

THE IMPACT OF EDUCATION OF CONSTRUCTION CLIENTS

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ABSTRACT

Research has identified the client or construction delivery system as inefficient and one of the major causes of nonperformance. A proposed hypothesis is that the clients lack a knowledge of supply chain best practices, supply chain management efficiency and outsourcing. The resulting environment produces an excess of solutions with little or no documented results, biased research, and no benchmarking of performance. The authors propose that through the facilitation of owner education, the knowledge gap may be closed, and the level of the construction industry elevated. This hypothesis will be established through supporting documentation as well as a recent case study detailing the effects of facility owner education.

Keywords: facility management, facility education, supply and demand, construction industry.

Introduction

The construction industry is experiencing an increase of construction inefficiency. Despite rising construction opportunities, revenue is declining. In the past year, the total revenue for the Top 500 companies according to ENR dropped 1.8%, with an average decline of 10.3% per company (2004). Contractor failure has also increased, with payouts for poor and unfinished work rising by 28% (Armendariz 2004). Overall construction performance has mirrored these results, with a majority of owners expressing dissatisfaction with projects being over-budget, past-schedule, or poorly handled (Egan 1998, Butler 2002).

Alternative award systems, management programs, increased specification, and other attempts to rectify the situation through the supplier's side have proved unsuccessful (Post 1998, Murray 1993). The ineffective results can be explained by analyzing the construction process through a simple Integrated Definition (IDEF) model that diagrams the hierarchical series and interfaces involved in the construction delivery system (See Figure 1). At first glance, project performance seems to be determined by the contractor's ability to minimize construction risk. However, the event of the contractor constructing is not independent. It is contingent on the environment primed by the owner (Guetzko 2004). Although the contractor is the instrument of execution, the conditions, constraints, and even the choice of instrument is made by the owner. The contractor has very little control over the quality of construction. Similar to a tool, the contractor is constrained by personal abilities and works within their financial constraints (US Services 1998, ENR 2004). As the owner determines the preliminary conditions, award methods, and processes of facility projects, they initialize a cascading effect that will establish the project outcome. Ultimately, it is the owner's that must identify the correct means in order to effectively minimize construction risk (not on time, not on budget, and not meeting the client's expectations.)

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As the driving force of this supply chain, any incongruent owner misconceptions regarding the industry will increase the chances of utilizing an ineffective system. In many cases, it may cause self-defeating processes or methods to be set into place. The minimization of this effect is the driving motivation for owner education. While FM education has become more accepted in the past decade, the lack of education has always been perceived to be a problem in the construction industry (Post 2000). The following case study will address the need for and effectiveness of an educational program directed towards the owners.

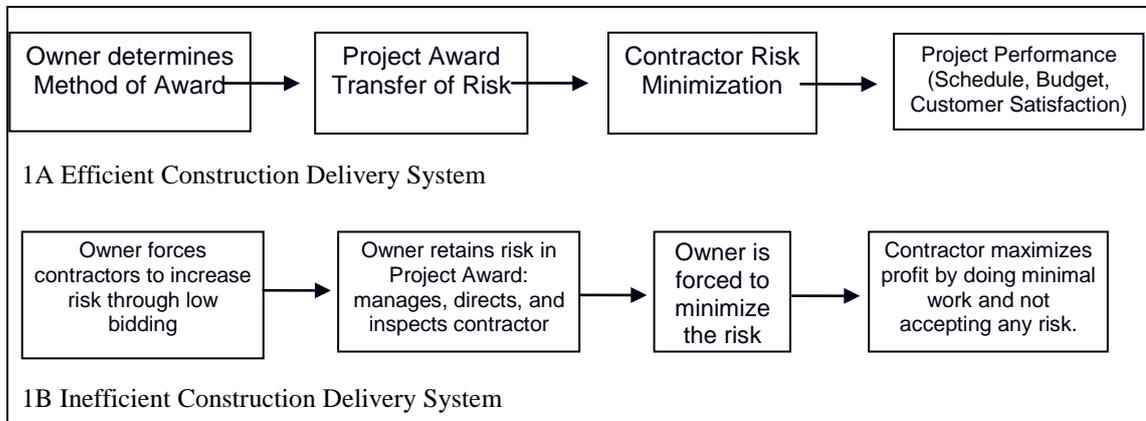


Figure 1: Efficient Delivery System vs. Inefficient Delivery System

Performance Based Studies Research Group

The Performance Based Studies Group (PBSRG) is a division of Arizona State University, devoted to streamlining the construction procurement process and increasing the efficiency and performance levels in the industry. As an educational entity, PBSRG accomplishes its mission through industry testing and implementation, as well as through industry education for contractors, designers, sureties, and owners. The two are self-sustaining, as they are maintained and supported by each other.

