

Job Order Contracting Performance 2015 Industry Survey



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Job Order Contracting Performance

2015 Industry Survey

Performance Based Studies Research Group (PBSRG)
Del E. Webb School of Construction

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Editorial

Since the inception of research by the Performance Based Studies Research Group (PBSRG), the most significant discovery was the industry structure model which identified the major difference between high performance [on time, on budget, and meeting the quality expectation of the owner] and low performance [not on time, not on budget, and not meeting the quality expectation of the client] was the concept of utilizing expertise of expert vendors [high performance] to replace the owner’s management, direction and control of the contractor [low performance]. One of the major challenges to delivering construction services on time, on budget was the client’s quantification of requirements and their procurement system.

One of PBSRG’s first research projects was the study of Job Order Contracting (JOC) for the Center for Job Order Contracting Excellence. With the input from JOC contractors and owners, the high performance of JOC was verified. Twenty years later, PBSRG once again revisits a more mature JOC industry to once again validate the theory that JOC can deliver very high performance of construction services in an expedient manner, at a very low cost and with high customer satisfaction. Owners of JOC services identified that JOC, when compared to their other delivery methods [design, bid, build (DBB) and design-build (DB)], shows significant high performance and customer satisfaction ratings.

Twenty years of research has shown that the major cause of nonperformance of construction services is the structural problem of the inability to utilize construction expertise as a result of human behavior and the tendency of all silos within the supply chain to seek the lowest price. Many owners do not realize utilizing construction expertise through JOC contractors delivers the construction faster, at lower costs and at their quality expectations, as well as providing a more collaborative process and leveraging the expertise of all involved. The average cost of hiring a JOC consultant to implement a new program is 2-10% of the delivered construction service, which is dwarfed by the proven cost savings of minimizing the management, direction and control of the construction contractors [5 – 20%].

I highly recommend owners who need construction services quickly to consider the JOC delivery system. As always, I recommend finding an expert JOC contractor who has a proven track record of high performance and is capable of delivering high quality work to clients.

Dean Kashiwagi, PhD

Director of the Performance Based Studies Research Group (PBSRG)

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Executive Summary

The construction industry has had difficulty in delivering projects efficiently, in a timely manner and within budget. Approximately 2.5% of all global projects are delivered on time and on budget¹. Project inefficiencies are estimated to cost between \$15.6 and \$36 billion per year². In order to improve project delivery performance, researchers have been actively developing alternative project delivery methods to replace the more traditional methodologies.

Over the past 24 years, research has been conducted at Arizona State University to identify the source of project inefficiencies³. As a result of 1800+ tests, researchers have concluded that a primary cause in low project performance (time, cost and customer satisfaction) is the traditional owner-vendor relationship in which the owner uses a design, bid and build (DBB) approach.

The industry has come up with other approaches such as design-build (DB) and construction management @ risk (CMAR) in hopes of decreasing the delivery time and lowering the project cost. However, in the latest industry study done comparing the different approaches, there are still no significant conclusions about which process is the most efficient.

The Performance Based Studies Research Group (PBSRG), however, has done extensive case study testing and has concluded that the client and their representatives are the largest source of time and cost deviations and risk. PBSRG has also identified the design and procurement of the construction are the largest culprits of risk.

Project performance decreases as owners attempt to design, select the low priced vendor and manage, direct and control (MDC) a vendor to minimize the risk of nonperformance. The combination of accepting the lowest bidder and owner MDC, instead of hiring an expert vendor and using best-value procurement, results in negative outcomes.⁴

Owners should hire contractors because they are experts in construction. Deductive logic identifies that the contractor typically has more expertise than the owner does. Research shows that “low bid” and MDC could increase project costs and time up to 30%⁵. When an owner utilizes a contractor’s expertise, the project risk and cost will be minimized. Deductive logic identifies that the more an owner tries to MDC the vendor, versus working towards mutually beneficial results, the less of the vendor’s expertise is being utilized, thus increasing the project risk.

Job Order Contracting (JOC) is a delivery system focused on minimizing the owner’s repeated design and procurements and MDC on projects, by enabling a greater utilization of vendor expertise. JOC also enables early and ongoing information sharing, another key factor contributing to better outcomes.

JOC creates a system in which an owner can contract with a vendor for multiple projects and/or years to deliver an indefinite amount of projects (task orders) throughout the contract duration. Logically speaking, the selection of the JOC contractor should be done based on expertise and performance. JOC facilitates an effective working environment by decreasing the need for repetitive contracting, and excessive
owner

¹ (PwC, 2009)

² (Lepatner, B. 2007).

³ (Rivera, A. 2014; Kashiwagi D. 2015b).

⁴ The authors define an expert vendor as one who is able to see a project outcome before it happens. Experts are able to accurately identify and mitigate sources of risk before they occur.

⁵ (Rijt et. al., 2011; Kashiwagi D., et. al., 2013; Kashiwagi D., Kashiwagi J., 2014).

MDC, documentation, and administration. This system gives vendors more time to focus on their expertise (technical requirements and construction tasks) than dealing with bureaucracy.

The key benefits of using JOC are its flexibility, transparency, ease of use and better use of the experience and capabilities of the program participants. JOC contractors are able to deliver quality projects quickly and in high volumes without excessive owner MDC. JOC focuses more on a vendor’s expertise and best value overall, thus allowing for higher project quality. The decreased administrative requirements and increased vendor expertise translates to a greater cost savings for both owners and contractors, as well as fewer change-orders and legal disputes.

From 1994 to 1998, several studies were conducted to measure the performance of JOC. The research presented within this report looks at JOC 15 years later, and JOCs which are larger and more mature. Table 1 shows the metrics of the last previous study in 1998 and the metrics of the current study.

	1998 Survey CJE Members	1998 Survey Non-CJE Members	Current Survey
Number of Owner Responses	62	30	47 owners / 13 contractors
Average Award Amount to Date	\$5M	-	\$144M
Average Number of Total Task Orders	114	131	1,529
Percent of Satisfactory Projects	95%	90%	97%
Percent of JOC Projects Completed on Time	82%	69%	87%
Percent of JOC Projects Completed on Budget	N/A	N/A	91%
Quality of Construction Rating	8.2	6.6	8.2
Quality of Drawings Rating	7.8	5.1	7.2

Table 1: Comparison of 1998 JOC Survey to Current Survey

This report examines the perspective of 47 owners and 13 contractors who have collectively delivered over \$5 billion of construction services in JOC projects. The survey results show that 99% of facility owners recommend JOC and, on average, 96% of JOC projects are completed with satisfactory results. 87% of JOC projects are delivered on time and 91% are delivered on budget. Owners estimate an average of 24% (21% for contractors) administrative cost savings through using JOC instead of traditional delivery methods. In comparison to Design-Bid-Build and Design-Build, owners report an increase in budgetary and schedule performance by 8% and 5% respectively which results in a 60% greater satisfaction rating. It is important to note that the fee charged by one of the largest JOC consultants is an average of 5% a year⁶. Therefore, the cost of JOC is very conservative and a best value for clients.

