Development of the Job Order Contracting (JOC) Process for the 21st Century

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Abstract

This research describes the concept of "Job Order Contracting" (JOC). It defines the "theoretical" advantages and disadvantages of the JOC (also known as "Delivery Order Contract" (DOC) and "SABER"). The article introduces the Center for Job Order Contracting Excellence (CJE) and the first documented performance of JOCs. The article also introduces the use of Performance Based Procurement System (PBPS) to set a "minimum performance" requirement and improving the performance of the JOC process.

Introduction

With the competitive worldwide marketplace forcing facility owners to minimize operation and maintenance costs, many facility owners are moving to modular construction to reduce the need for complex engineering design. The renovation of existing facilities has become a viable option for facility owners. "At present, almost half of the money spent on building construction in the US is spent on renovations, additions, or replacements of major systems in existing buildings ($55 billion). Over the past 15 years, renovation spending has increased an average of almost 7 percent per year and only declined one year (1991)." (1) The traditional specification, design, and low bid award delivery system for minor construction or facility modification has the following deficiencies:

1. Specifications and drawings are compiled by designers who often do not have the best construction experience.
2. The delivery system is a time consuming process requiring time for each step of the process: design (three months), advertisement (three weeks), bidding, award (three weeks), and mobilization (three weeks).
3. The competitive low-bid award system motivates contractors to do minimal quality work that meets the minimal requirements of the specifications.
4. Lack of motivation for the contractor to increase performance, training, or safety.
5. Contractors are not rewarded for high performance construction.

Facility owners who are trying to keep up with changing operations requirements and operation line optimization may wait for six months for facility modifications with the current specification, design, low-bid award procurement process. Thousands of dollars could be saved by delivering construction modifications sooner. The Job Order Contracting (JOC) process is a delivery system that was developed to meet this need.

Facility engineers at the U.S. Military Academy, West Point, realized the disadvantages of the design-bid-build delivery system in the early 1980's. A process that could provide timely construction to meet the facility requirements of an aging facility was needed. They decided to implement an experimental indefinite delivery- indefinite quantity (IDIQ) facility maintenance contract which was first used by the Supreme Headquarters Allied Powers Europe (SHAPE) in Belgium. This new delivery system resembles the just-in-time and partnering contracting delivery system used by the Japanese automobile makers to meet the rapidly changing needs of the worldwide competitive marketplace. By implementing the new delivery system, the facility engineers at West Point managed to accomplish the following:

1. Minimized the response time for facility construction.
2. Reduced the workload on in-house design staff.
3. Enhanced quality control.
4. Lowered the contract administration costs.
5. Reduced construction costs.
6. Reduced the backlog of maintenance and repair.

JOC is used in nearly every US military site in the world. There are over 200 JOCs in place in the public and private sectors, ranging from one to five million dollars of construction per year.

Job Order Contracting Process

A JOC system is based on a competitively bid, indefinite delivery - indefinite quantity (IDIQ) contract between a facility owner and a construction general contractor. The contract predefines basic construction units of work in a unit price book (UPB). This book defines a unit price to be paid for each of the construction line items. Over 40,000 line items are included in the UPB. The JOC on a site usually competes against the in-house construction capability and the traditional design, advertise, and low-bid award delivery system.

A JOC includes the following conditions:

1. Design and construction by the JOC contractor.
2. A minimum and maximum amount of work per year per site.
3. A maximum limit on the size of a job order (usually $300,000 for the federal government).
4. Construction tasks not included in the unit price book may be negotiated.
5. A facility owner may award more work to a performing JOC.
6. A facility owner may exercise "option years" to extend a performing JOC.

A JOC is awarded on a low-bid, competitive award basis. The facility owner uses a UPB to identify a cost of doing business. To bid on a JOC, contractors will do the following:

1. Estimate what types of construction work will be required at the site during the year.
2. Using the UPB unit prices, estimate the facility owner's cost of construction.

3. Estimate the contractor's cost of construction. The difference between the facility owner's cost based on the UPB and the contractor's cost is represented as a coefficient which is used as a multiplier that covers the contractor's overhead and profit as well as any adjustment between the UPB and the local prices. The coefficient is then submitted as the bid submittal price.
4. Submit the bid.