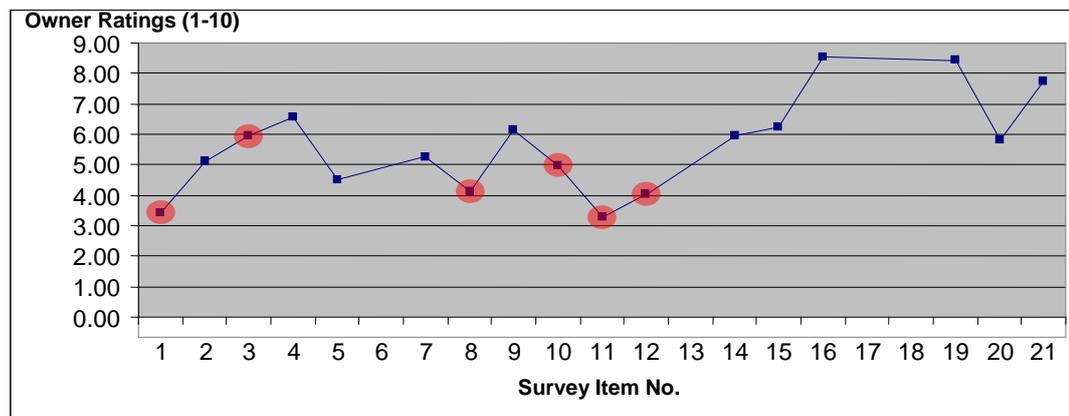
Over the past year (2004), PBSRG has educated 365 facility owners in procurement seminars given throughout the United States. In order to measure the effectiveness of the educational seminars as well as the change of industry perception, the owners were asked to complete a survey before and after the presentation. Three questionnaires were used in the surveying process, each composed of approximately 21 questions. The survey invited the participants to rate their agreement level (on a scale of 1-10, 10 being the highest) to various statements concerning the construction industry (See Table 1). The results were compiled and analyzed.

Survey Results

In order to compare the individual issues on the industry questionnaire, the statements were adjusted to align with current research. For example, if an issue originally read, “The construction industry has a large profit margin,” with an average owner rating of 2.5, it was adjusted to, “The construction industry does not have a large profit margin,” with an average rating of 7.5. Through this method, the results revealed the degree that the owners’ perceptions paralleled current research results in the fields of management theory, construction procurement, and business best practices. Of the twenty questions, items six, thirteen, seventeen, and eighteen were excluded due to inadequate published research. Figure 2 displays the average respondent rating for each of the issues before the educational seminar.

Table 1: Owner Questionnaire

No.	Questionnaire Statement	Responses
1	The majority of owners outsource construction	314
2	Contractors should be selected based solely on Performance (and not price)	313
3	The owner should never give their budget to the contractors	315
4	Awarding to the best-value (first cost) is more expensive than low-bid	314
5	The owner should be involved in decision-making	260
6	An efficient delivery process should maximize the amount of information passed	312
7	The facility owner should have technical expertise in what they are trying to buy	364
8	Low performing contractors are the major source of problems in the construction	314
9	Minimum standards and specifications increase quality and performance	314
10	More extensive and accurate specifications are needed in the industry	364
11	Management and inspection are very important to the success of a project	315
12	Warranties are very important since they protect the owner from issues that may arise in	314
13	The owner should be involved in creating and enforcing a quality control (QC) plan	315
14	A successful facility manager should outsource risk	361
15	A facility manager should feel comfortable minimizing control and inspection	362
16	Long term partnerships build trust and relationships	315
17	Long term partnerships decrease performance and value	365
18	In a best-value environment, trust is not a key component	365
19	A facility manager / owners representative should feel comfortable measuring	362
20	A facility manager / owners representative should feel comfortable minimizing the	364
21	The time/cost to measure the performance of individuals is often worthwhile	362



● Owner biases addressed in the paper

Figure 2: Average Response Before Education

Each issue was then given an ‘Incongruity Level,’ that accounts for both the averaged level of the responses as well as the variability between owner ratings. This was computed by dividing the owners’ average rating by the scaled variance of the issue’s ratings. As either the owner response lowers or the variance of the responses rises, the assigned incongruity level increases. Table 2 displays the results from this process. By evaluating the responses, it is noted that the industry bias deviates from proven industry studies. In many cases, they oppose and disavow each other. This section will address the top six owner biases that do not correspond with documented research.