Owners identified that the greatest impact of utilizing JOC is an overall faster delivery of construction. Eighty-one percent (81%) of respondents identify that JOC saves time in project procurement, and 68% of respondents identify that less PM support time is needed throughout the contract duration compared to traditional methods. In addition, owners also rate JOC as 30% more transparent than traditional delivery methods.

⁶ (PBSRG, 2014).

Both owners and contractors identify similar challenges that can be overcome with best practices. The challenges include:

- 1) Inaccurate price books
- 2) Poor understanding of JOC processes
- 3) Lack of transparency
- 4) Procurement inefficiencies
- 5) Poor scope definition

These challenges can be overcome by utilizing more of the Best Value approach. In addition, using JOC as it was intended will minimize these issues, this includes:

- 1) Align program volume with optimal number of contractor awards to maximize JOC efficiency.
- 2) Establish clear guidelines for contractor selection or assignment if multiple contractors are awarded.
- 3) Ensure the unit price book provides thorough coverage for anticipated work tasks.
- 4) Consider and define collaborative design process and early contractor involvement consistent with applicable laws.

The results of this survey effort suggest that JOC users are highly satisfied with its overall performance and are seeing better project outcomes and cost savings compared to more traditional methodologies. Users express that the reason they continue to use JOC is because it saves time and money, it is easy to use, and it increases project efficiency. JOC has progressed from an alternative delivery method used only on smaller projects to a major service and procurement delivery system that can be effectively used on a variety of project types and sizes.

State of the Construction Industry

Introduction

Over the past three decades, the construction industry has had issues delivering high performing services (on time, on budget, high quality). Research has shown that the industry as a whole is under-performing⁷. The Construction Industry Institute (CII) identified that only approximately 2.5% of all global projects are delivered on time and on budget⁸. Project inefficiencies are estimated to cost between \$15.6 and \$36 billion per year⁹. Varieties of delivery methods and solutions have been proposed to solve the non-performance issues of the traditional design-bid-build (DBB) process. They are as follows¹⁰:

- Design-Build (DB)
- Design-Bid-Build (DBB)
- Construction Management at Risk (CM@Risk)
- Indefinite Delivery/Indefinite Quantity (IDIQ)
- Job Order Contracting (JOC)
- Time and materials (T&M)
- Integrated Project Delivery (IPD)
- Public Private Partnerships (PPP)

Design-Bid-Build:

The traditional process was the design-bid-build (DBB) process. Due to its problems of contractors blaming faulty design and designers blaming faulty construction, the industry came up with the design-build process. The design build process identified one design build team that worked together. This eliminates the blaming between contractors and designers. However, it required the owner to identify what they wanted to build, select a contractor based on a proposal, which identified the end-product and the lump sum price, then sign one contract with the general contractor [who had the designer on their staff]. With this system, the contractor and the designer could not blame each other. However, a contention arose because the owner wanted to change the scope of the deliverable after selection of a vendor who had a fixed price and deliverable. The owner felt that the designer, who now worked for the contractor, was not acting in their best interest. Therefore, the industry came up with the construction manager at risk (CM@Risk) approach.

CM@Risk:

In this approach, the owner hired both the contractor and the designer, writing two different contracts. This brought the control of the scope back to the owner. At the same time the general contractor (GC) [who is the construction manager] works with the designer from the very beginning to ensure constructability, that the cost stayed within the budget, and that the final design would be delivered for a guaranteed maximum price [GMP] which the contractor would sign a construction contract. However, the general contractor (GC) cannot be held responsible for design errors. Even if the GC had reviewed the drawings they cannot be penalized for design errors, [only designers have errors and omissions insurance]. Therefore, a guaranteed maximum price (GMP) was not enforceable due to design errors.

⁷ (Adrian, J. 2001; CFMA, 2006; Chikuni, A, Hendrik P, 2012; Kashiwagi, D, Parmar, D, 2004; Leicht, R, et. al. 2015; Lepartner, B 2007; Ohrn, G. 2009; UK Construction Industry 2011).

⁸ (PwC, 2009)

⁹ (Lepatner, B. 2007)

¹⁰ (AGCA, 2004; Gransberg, D., et. al. 2006; Kashiwagi, D. 2015b; Konchar, M., Sanvido, V. 1998; Ohrn, G., 2009):

Studies have attempted to identify the relative performance of the different approaches to delivering construction services. A CII study identified the design-build (DB) process as the most effective followed by CM@Risk and then design-bid-build (DBB) approach¹¹. The DB approach was found to be much more effective than the DBB. Interestingly the most efficient process focused on decreasing the need for owner management, direction, and control. However, questions were asked about the validity of the analysis due to the differences in the types of projects being used in the analysis. A follow up and more complete study performed 17 years later by CII and the Charles Pankow Foundation (CPF), could not identify which process was more efficient¹². Findings included that combined contracts were faster, and cost and quality were driven by procurement and contracting. Findings also revealed success elements, which included:

1. Early involvement of core team.
2. Qualification-based selection.
3. Transparency in cost accounting.
4. Delivery methods alone do not dictate success.
5. Lines between delivery systems are blurred.
6. Owners drive success by selecting strategies that promote team integration and group cohesion.

After studying 204 projects, the CII study is now stating that if owners utilized expert vendors (through prequalification) and if the expert vendors and the owner work together as a cohesive group, the project has a greater chance of success. After the huge number of projects that were studied in 1998 and 2015, the most effective delivery system depends on the owner's constraints and it is highly advantageous to utilize expert vendors who can work together. This supports another concept developed in 1991, the industry structure (IS) model shown in Figure 1¹³. The industry structure (IS) model identifies that poor performance is when the owner/client attempts to exclusively use management, direction and control (MDC) on the project to minimize project risk. Performance increases when the owner utilizes expertise. The movement from low performance to high performance is when the client/buyer replaces MDC with the utilization of expertise and alignment of project roles through increased transparency. In a Value Based system, the buyer selects a vendor based on expertise and value. This system allows vendors to operate effectively within their own defined scope. The logical progression of the Industry Structure model states the following:

1. Owner/client excessive management, direction and control (MDC) of a vendor increases the cost of the delivered service.
2. MDC of a vendor by the buyer minimizes the need of vendor's expertise and the buyer's utilization of the vendor's expertise.
3. MDC of a vendor increases non-transparency, cost and transactions, and decreases the value of expertise and the utilization of expertise.
4. The utilization of vendor expertise instead of MDC will improve value, quality and minimize cost.

