (fewer change orders, unforeseen conditions, and delays).

The Olympic Village project was followed up by an Academic Training Center (ATC) addition at Brigerland, Utah ($3.5M), correctional facility buildings ($7M), and a physical education building at the Southern Utah University (SUU) ($17.5M). The following were the results:

1. Subcontractors were selected based on performance and price.
2. All projects were on time, and on budget, with no contractor generated costing change orders.
3. The Bridgerland ATC was delivered in seven months, a year ahead of time.
4. Cooperation and performance of critical subcontractors on all the projects was noted as "the best that had ever been seen."
5. The users were stunned by the success of the projects.
6. Project managers were impressed by the contractors.

Dedicated PIPS "Core Group"

Although the PIPS process was criticized by many in the State of Utah, the success of the projects were undeniable. The projects were the "best construction in the last 10 years." Risk (not on time, not on budget, not meeting quality expectations) as minimized. The high performance subcontractors selected performed. The State of Utah tests identified a critical element of PIPS; it required a couple of dedicated PIPS staff with the following "information worker" attributes:

1. Understanding of IMT logic and PIPS.
2. Minimize decision-making and subjective bias.
3. Comfortable with the minimization of control and inspection.
4. Facilitate the success of the contractors.

The State of Utah did not have the funding for a dedicated "core group." Despite what a "core group" could accomplish and a very heavy workload, the State of Utah Building Board decided to discontinue PIPS and use a "Value Based" procurement system which was easier to run, used subjective prioritization instead of AI nonbiased prioritization, and less performance data (eliminated the need for critical subcontractor performance data).

The State of Hawaii took a different approach to implementing PIPS and IMT. Their objective was to build the "core group" and to restructure based on an "information worker" organization. The three trained personnel (an administrator to resolve disputes, a program manager for the PIPS program, and a project coordinator to run projects through PIPS). These three personnel were educated and trained over two years. In 2000, the State of Hawaii took over the PIPS program for roofing. The team moved to mechanical retrofit, electrical projects, and general construction in 2001.

PIPS Implementation

The speed of PIPS implementation depends on the affinity for IMT by the core group. If the core group is an "information worker" group, implementation can happen within a year. Minimum costs for PIPS implementation is $50K. The authors encourage PIPS core groups to:

1. Attend PIPS annual training at Arizona State University.
2. Conduct a four-day PIPS seminar for contractors, project managers, inspectors and designers.
3. Continually modify the process to minimize subjectivity and emphasize performance.
4. Do not use PIPS to select designers. Allow designers to participate in the PIPS implementation.
5. License PIPS modeling, database, and education from ASU.

Challenges of PIPS Implementation

The difficulty with implementing PIPS and selecting the right contractor is that many facility managers, owners representatives,

designers, and project managers have not been educated in being "information workers." Managers and engineers in construction are educated to control and make decisions. "Information workers" are more in line with leadership principles. Information workers identify performers and assist the performers to be successful. Information workers are facilitators. Deming states, "Pick the best people and educated them" (Deming, 1982). Pick the personnel who have an affinity for IMT, and train them into the PIPS "core group." PIPS will pick the best contractor for the project, and assist them to be successful. The principle has been proven over 250 tests. Performing contractors are the key to good construction.

Conclusions

PIPS has been tested successfully on complex general construction projects. PIPS has been successfully transferred to a "core group." The future of construction is to use performance information to minimize risk. Construction managers who can be "information workers" will be in high demand due to their productivity, ability to use the information technology, and minimization of risk. Instead of using information technology to communicate data, information workers will use the information technology to manage construction.

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