Table 2: Identifying Congruity

Item No.	Average Response Before Education (R _{Ave})	Variance	Incongruity Level $\frac{R_{Ave} * (Var_{Max} - Var_{Min})}{Var - Var_{Min}}$
1	3.44	14.13	2.91
8	4.15	10.88	1.69
10	4.98	11.29	1.48
3	5.97	12.37	1.40
11	3.29	8.21	1.39
12	4.05	9.27	1.37
2	5.12	9.27	1.08
5	4.50	8.31	1.03
9	6.16	9.53	0.94
16	8.53	11.4	0.88
4	6.56	8.85	0.78
7	5.26	7.42	0.73
20	5.82	6.51	0.51
14	5.96	5.64	0.37
15	6.23	4.84	0.23
19	8.44	3.25	0.00

Confusion In The Industry

Owner Bias #1: Management and Inspection are important to the success of a project (Item No. 11, Average Rating 6.7). Management and inspection roles were created to enforce the construction performance stipulated by the owner. The *Just in Time (JIT)* theory contradicts this reasoning, and views management and inspection as non-value added components that do not contribute to product desirability (Imai 1997). JIT assumes that defect prevention rather than rework will stabilize a process for sustainable quality. Increased management and inspection draw the focus to the occurrence rather than preclusion of error, deeming construction gaffes acceptable. Instead, JIT promotes a culture intolerant of mistakes, investing and allocating resources to the system’s process that delivers quality with little risk.

Furthermore, contractors are employed to compensate for an owner’s lack of technical expertise in construction. Their task is to minimize the owner’s risk by performing a function in their area of specialty. By encouraging management and inspection, owners reclaim the risk that they had previously outsourced. Their behavior is inefficient, as it frustrates the initial plans by neutralizing the benefits of expertise. Instead, the owner is left saddled with the project risk, naively lulled in the false security of an emasculated professional (Korman 2004).

Owner Bias #2: Owners should never give their budget to the contractors (Item No. 3, Average Rating 5.97). Owners are under the impression that giving their budgets to the contractors will result in an exploitation of project costs. This may be true in a low bid situation where contractors will often bid low, and then process change orders to use the full owner’s funding. However, when awarding based on price and performance (value), the owner is assisting the low performing low-bidder to get the project if they do not give the budget (critical information in the case of a lack of a clear scope definition). The low bidder does not gain an advantage if they increase their price. That is their advantage due to their poor performance. The high performance contractor who minimizes risk, will raise their price when not given critical information (time, budget, clear scope, and expectation) to minimize the unknown risk. This bias has led to government agencies not giving budgetary figures, but

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rather ranges that assist the low bidder (FAR). While there are an insufficient number of documented cases to assume that project budget disclosure is correlated to successful projects, there is no evidence to prove contrary (FAA, Harvard University, USAMedical Command, USCG.)

Owner Bias #3: More extensive and accurate specifications are needed in the industry (Item No. 10, Average Rating 5.0). A specification is defined as, “a detailed, exact statement of particulars (Specification 2005).” This has a strong correlation to commodity products, which use precise measurements for the assurance of performance and success. The purpose of specifications in the construction industry has been warped over time. While construction is a service that utilizes commodity products, it is not a commodity in and of itself. The service requires technical expertise and judgment in the application of commodity products, as well as creativity and aptitude in providing effective solutions. The utilization of technical specifications in construction is ineffectual and deceptive as construction standards have little effect on the performance level of a contractor (Holf 2003).

Ironically, specifications are detrimental to the owner, as they force the retention of risk for design deficiencies. They provide the contractor with instructions that do not require experience or examination, as well as a default for construction failure. They allow the contractor to provide a minimum standard material at a maximum industry price (Murray 1993). As one owner stated, it is reaching down to the lowest level of practice in order to raise the level (Post 2004).

Functional, general specifications tend to be more effective than technical specifications (Mahtesian 1994). They allow owners to describe a problem without using explicit instructions and permit vendors to propose their own creative solutions. Instead of conforming to technical requirements, the contractors must focus on customer satisfaction. Miscommunication is minimized as the owner’s translation between desired outcomes and actual solutions is eliminated and is performed by the contractor.

Owner Bias #4: The majority of owners currently outsource construction (Item No. 1, Average Rating 6.6). Outsourcing is defined as the “delegation of non-core operations...to an external entity that specializes in that operation (Outsourcing 2005).” Because outsourcing is a market-driven activity, the customer essentially determines the relationship’s structure by determining the amount of control to relinquish. Providers are flexible and immediately respond to changes in the market’s demands.