¹¹ (Konchar and Sanvido, 1998).

¹² (Leicht, 2015; Konchar, 1998).

¹³ (Kashiwagi, D., Badger, W., 1991)

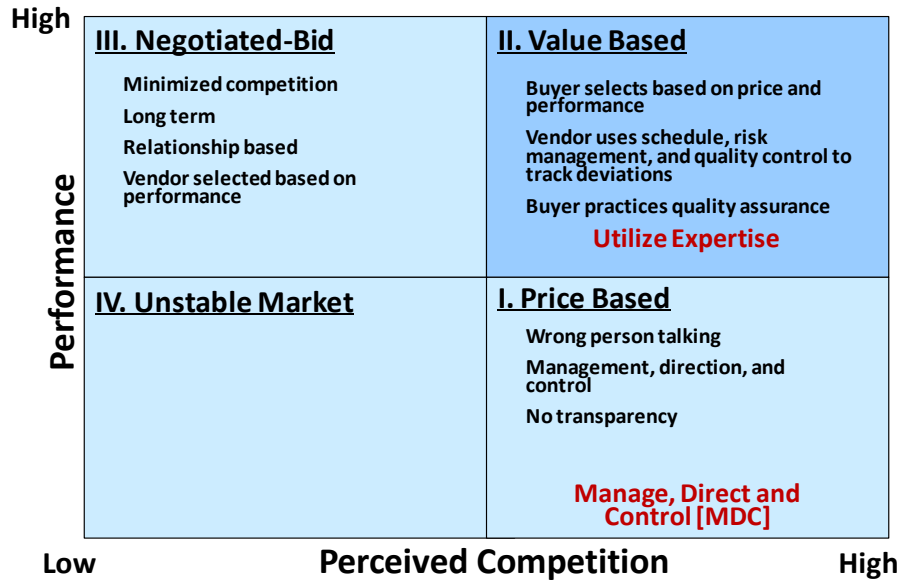


Figure 1: Industry Structure

The Industry Structure (IS) model follows a logical format. It identifies that the client/owner, because they are may not be experts in construction, are challenged with the management, direction and control of the vendor, who is an expert in construction delivery. Therefore the IS model states that the more the client/owner utilizes the vendor’s expertise, the higher the level of resulting performance. Job Order Contracting is a delivery system that minimizes the need of the client/owner’s MDC of the contractor

Table 2 shows the results of the tests conducted by the University of Minnesota and other state organizations. Note the following results¹⁴:

1. The client/buyer was responsible for 98% of all project cost and time deviations.
2. Client satisfaction of the contractor quality was 100% and the average rating for performance of the contractor was 9.6.
3. Over 50% of the time, the best value also had the lowest cost.

¹⁴ (Kashiwagi D., Kashiwagi J., 2013)

Criteria	Rating
Number of Projects	326
Awarded Cost	\$296M
Percent of Projects where BV had lowest cost	53.00%
Overall Change Order Rate	15.80%
Due to client	14.30%
Due to designer	00.60%
Due to contractor	00.00%
Due to unforeseen	00.90%
Overall Delay Rate	42.90%
Due to client	31.20%
Due to designer	04.10%
Due to contractor	02.20%
Due to unforeseen	05.40%
Client Satisfaction of Contractor Quality	100%
Average Contractor Performance Rating	9.6/10
Number of Completed Project Ratings	206

Table 2: University of Minnesota Best Value Approach¹⁵

Table 3 shows the results of the tests performed by the Army Medical Command (MEDCOM). MEDCOM's results are similar to the test performed in Minnesota showing that the owner/client initiated the majority of project deviations. The tests also show that as MEDCOM continued to move control of the projects to the contractors, overall project deviations decreased.

Completed Projects	NTP 2007	NTP 2008	NTP 2009	NTP 2010	NTP 2011
# of Projects	110.00	129.00	122.00	92.00	27.00
Original Awarded Cost (\$\$)	\$181,945,282	\$177,275,551	\$183,989,041	\$107,091,486	\$16,278,439
Final Awarded Cost (\$\$)	\$193,881,007	\$187,844,708	\$192,602,961	\$110,952,677	\$16,352,909
Total Over Budget (\$\$)	\$11,935,725	\$10,569,156	\$8,613,920	\$3,861,190	\$74,470
Total % Over Budget	6.56%	5.96%	4.68%	3.61%	0.46%
% due to owner	4.58%	5.59%	3.61%	2.36%	0.46%
% due to Designer	0.00%	0.14%	0.00%	0.21%	0.00%
% due to contractor	0.11%	-0.17%	-0.01%	0.08%	0.00%
% due to unforeseen	1.88%	0.40%	1.09%	0.96%	0.00%
Total % Delayed	51.56%	48.43%	36.77%	28.53%	3.31%
% due to owner	41.38%	39.96%	28.51%	16.53%	9.20%
% due to Designer	0.00%	0.49%	0.00%	1.32%	0.00%
% due to contractor	1.86%	-0.02%	1.29%	0.12%	-6.40%
% due to unforeseen	8.32%	8.01%	6.97%	10.56%	0.51%

Table 3: U.S. Army Medical Command Best Value Performance

The same results were also verified by the Dutch Fast-Track project test in the delivery of \$1B of infrastructure repairs¹⁶. The state of Hawaii roofing program shows that owner MDC was the source of poor performance¹⁷. The cost decreased, the profit margin increased, and the performance issues disappeared¹⁹. The State of Utah implementation also showed successful implementation of the

¹⁵ (Kashiwagi, D., and Kashiwagi, J. 2013)

¹⁶ (Ibid; Rijt et. al., 2011)

¹⁷ (DAGS, 2002)

philosophy in building the 2002 Winter Olympic Housing at the University of Utah¹⁸. The State of Arizona Department of Environment Quality (ADEQ) recently procured three projects using the same methodology; they found tremendous cost and time savings in just the procurement of the services see Figure 2 (Kashiwagi D., Kashiwagi, J. 2014b).

Criteria	% Diff	Traditional	Best Value
Required time to evaluate proposals	-95%	286hrs	13hrs
Protests	0%	0	0
Avg. Customer Satisfaction of process (1-10)	63%	5	9
ADEQ Administration Cost	-96%	\$98,520.00	\$3,840.00
ADEQ Admin. Cost Savings		\$94,680.00	

Table 4: ADEQ Best Value Procurement Savings¹⁹

These results also are supported by the IS model, which states that project performance increases when owners are able to better utilize vendors’ expertise thereby minimizing the need for MDC.