The JOC is usually awarded on a "low-bid" basis. As soon as the contract is awarded, the JOC contractor mobilizes and establishes a site office adjacent to the facility management staff. The JOC contractor's representative becomes a member of the facility management staff. When a facility owner or user has a construction requirement the contractor's representative arranges for a site visit and prepares a simplified design and preliminary cost estimate. After design approval, the contractor and the facility manager establish a detailed cost estimate using the UPB. By using estimating software that computerizes the UPB data, the estimating process is completed quickly. After approval, a job order is issued and the contractor begins construction.

Theoretical Advantages of JOC

Major theoretical advantages of the JOC process over the traditional design and low-bid award delivery system should include:

1. Higher quality of construction and service due to the partnering and performance incentives.
2. Construction starts approximately 30 days from the identification of construction requirement.
3. The simplified design documents and acquisition process eliminates the need for complicated and repetitive contract documents for similar or standard type construction.
4. In case of unsatisfactory performance, the facility owner can unilaterally decide to stop using the contract once the guaranteed minimum amount is awarded and can use the traditional design/specification process or in-house construction capability.
5. A procurement process that legally allows government entities to raise the level of performance, eliminate redundant "boiler plate" documentation and other procurement functions, and allow contractors to partner with the facility users.

Theoretical Disadvantages of the JOC

The following are the "theoretical" disadvantages or problems with the JOC process:

1. Facility owners were using multiple JOC contractors at a site. The motivation was to force JOC contractors to compete and increase the level of performance. The problem with this philosophy is that JOC requires a minimum mobilization at a site. The "sunk cost" of this mobilization is a win-win situation only if the JOC contractor is able to do a large volume of work. Multiple contractors with mobilization costs negates the win-win philosophy of the JOC.

2. The awarding of JOCs to low bids motivates low performing contractors to bid low to win bids. These contractors then deliver a low level of performance to attempt to break even. The low-bid award process can negate the advantages of JOC.

Center for Job Order Contracting Excellence (CJE)

In 1994, a group of JOC/SABER/DOC contractors gathered at Arizona State University (ASU) to address the successes, failures, and future of the JOC industry. They were presented with the concepts of industry stability, differentiation by the performance, the shortcomings of the low-bid procurement system, information systems, and the unstable structure of the construction industry. The result of the meeting was the establishment of the Center for Job Order Contracting Excellence (CJE). The objectives of the CJE are to:

1. Collect performance information on Job Order Contractors.
2. Disseminate the performance information to assist facility owners in reducing risk and life cycle costs and to motivate contractors to perform.
3. Research JOC issues and assist the industry in stabilizing and improving its performance.
4. Educate facility owners on the advantage of using the JOC process.
5. Act as an interface between the academic community, the Job Order Contracting industry, and potential clients.
6. Provide owners with a reliable means of performance based evaluation and competitive selection between JOC and more conventional methods.

Job Order Contracting Performance

The CJE has been conducting a yearly JOC performance survey since 1994 in order to:

1. Quantify the JOC contractors' performance.
2. Verify theoretical strengths and weaknesses of the JOC process.
3. Improve the JOC process.

Public agencies have begun to recognize that the increased use of past performance information as an evaluation factor in the contract award process can improve the procurement system's ability to select quality contractors at a better price. The 1996 JOC/SABER/DOC questionnaire consists of 31 questions. Performance criteria were developed by the CJE, facility managers, and ASU researchers. The performance information addresses such factors as customer satisfaction, number of complaints, number of job orders completed on time, and percentage of dissatisfied work. The following JOC contractors (who account for $360 million of construction per year) participated in the 1996 survey:

1. Beneco Enterprises
2. Brown & Root Services Corporation.
3. Centennial Contractors Enterprises, Inc.

4. DEL-JEN, Inc.
5. FKW, Inc.
6. Gracon Corporation.
7. MCC Construction Corporation.

Table 1

Performance Trends of JOC

S. No.	Description	Units	Year		
			1994	1995	1996
1	Average contract duration.	Years	3.71	3.55	3.95
2	Percentage of delivery orders that the customer is dissatisfied with.	%	13.37	13.8	12.59
3	Average response time for estimate and working drawings.	Days	11.46	15.2	14.46
4	Customer rating of quality of drawings.	(1-10)	5.69	7.89	7.42
5	Average response time for emergency/urgent delivery orders.	Days	4.31	6.11	5.07
6	Average percentage of delivery orders completed on time.	%	75.94	78.35	80.33
7	Average Customer rating of quality of construction	(1-10)	7.32	7.75	8.08
8	Average rating of the professional level of the contractor.	(1-10)	7.05	8.2	8.55
9	Average rating of the housekeeping level of the contractor.	(1-10)	7	7.9	8.16
10	Average rating of the management capability of contractor's on-site personnel.	(1-10)	6.91	7.73	8.08
11	Average rating of the of the contractor's engineering support capabilities.	(1-10)	5.54	7.32	7.44
12	Average rating of the contractor's public relations.	(1-10)	6.92	8.55	8.38
13	Average number of delivery orders JOC handles simultaneously.	#	19.66	15.68	22.96