Owners in the construction industry are currently aiming for an outsourcing relationship. However, the target has been overshot into the closely related field of vendor associations. The difference is in the transfer of control. Outsourcing will shift a significant amount of control and risk to the supplier, while a vendor exchange will not. As control and risk are reallocated, the owner’s involvement in the “how” is minimized, allowing them to focus on the “what” of the business (Corbett 2004). Thus, successful outsourcing will occur when the owner is not included in the technical aspect of construction, and decisions and accountability are effectively retained by the specialist. The current field does not reflect this (Post 1998).

Owner Bias #5: Warranties protect the owner from issues that may arise in the future (Item No. 12, Average Rating 5.9). Warranties are made for the express purpose of limiting contractor and manufacturer liability. Through the Uniform Commercial Code Law, each owner or user is entitled to an adequate product used under “reasonable consequence (Smith 2005).” Owners are automatically empowered to receive compensation for failure. Warranties protect the manufacturer by constraining their obligations. They are “marketing tools” designed to pacify the owner. As one expert asserted, “A warranty may not be in the

best interest of the facilities executive. [They] might get a better coverage without a warranty (Roof Consultants 2004).”

The coverage of a warranty is directly correlated with the contractor performing the construction. As the warranty is designed to protect the supplier, the life length of the system depends completely on the installer. If the construction is done well, the warranty will be unneeded. If substandard, the warranty will likely hold clauses that deem it to be of no use to the owner (Consumer 1992). Warranties do not guarantee the life time of a product – only performance can do that.

Owner Bias #6 Low performing contractors are the major source of problem in the construction industry (Item No. 8, Average Rating 5.9). The problems in the construction industry and the contractor’s role are similar to cracks in a dam. Although the escaping water is causing damage, it is not the problem but an effect or symptom. Any attempt to blame, divert, or control the symptom will be ineffectual. It is only by fixing the source that the problem may be resolved.

As with any marketable service, construction is a demand driven event. Supply is a symptom or indication of the type of demand communicated. The owner gives specific desires, constraints, and expectations, and the specialist attempts to satisfy the owner through their skill and expertise. Failure benefits neither party.

An owner’s core function in construction is facilitation. As owners do not have the expertise to make educated technical decisions, their job is to identify competent entities with the necessary skills. When owners are forced to make decisions, the work has been poorly outsourced, and the FM as well as the contractor has been unsuccessful. Hired specialists do not remove total risk from the project. Nevertheless they are presumed to have competitive abilities superior to in-house management. In allocating decision making to an outsourced entity, the owner is investing in their own judgment and assessment of the specialist. The trust involved is not focused on the specialist, but on the owner. With this assumption, the following are guidelines for defining owner demand:

1. Use historically performing contractors. If the goal is quality work, then bidders with similar experience and capabilities must be used (Snyder 2003).
2. Award projects on both measurable “value-added” performance as well as price. Studies have found that owners treating construction as a commodity, with an emphasis on price, as well as those nurturing long term relationships, often do not receive the highest value for their money (Tuchman 2005).
3. Avoid the low bid arena. As owners pressure vendors to lower prices, the budget decrease must come from somewhere. Profit margins are driven down and must be accounted for, usually resulting in forced corner cutting (ENR 2004).
4. Facilitate contractor planning and risk minimization early in the project. Drive the contractor to outline critical choices and comprehensive project planning (Casinelli 2005).

The construction process begins and ends with the owner. The relationship that the owner establishes with the contractor must be grounded in a win/win proposition with fair and reasonable opportunity. As the demanded expectations are matched with appropriate resources and processes, the quality of the supply will follow.

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Conflicting Principles

The survey results disclosed inconsistencies in the owners' managing principles. While they seemed to be aware of current best practices in general management, they were unable to transfer these principles to the construction field. The following are identified statements that were rated incongruently in the survey:

1. While FM's believed that most owners outsource construction and should outsource risk, they favored controlling project risks through decision making and enforced quality control (QC).
2. Although the owners felt that minimum standards and specification would not increase quality and performance, they vied for more extensive specifications.
3. The majority of owners agreed that FMs should feel comfortable minimizing the amount of control and inspection they perform, but asserted that management and inspection are important to a project's success.
4. Lastly, owners indicated that facility managers should feel comfortable measuring themselves in terms of performance. However, owner accountability was placed second to contractors as the source of low project performance.