Cost of Management, Direction, and Control (MDC), by Owners

Tangible results of implementing a best value process that optimally leverages contractor expertise and minimizes the need to manage, direct, and control the vendor, include:

1. State of Hawaii roofing program saw a 3.07% drop in roofing costs. It also saw the State of Hawaii project manager able to do 10 times the amount of work¹⁹.
2. University of Minnesota project manager saw his workload decrease by 90%²⁰.
3. The Arizona Department of Environmental Quality selection process saw a savings of \$94K due to the efficiency of the selection process. A comparison of like projects saw the cost of professional services go down by 100% in some cases²¹.
4. The Arizona State University food services purchase of \$400M worth of food services saw a savings of over 10%. The ASU networking contract saw a 15% drop with dominantly higher performance²¹.
5. The State of Oklahoma saw a savings of 33% over the budgeted amount over 13 awarded projects²³.
6. The Dutch fast track infrastructure projects saw a reduction of cost of 20%, and a decrease in construction time of 25%²².
7. The Dallas Independent School District [DISD] saved 14% off their roofing cost by minimizing MDC. They also utilized the services of their worst performing contractor and received the highest performing roofing systems. They realized that their method of MDC was responsible for the previous poor roofing performance²³.
8. The U.S. Army Medical Command minimized project cost deviations by 5% by utilizing the best value approach in execution²⁴.

The Best Value approach, which utilizes the expertise of expert vendors results in a savings of 5 – 30%. The savings is due to the owner minimizing the use of MDC and utilizing the expertise of the vendors.

¹⁸ (Kashiwagi, Byfield, 2002)

¹⁹ (Kashiwagi, D. and Kashiwagi J., 2014b)

²⁰ (Sullivan, et. al., 2007)

²¹ (Kashiwagi, J. 2013)

²² (Kashiwagi et. al. 2013, Rijt et. al. 2011)

²³ (Kashiwagi et. al. 2003)

²⁴ (Kashiwagi et. al. 2012)

The expert vendors are selected based on past performance and capability. Contractors and owners discuss the requirements, however, the contractors (not the clients) determine the final scope, the means, and the methods. The savings result from a change in paradigm of the client to utilize the expertise of the expert vendor to deliver services.

Job Order Contracting (JOC)

The Job Order Contracting (JOC) process was introduced over 20 years ago. JOC is an indefinite delivery, indefinite quantity (IDIQ) contract, which utilizes a unit, price book (UPB) and the JOC contractor coefficient that covers overhead, general conditions, and profit. A typical UPB has between 40,000 – 250,000 line items that cover almost every construction task. Limited quantities of tasks not included in the Unit Price Book may be priced using alternative methods defined in the contract.

The JOC contract award is done competitively by comparing the contractors' coefficients (price). Once the contract is awarded, the projects are priced out using the UPB. Contracts are typically established for 1 – 2 years with up to 5 additional option years. One primary advantage of the JOC is speed resulting from minimized procurement transactions. Fewer procurement transactions naturally result in lower MDC of the contractor, and lower overall project risk.

Challenge of Showing the Value of the JOC Delivery System

A challenge facing the JOC industry is the assumption that all projects are the same and thus the performance of JOC projects is comparable to traditional projects. This concept comes from the low bid award approach. The low bid assumption is that all vendors are “the same” and they all understand the “same thing” and perform in exactly the “same manner.”

A more recent approach to identifying value is the Information Measurement Theory (IMT)²⁵. IMT is a deductive logic methodology that uses simple observations and common sense to understand and predict real world events. IMT proposed the following concepts:

1. Natural laws are not created, they are discovered. Natural laws were always there, in every space and in every time. There is no such thing as magic.
2. Every set of conditions based on a location and time is unique. Each set of conditions has a different set of characteristics that makes it unique. Unique characteristics include time, location, culture, organizations, resources, expectations, people's perceptions, and physical conditions.
3. Unique conditions of the past have a relationship with unique conditions of the present at a unique location. Unique conditions of the present will have a relationship with the unique conditions of the future.
4. Everything that happens over time starts from one set of unique conditions and results in another set of unique conditions.

There are no identical projects. IMT identifies that there are never two identical sets of conditions or events. In other words, every unique cause results in a unique effect. This concept, according to IMT, is called a natural law or an axiom of reality. Therefore, IMT proposes that every project, every vendor or contractor, and every client or user is different. Therefore, a supposition that assumes any two projects to be “identical” is fundamentally flawed and will lead to erroneous conclusions (Kashiwagi, D. 2015a).

Common inaccurate “identical” project assumptions made in the delivery of construction services are as follows:

²⁵ (Kashiwagi, D. 2015a).

1. Information (specifications) can be transferred to another person's mind with "exact precision".
2. All vendors interpret specifications the "exact same" way.
3. Vendors have the "exact same" level of expertise, and therefore the lowest cost (price-based award) vendor is the best value vendor.
4. A perception in one person's mind can be enforced to lead to the "exact same" perception in another person's mind.
5. The only way to prove that one delivery system provides a better value is by running two projects that are "exactly the same" and identifying which project had the more optimal results in terms of time and cost.

IMT introduces the concept that all entities and conditions are unique. When people assume that an "apples to apples" comparison can be made, the following may occur:

1. The false assumption requires a tremendous amount of work attempting to create and compare two identical set of conditions, which are "exactly the same."
2. The results of two projects are difficult to validate and therefore the derived conclusions may have little effect in changing traditional practices.
3. Economic analyses, which attempt to prove that a new concept is advantageous in adding value by using a comparison of two "exactly same" projects, may be too difficult and may not have an impact on changing industry practices.
4. The industry may not be able to take advantage of new practices which may increase the value to buyers and expert vendors because of the inability to validate the value of the new practice using the inaccurate assumption of having "exactly the same" conditions.

The implementation of JOC has not been widely accepted due to the reasons above. IMT provides a way to change the paradigm. IMT states that if decision-making is required, it will be highly unlikely that change will be implemented. IMT suggests dominant and simple information that minimizes the need for decision-making. The logical conclusion is the new process is of great value to the client and should be implemented.

History of Job Order Contracting

Job Order Contracting (JOC) is a competitively bid, firm-fixed price, Indefinite Delivery Indefinite Quantity (IDIQ) delivery system. JOC is widely considered to be a LEAN construction method across the industry. Through JOC, a facility owner contracts with a service provider or construction contractor to form a multi-year partnership. Under this system, the contract predefines a unit price book (UPB) that contains a list of service items that a vendor can continuously provide throughout the length of the contract. Originally, the typical UPB had over 40,000 line items that covered every construction task. Still today, the UPB establishes a unit base price for each service item, and a contractor bids a coefficient that reflect overhead, profit and the contractor's adjustment to the unit prices based on the contractor's unique efficiencies and expertise. Each task order is priced by multiplying the UPB cost for each service item used by the contractor's coefficient. Many contracts typically included provisions that would allow for adjustments to the UPB; these processes were typically defined at contract signing. The traditional JOC contract had the following characteristics²⁶:

1. Contractors were engaged early on to participate in the design and scope definition process.
2. Contractors competed for a contract by applying a coefficient to the unit price book. The contractor with the lowest coefficient won the contracts. The coefficient captured the cost, general conditions, overhead, and profit.
3. The contracts set a minimum and maximum amount of work per year for each site in a multisite contract.
4. Contractors continuously received task orders from clients.
5. If design work was necessary, the contractor could help manage the design process. Contractors also identified the different tasks and units, and applied their coefficient to calculate the total cost.
6. Owners had the option to extend the timeframe of a JOC.
7. Often, JOC consultants or service providers were employed by owners to facilitate their JOC contracting which included an additional consulting fee..
8. The contract contained a minimum and maximum dollar amount of job orders throughout the duration.