The 1996 survey results include the following:

1. Number of sites surveyed: 83
2. Number of sites responding: 55 (60%)
3. Number of Contractor’s full time staff on site: 6.84 persons
4. Comparing JOC performance to traditional process:
    - Better than: 75%
    - Same as: 20%
    - Worse than: 5%
5. Percentage of work that facility owner is satisfied with: 87%
6. Response time for routine construction (drawings and cost estimate): 14.5 days
7. Response time for emergency construction (drawings and cost estimate): 5 days
8. Construction completed on time: 80%

9. Customer rating of construction (0-10): 8
10. Professional level of contractor (0-10): 8.6
11. Contractor's safety performance (0-10): 8.7

The initial survey in 1994 asked three questions not asked in 1996. The results are shown below:

1. JOC is more efficient than previous procurement processes: 93%
2. JOC is more timely than previous procurement processes: 91%
3. JOC is more cost effective than previous methods: 62%

Table 1 is a summary of the 1994/95/96 survey results (Kashiwagi, Anderson and Sharmani). It shows trends in performance of the JOC contractor performance over the last three years.

The above results indicates that JOC is more efficient and effective than traditional construction delivery systems. It shows that the seven contractors surveyed are performing at a high level of performance. The majority of these sites have only one JOC and have a performing contractor. To ensure this level of performance, the "low-bid" award system requires enhancement. Deming states that individuals and entities are constrained by who they are. Deming encourages performing owners to hire the "best" available and then educate and partner with them (Deming, 1985).

Performance Based Procurement of JOC Service

The Performance Based Procurement System (PBPS), was first introduced in 1991 (Kashiwagi, 1991). It uses computer technology, "fuzzy logic," and Information Theory (IT) to transform construction data into performance information. The PBPS model is a modified relative distancing model of the "Displaced Ideal Model" introduced by Zeleny (1985). It mimics the human mind by differentiating between information and non-informational data by using relativity to compare cost and performance at the same time.

For example, Table 2 lists three contractors and three performance criteria. Column A, Rows 1, 2, and 3 represent the contractors bidding on the contract. Column B, Rows 1, 2, and 3 represent the different contractors' coefficient (cost plus profit). Since all the coefficients are exactly the same, there is no differentiation and the selection cannot be made based on price. The price data is therefore non-informational data and is not considered by the model. Columns C and D are the ratings given to the contractors by the survey. The numbers in Row 4 represent a "theoretical best" system performance. This "best" system will now be used as the baseline against which all available system will be compared. Contractors and their proposals are compared relatively to what actually exists, not to what a facility owner perceives is available. Row 5 represents the facility owner's weighting scheme, which is how he/she ranks priorities and needs. Assuming that the facility owner is not planning to do multiple projects at the same time (Column D), for example, the contractor's ability to process multiple delivery orders at the same time is not critical. However, if it is a large facility with rapidly changing facility requirements, that capability becomes important (information). It is important to recognize that, based on the

requirement, what is considered as "non-informational data" in one situation may be considered as "information" in another requirement.

Table 2

Sample Calculation Showing Procedure of Relative Distancing Model

S.No.	A Options	B Coefficient	C Construction Performance	D Multiple Delivery Order Performance	E Total Relative Distance
1	Contractor 1	1.25	10	9.5	0.1
2	Contractor 2	1.25	9.5	8	0.15
3	Contractor 3	1.25	9	9	0.12
4	Best Line	1.25	10	9.5	-
5	Requirement	0.2	0.6	0.2	-

The model uses the performance information obtained from the surveys (Columns C and D), the requirement factor (weight scheme, Row 5), and the relative best distance from each alternatives data point (Rows 1, 2, 3) to the best possible data point (Row 4), to produce a "total relative distance" of each option to the "ideal option" (Column E). The option (contractor, for example) that has the smallest number in Column E is closest to the theoretical best. In the example in Figure 1, the best option is "option 1."