Effect Of Education

The change or differential between the questionnaire statements before and after the educational seminar were assessed. It was recognized that statements producing a drastic alteration would confirm the instability of current principles in the construction industry. In looking at each questionnaire, the shift varied from a change of 4.3 points to a change of .47 points. The average change for the responses was 1.4 points (See Figure 3 and Table 2).

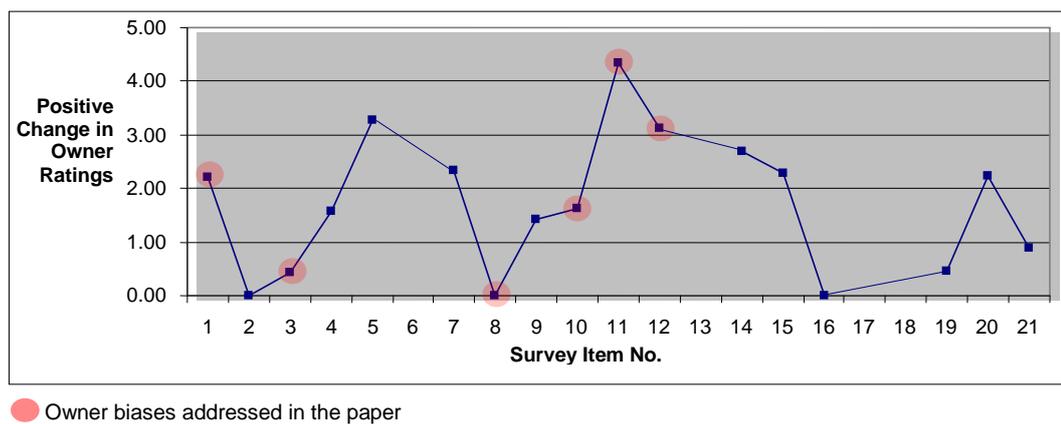


Figure 3: Positive change between owner responses 'Before' and 'After' education

Education was successful in influencing the owners' perceptions towards the construction industry. This was specifically true in items relating to management theories. However, it should also be noted that education did not significantly affect the facility manager's view of the contractors. Although they identified the value in following best practices, the owners did not seem to realize the correlation between their actions and the contractors. The owners were able to see the logic of the principles, but not the application. It may be concluded that facility education must be followed up with a more in depth accounting of applicable case studies.

Table 3: Positive change between owner responses ‘Before’ and ‘After’ education

No	Criteria	Average Response Before Education	Average Response After Education	Positive Change
2	Contractors should be selected based solely on Performance (and not price)	5.12	4.00	0.00
8	Low performing contractors are the major source of problems in the construction industry	4.15	3.95	0.00
16	Long term partnerships build trust and relationships	8.53	5.37	0.00
3	The owner should never give their budget to the contractors	5.97	6.41	0.44
19	A facility manager / owners representative should feel comfortable measuring themselves (in terms of performance)	8.44	8.90	0.47
21	The time/cost to measure the performance of individuals is often worthwhile	7.73	8.61	0.88
9	Minimum standards and specifications increase quality and performance	6.16	7.58	1.42
4	Awarding to the best-value (first cost) is more expensive than low-bid	6.56	8.13	1.57
10	More extensive and accurate specifications are needed in the industry	4.98	6.61	1.62
1	The majority of owners outsource construction	3.44	5.65	2.21
20	A facility manager / owners representative should feel comfortable minimizing the amount of technical information passed to the owner	5.82	8.04	2.22
15	A facility manager should feel comfortable minimizing the amount of control and inspection they perform	6.23	8.53	2.30
7	The facility owner should have technical expertise in what they are trying to buy	5.26	7.59	2.33
14	A successful facility manager should outsource risk	5.96	8.65	2.69
12	Warranties are very important since they protect the owner from issues that may arise in the future	4.05	7.17	3.12
5	The owner should be involved in decision-making	4.50	7.77	3.27
11	Management and inspection are very important to the success of a project	3.29	7.63	4.34

Conclusion

The existing views of management and performance in the construction industry are insubstantial and contradictory to best practices. Because the industry’s inefficiency and poor performance is tied to the pulling demand of facility owners, attempts to raise the level of quality and performance have not been successful. Facility management/owner education has proven effective in indoctrinating and acquainting owners with correct business and management principles. Education has the ability to alter the owner’s biases through logical explanation, reasoning, and past case studies. If the industry’s performance is to improve, the source of demand must be addressed first. Through the orchestration of similar facility

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education, owner perception, customs, and techniques can be changed. The impact to the industry culture and construction demand will provide the principal key in needed to increased performance in the construction industry.

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