Today, the fundamental purpose of JOC is to increase the efficiency of service delivery, specifically when an owner anticipates a continuous stream of on-site work orders. In using JOC, owners eliminate the need for repetitive procurement cycles. JOC works to simplify the entire delivery system by decreasing the amount of transactions between owners and vendors as well as minimize the time requirements for design, bidding, and construction.

The initial need for JOC arose from the US Army in the early 1980s. Newer facilities established in Europe were facing an increasing demand for continuous construction and maintenance work orders²⁷. The Supreme Headquarters Allied Powers Europe (SHAPE) was unsatisfied with the overall performance of design-bid-build (DBB) methodologies. DBB was cumbersome to implement on repetitive small-scale projects. DBB requires new contracts for every work order, and in a government environment, a new contract means additional oversight, review, and spending. Out of the need to simplify the contracting process, Colonel Harry Mellon at SHAPE conceptualized a delivery system that would ultimately become JOC.

As JOC implementation continued to spread throughout the US military and then eventually to the public, it continued to develop with its focus on rapid response time and high performance results. In 1992, Dr.

²⁶ (Kashiwagi & Sharmani, 1999; Kashiwagi, Bader, 1991)

²⁷ (Williams, 1994; Hoover, 1994).

Bill Badger and Dr. Dean Kashiwagi of ASU initiated a nationwide research effort to measure the performance of JOC. This collaborative group led to the establishment of the Center for Job Order Contracting Excellence (CJE). To this day, CJE's goal is to track the implementation and performance of JOC in an effort to provide continuous education to JOC users.

From 1994 – 1998, ASU and CJE created an annual performance survey to measure the current usage of JOC in the military and improve the overall process²⁸. These surveys examined data from nearly 200 different military sites. The surveys identified JOC as a high performing delivery system. Its strength was that the owner's procurement process was minimized, allowing a contractor to quickly design and construct the work.

The most recent survey (1998) summarized the data from 7 CJE members who managed 80 collective military sites. A survey was given to each site to examine the performance of their JOC program. Every site had a different facility manager who completed the survey. In total, 62 responses were submitted. The results of the surveys are as follows:

1. Comparing JOC performance to traditional process:
 - a. 85% felt the JOC system was better than.
 - b. 14% felt the system was same as.
 - c. 2% felt the system was worse than.
2. Facility owners were satisfied with 95% of work performed via a JOC system.
3. Construction completed on time: 82%
4. Customer rating of construction (0-10): 8.21
5. Professional level of contractor (0-10): 8.45

²⁸ (Kashiwagi & Sharmani, 1999)

Research Methodology

In 2015, The Gordian Group, one of the largest JOC delivery supporters, approached PBSRG to conduct a research analysis of the performance of the JOC delivery system. The Gordian Group approached PBSRG due to Dr. Dean Kashiwagi having been an integral part in the JOC community and having performed the last major JOC report 20 years before (1998) in concert with the Center for Job Order Contracting Excellence.

PBSRG proposed that the report would have greater impact and more validity if the report was supported by other major industry participants. The Gordian Group agreed and after conducting an industrywide invitation, a group of JOC professionals and organizations were identified as the stakeholders for this study. The major stakeholders are as follows (See Appendix A for a listing of all stakeholders and their credentials):

1. Centennial Contractors
2. Center for Job Order Contracting Excellence
3. Chicago Community Colleges
4. 4Clicks
5. The Gordian Group
6. J. Banicki Construction
7. The JOC Group
8. Purdue University
9. TCPN

Stakeholder involvement entailed assistance in the following:

1. Identifying the overall research objectives.
2. Shaping the owner and contractor surveys.
3. Providing a list of potential survey participants and publishing the research effort.
4. Providing relevant JOC literature and support documentation to be used in the final report.
5. Reviewing research report documentation.

To develop the structure of the research, the stakeholders met in January of 2015 at Arizona State University. During this meeting the following objectives were developed:

- Provide data to owners and other parties involved in construction procurement that identifies the specific values that JOC delivers over other traditional methods.
- Identify savings JOC brings through administration costs, program management costs, reduced legal disputes, reduced change orders, time, and increased flexibility to achieve organizational objectives.
- Provide an explanation for why contractors under the JOC system are able to deliver construction for a lower total program cost, and why they are motivated to deliver high quality to the owner.
- Evaluate and define best practices when utilizing JOC.
- Utilize the study in other forms, upon completion, to increase the adoption of JOC as a construction procurement method.

A full list of the objectives of the study can be found in Appendix J. Objectives were accomplished through an extensive literature research and by administering the JOC owner and contract surveys.

The literature research was broken into two major components: first, stakeholders provided relevant documents on best practices, legal requirements, and state audits, and second, ASU assembled a team of research assistants to identify any state statutes specifically related to JOC or any laws outlining procurement requirements. The research team identified 53 different sources related to JOC statutes (see Appendix K).

Two industry surveys were created: one for owners using JOC and the other for contractors that had performed work under a JOC. The surveys were developed and critiqued by the stakeholders and then finalized. The finalized surveys can be found in Appendix H and I. The details of each survey are as follows:

Owner/Client Survey

- 4 sections
- 37 questions
- 6 data tables
- 5 pages

Contractor/Vendor Survey

- 4 sections
- 32 question
- 3 data tables
- 4 pages

The research team wanted to ensure that a diverse perspective of JOC users was captured in the data. In order to do so, users were surveyed from 5 major industries: universities, state/county/city governments, K-12 education, federal government and Department of Defense, and private organizations. Survey respondents were sourced using stakeholder client contact lists and through an internet query of JOC users across the U.S. Respondents were told to complete the surveys with high accuracy, but they were given the option to leave any questions blank if they were uncertain. The major steps of engaging JOC users were as follows:

1. Stakeholders provided over 60 potential contacts.
2. The ASU researchers identified an additional 90 potential contacts using online resources.
3. The ASU researchers contacted all potential survey respondents.
4. Any interested contacts were briefed on the research objectives and given specific instructions, after which they were given a copy of the survey.
5. 75 contacts agreed to complete the survey.
6. 47 owners/clients returned completed surveys and 12 contractors/vendors returned completed surveys.
7. After receiving the data, the research team contacted survey respondents to clarify any inconsistencies.
8. The data was analyzed to identify any major findings.