There are two methods to implement the Performance Based Procurement System (PBPS):

1. To award the contract on a one-step, competitive bid process which considers price and performance.
2. To set the level of performance requirement based on documented performance of contractors by using a relative performance.

In implementing the JOC process in 1996, Arizona State University (ASU) decided that method 2 would be the more "acceptable" process to procure a performing DOC to meet the strict state of Arizona procurement laws.

The criteria shown in Table 3 does not include one critical component of the JOC, the site manager performance for the contractors. This data is not available until after the bids are submitted. Using the performance information of the CJE participants (except for the site manager's performance), the PBPS gave the following relative distances for the performing JOCs:

1. Best option relative distance: 0.1075
2. Second best option relative distance: 0.1292
3. Third best option relative distance: 0.2171
4. Fourth best option relative distance: 0.2254
5. Fifth best option relative distance: 0.2480

Table 3

Weighting scheme used by ASU on the JOC performance criteria.

S. No.	Criteria	N Weights
1	Max. Duration (Base & Option Years)	0.0026
2	Total number of current contracts	0.0360
3	Number of JOC/SABER/DOC on site	0.0067
4	Number of job orders to date	0.0283
5	Cost per job orders to date	0.0221
6	Number of contractor personnel on site	0.0051
7	Dollar / Person	0.0026
8	Efficiency of JOC compared to other methods % Better Than	0.0452
9	Efficiency of JOC compared to other methods % Worse Than	0.0452
10	Customer satisfaction with JOC	0.0488
11	Percentage of delivery orders that the customer is dissatisfied with	0.0463
12	Response time for estimate and working drawings	0.0437
13	Response time for emergency/urgent delivery orders	0.0463
14	Customer rating of quality of drawings	0.0324
15	Percentage of delivery orders completed on time	0.0504
16	Customer rating of quality of construction	0.0488
17	Rating of the professional level of the contractor	0.0427
18	Rating of the housekeeping level of the contractor	0.0437
19	Management capability of contractor's on-site personnel	0.0324
20	Rating of the contractor's engineering support capabilities	0.0298
21	Rating of the contractor's public relations	0.0308
22	Performance level of subcontractors	0.0437
23	Ability to manage multiple subcontractors	0.0452
24	Rating of contractor's ability to handle multiple projects	0.0463
25	Number of delivery orders JOC handles simultaneously	0.0411
26	Contractor's safety performance	0.0411
27	Site Manager	0.0514
28	% Responses for Survey	0.0411

If 0.2 is used as the maximum possible distance from the best line, only two options would meet the prequalification. The following factors were considered in setting the minimum requirement:

1. The five CJE participants are performing contractors.
2. If the site manager of the fifth best option was a high performer, the distance from the best line would be less (better performance).

The ASU facility management personnel used 0.24 as the prequalification requirement. The Performance Based Procurement of a performing JOC contractor at ASU will have the following steps:

1. A specification and accompanying UPB is constructed.
2. Contractors bid a price and give previous JOC point of contacts at past or current sites.
3. The performance information is collected on each contractor.

4. Performance lines are constructed, and the PBPS is used to prioritize the contractors using the same weights as shown in Table 3.
5. All contractors who have a "relative distance" away from the best line that is less than .2400 will be qualified to bid on the project.
6. The bid prices of the qualified contractors will then be opened and the lowest qualified bid will be awarded the DOC.

This process ensures that the JOC contractor is a performing contractor of "equal" performance with the other performing contractors and the price is a competitive price of a performing contractor.

Conclusion

The JOC process is a high performance delivery system for facility renovation and minor construction. The process is more efficient and timely. It has not been documented that the JOC process delivers construction at a lower price. High performing JOC contractors combined with the JOC delivery process has provided customer satisfaction, quality construction, and timely delivery. To raise the level of JOC contractor performance, a performance based prequalification can be implemented. The CJE and the PBSRG will continue to monitor the performance of JOC contractors and assist the contractors to continually improve as well as to continue to experiment with implementing the PBPS to raise the level of JOC contractor performance.

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Keywords

Job Order Contract, Delivery Order Contract, Indefinite Delivery Indefinite Quantity (IDIQ) Contract, Performance Based Procurement System (PBPS)