The survey questions were aimed at investigating the performance of JOC along with any best practices or implementation guidelines. Respondents were given the opportunity to provide general feedback on JOC as a whole along with any case studies that highlight definitive good or bad results. The survey questioned users in relation to:

1. JOC project performance information (time, cost, quality ratings, and customer satisfaction).
2. Comparison of JOC performance to other delivery methods.
3. JOC best practices (common issues, lessons learned, and requirements for a successful JOC).
4. Intangible benefits of using JOC.

The full schedule of the research effort is shown in Table 4:

Research effort commencement	7/30/2014
Identify potential stakeholders	9/30/2014
Initial stakeholder meeting	1/09/2015
Finalize owner data collection	9/18/2015
Finalize contractor data collection	10/23/2015
Complete data analysis	10/30/2015
Verify respondent data	11/20/2015
Final delivery of report	1/25/2016

Table 5: Research Schedule

Research Results

The goal of this research is to measure the performance and usage of JOC across various industries. In 1998, it was proposed that JOC is a high performance delivery alternative to more traditional methods (Table 5). In the last 20 years, JOC usage has moved from primarily military usage to implementation across all government organizations and some private sector owners. The scope of the research effort is as follows:

- 17 industry stakeholders
- 200 organizations contacted
- 47 owner/client surveys collected
- 13 contractor/vendor surveys collected
- Projects delivering \$5B construction surveyed
- 3,000 data points collected

The current survey effort is a follow-on research to the JOC research conducted from 1994 - 1998 which surveyed military usage of JOC. The latest 1998 survey examined the perspective of facility managers on 62 different military sites. The current research surveyed 47 owners from a variety of industries and 13 JOC general contractors (Table 5).

	1998 Survey, CJE Members	1998 Survey, Non-CJE Members	Current Survey
Number of Owner Responses	62	30	47 owners / 13 contractors
Average Award Amount to Date	\$5M	-	\$144M
Average Number of Total Task Orders	114	131	1,529
Percent of Satisfactory Projects	95%	90%	97%
Percent of JOC Projects Completed on Time	82%	69%	87%
Percent of JOC Projects Completed on Budget	N/A	N/A	91%
Quality of Construction Rating	8.2	6.6	8.2
Quality of Drawings Rating	7.8	5.1	7.2

Table 6: Results Comparison between 1998 JOC Survey and Current JOC Survey

The data from both the 1998 and the current survey show that JOC is continuing to show very high performance compared to other delivery methods and construction performance in general. According to a KPMG International 2015 survey on construction industry performance, only 25% of projects are completed within 10% of the original schedule, and only 31% are completed within 10% of the original budget²⁹. Furthermore, the Construction Industry Institute (CII) identifies that only approximately 2.5% of all global projects are delivered on time and on budget³⁰. According to a 2015 KPI report examining the performance of construction projects in the UK, since 1996 cost overrun has increased by 19% and schedule

²⁹ (KPMG 2015)

³⁰ (PwC, 2009)

delays have increased by 14%³¹. Despite the industry declining performance over the past 20 years, JOC has shown increasing effectiveness.

In addition to overall performance, this research spans several topics of focus related to administering, tracking, and implementing JOC. Respondents were asked to report on their personal perspectives and satisfaction ratings along with company performance metrics related to project performance (cost/schedule deviations, customer satisfaction ratings, award size, etc.) Among each of these categories, the most impactful analysis results are:

1. 99% of owner/client participants recommend other owners to use JOC.
2. Owners estimate a 24% administrative cost savings.
3. Contractors estimate a 21% overall cost savings.
4. 96% of projects were completed with satisfactory results.

These results suggest two major findings: first, an overall high satisfaction of JOC among owners/clients, and second, a cost savings from implementing JOC. The remainder of this report will explore these results in further detail along with other comparisons between different owner and contractor perspectives. This section of the report is organized as follows (Table 6):

Section Name	Major Findings
1. JOC Performance	<ul style="list-style-type: none"> – Less than 5% of JOC projects are unsatisfactory – Owners report 24% cost savings (21% for contractors) – 86% of owner projects delivered on time – 91% of owner projects delivered within budget
2. JOC cost savings	<ul style="list-style-type: none"> – 75% of owners attribute JOC cost savings to decreased procurement time – 52% of owners attribute JOC cost savings to decreased PM support time
3. Comparing JOC with other delivery methods	<ul style="list-style-type: none"> – Owners believe that JOC shows 8% greater budgetary performance than DBB or DB – Owners believe that JOC shows 5% greater schedule performance than DBB or DB – Owners are 60% more satisfied with JOC than DBB or DB – Owners report a 65% decrease in overall service delivery time using JOC compared to DBB and DB – Owner rating for transparency is 30% greater for JOC than traditional delivery methods.
4. JOC Strengths and Weaknesses	<ul style="list-style-type: none"> – Strengths: time & cost savings, simplicity, flexibility, and efficiency. – Weaknesses: pricing disagreements, lack of JOC industry experience, and poor communication.

Table 7: Overall Summary of Research Report

1. Performance Overview

All owner respondents of the survey were classified in five client type categories (university, K12 organizations, state/county/city governments, federal government, and private organizations). Each of these clients was identified through stakeholder references and online resources. Appendix H and I

³¹ (UK 2011)

provide an overview of the owner survey and contractor survey results respectively. Survey respondents have a varying level of experience with project types, sizes, and costs. For contractor respondents to the survey, 13 contractors responded, all of which are general contractors who perform various types of work (HVAC, electrical, GC, restoration, etc.) Together, the respondents offer a range of experience. The following show details of the owners and contractors that responded:

Owners (47)

- Years of experience ranges: 2 – 26 years (10 average)
- Total historic award amount of all JOCs: \$0.15M - \$2B (\$144 average)
- Average cost of each task order: \$100K - \$9.9M (\$3.3M average)
- Total number of Job/Task orders to date: 2 – 30,000
- Total number of active master agreements: 0 – 200

Contractors (13)

- Years in business: 12 – 78 (33 average)
- Years using JOC: 4 – 27 (11 average)
- Number of JOCs with different owners: 1 – 31 (14 average)

Both clients and contractors were asked to report on the performance of the projects that they either used JOC on or participated in (Table 7). The key findings are as follows:

	Unit	Owners	Contractors
Average Percent of Cost Savings Through Using JOC	%	24%	21%
Percent of Projects Completed With Satisfactory Results	%	98%	-
Percent of Projects On-Time	%	86%	94%
Percent of Projects On-Budget	%	91%	89%
Overall Satisfaction With JOC	(1 – 5)	4.1	4.3
Flexibility	(1 – 5)	4.3	3.9
Transparency	(1 – 5)	4.1	4.1
The Importance of Technology in JOC	(1 – 5)	4.1	-

Table 8: Owner and Contractor Performance Using JOC

1. Owners report that only 3% projects are unsatisfactory (the highest rate is 15% while 32 of the other respondents reported a rate of less than 10%).
2. The highest maximum reported contract duration is 8 years, while the rest of the respondents report a duration of 1-5 years, the overall average being 3 years.
3. 18% of respondents use 1 contractor per JOC, 78% of respondents report using on average 3 or fewer contractors, and 14% report using on average 10 or more contractors per JOC.
4. 64% of respondents issue 10 or fewer job/task orders per JOC contract, while 18% report issuing 20 or more (the greatest reported number being 80 from a client who typically contracts for 5 years)
5. 79% of respondents maintain facilities.
6. Out of 42 respondents, only 1 states that they would not suggest using JOC to another owner.
7. 77% of owners report that they use support software to perform JOC, as noted in Table 6, owners believe technology to be an important aspect of running JOC.

2. Cost Savings

Owners were asked to estimate the total amount of administrative cost savings compared to traditional methods and contractors were asked to estimate total cost savings seeing throughout the project. Administrative cost savings primarily comes from the amount of time needed to procure, administer and manage contracts. Administrative costs may also come from legal fees or costs associated with documentation requirements and revisions. Out of 44 owners that responded to having experienced cost savings, only 18 (42%) could quantify how much they saved, reporting on average 24% savings (highest 80% and lowest 0%). Of the 13 contractors, they report a 21% cost savings. Savings depend greatly on users' current and past delivery methods. To gain a better understanding of the source of savings, respondents were asked to list all of the sources of probable cost savings. The most commonly mentioned sources (and the percentage of owners that listed the source) are listed as follows:

Owner Survey (44)

- Procurement Administrative Time (75%)
- Project Manager Support Time (52%)
- Design and Drawing Costs (30%)
- Decreased Documentation Demands (30%)
- Minimized Admin Transactions (14%)
- Decreased Support Staff (9%)

Contractor Survey (13)

- Acquiring and Bidding New Projects (73%)
- Decreased Change Orders (45%)
- Decreased Time Requirements (27%)
- Design (27%)
- Overhead (27%)

3. Comparing JOC with other Delivery Methods

Early in its development, JOC was used for smaller scoped projects. Today, JOC is being used on a variety of projects with varying scopes and sizes. JOC is now able to compete with more traditional delivery methods in many instances. In the survey results, owners provide data on 60 JOC contracts that encompass 8,000 job/task orders. The average cost of each task order ranges from \$100K - \$9.9M.

All survey respondents (owners and contractors) report using a variety of other delivery methods in conjunction with JOC (Design-Bid-Build [DBB], Design-Build [DB], Construction Manager at Risk [CM@R], etc.) Owners/clients were asked to report on any observable performance differences between JOC, DBB, and DB. This research does not intend to prove the viability of one delivery method over the other, in order to do so, the research team would need to gather precise project performance data instead of client estimations. The purpose of this research is to measure how clients perceive JOC performance compared to the other more traditional delivery methods, and determine if JOC highlights comparable performance. In the delivery methods comparison portion of the survey, clients were asked to consider how JOC, DBB, and DB perform on projects of similar budget, service type, and overall scope. Respondents reported on cost/schedule deviations, overall satisfaction ratings, and project duration.

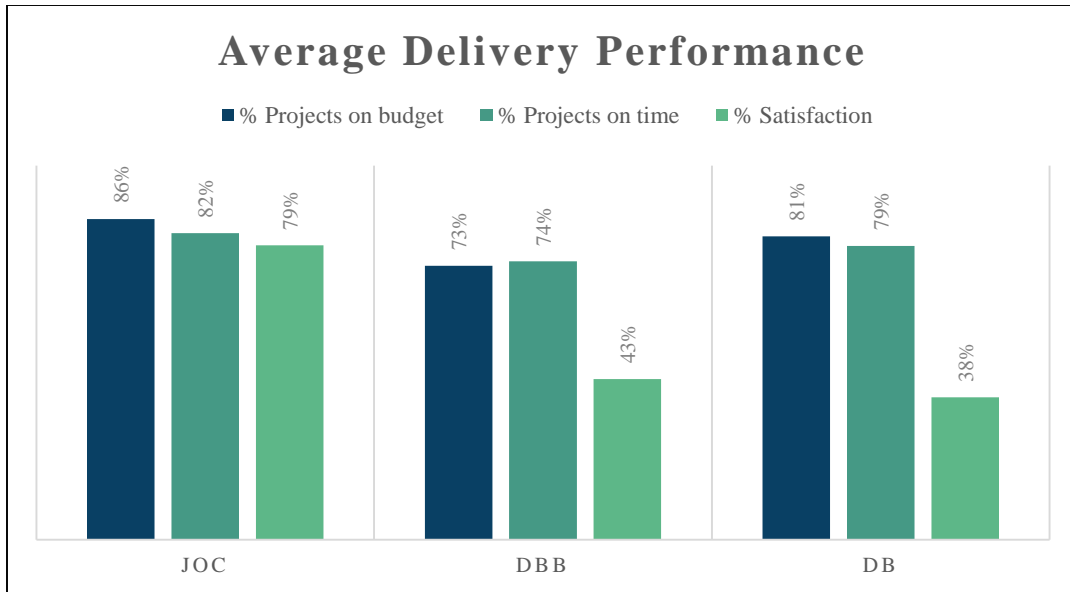


Figure 2: Owner perception of JOC (n=31), DBB (n=19), and DB (n=11) project performance

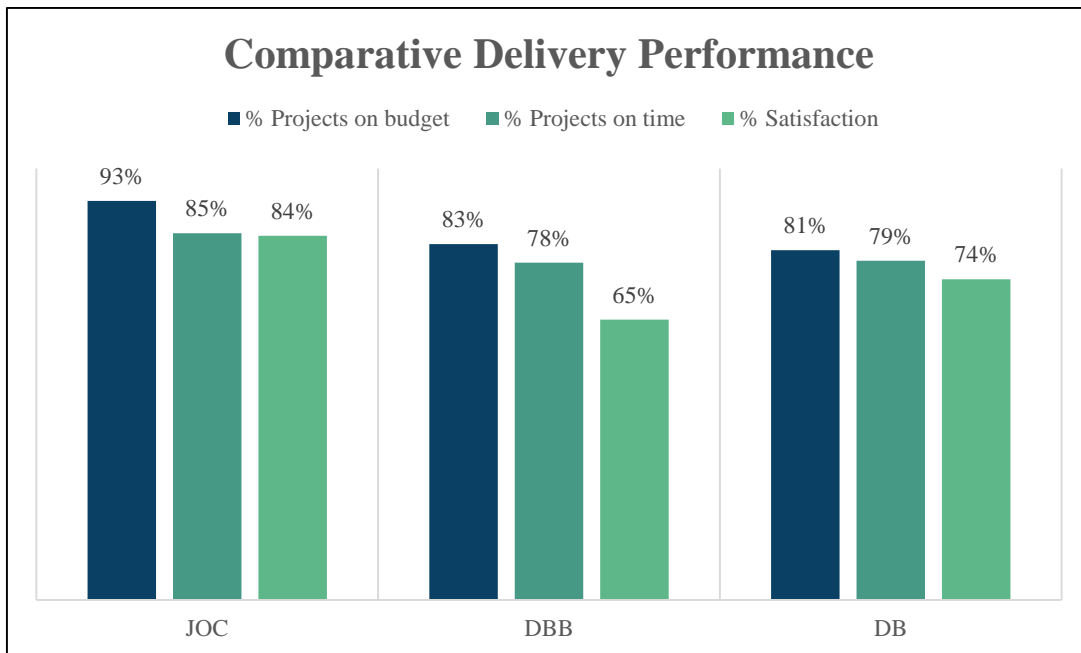


Figure 3: The perceived performance of JOC, DBB, and DB by owners who reported metrics for on all three delivery systems (n = 17)

The average project performance (schedule and budget deviations) of JOC, DBB, and DB is shown in Figure 3. Figure 4 shows the comparative project performance for owners who reported data from JOC, DBB, and DB. Both figures suggest that JOC projects are more often delivered on time and on budget compared to DBB and DB projects of similar scopes. In regards to budgetary performance, JOC is perceived to be 8% higher than the average DBB and DB. In regards to schedule performance, JOC is

perceived to be 5% higher than the average DBB and DB. It should be noted that there were more responses for JOC performance (31) than DBB (19) and DB (11).

In the survey, owners/clients were asked to rate their relative satisfaction of JOC, DBB, and DB for various aspects of project delivery on a scale of 1 – 5 (5 is high, 1 is low) (Table 8). Overall, respondents are most satisfied with JOC, followed by DBB, and then DB. Survey respondents are 60% more satisfied on average with JOC than DBB and DB. Owners believe JOC to be more transparent (30% average) and flexible (76% average) than the other delivery methods. These percent differences are calculated by comparing the percent difference between the ratings of each survey response.

The only category where DBB outperforms JOC is in quality of design drawings and services. The number of responses vary between each delivery service, JOC having the most and DB having the least. Additional research should be done to widen the scope of survey responses. In regards to contractors' perspective, they report a greater satisfaction in using JOC along with a higher project performance (percent on budget and on time). The results in Table 9 are similar to owner perspective.

	JOC	DBB	DB
Number of Responses	33	24	14
Overall Satisfaction rating (1-5)	4.1	2.3	2.0
Quality of Construction (1-5)	4.1	2.5	2.3
Quality of Design Services (1-5)	3.6	3.8	2.3
Quality of Design Drawings (1-5)	3.6	4.1	2.3
Level of Transparency (1-5)	4.2	2.3	2.2
Level of Flexibility (1-5)	4.3	2.0	2.0
Allows the achievement of organizational goals (1-5)	4.3	2.5	2.4
Average Rating (1-5)	4.0	2.8	2.2

Table 9: Satisfaction Rating of Owners/Clients for JOC, DBB, and DB.

	JOC	DBB	DB
Number of responses	11	8	10
Contractor's Satisfaction Rating	4.3	2.8	3.7
Average Customer Satisfaction Rating of the Contractor	4.4	3.3	4.1
% Projects on budget	89%	60%	69%
% Projects on time	94%	63%	73%

Table 10: Contractor Perspective of JOC Compared to DBB and DB.

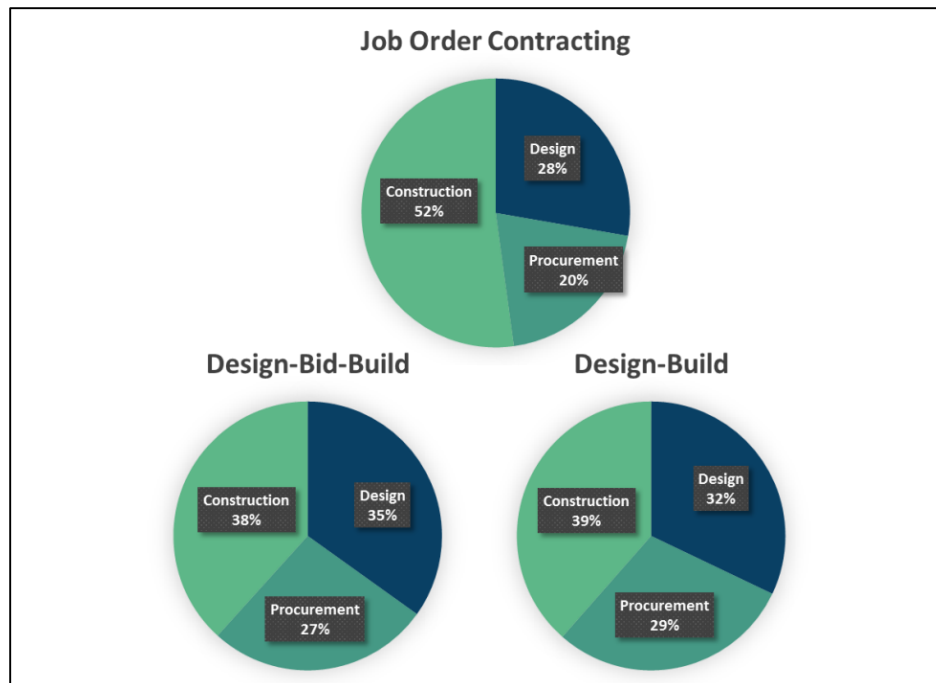


Figure 4: Time Spent in the Primary Phases of Service Delivery

Owners/Clients were asked to estimate the total amount of time spent in each delivery phase of JOC, DBB, and DB given a similar project size and scope (Figure 4). The research team contacted respondents to verify that only projects of similar size and scope were being considered in order to ensure accuracy. This information illustrates that with JOC, the time spent on procurement and design is minimized so the major resources of time and funding can be devoted to the actual construction.

4. JOC Strengths and Weaknesses

JOC was designed to minimize any non-value related activities delivering construction projects. Thus, creating a more efficient way to complete projects. The major benefits of JOC are as follows:

- 1) Minimizes time spent on procurement up to 97% (72% average)
- 2) Increases flexibility to achieve organizational goals by 300% (76% average)
- 3) Decreases time it takes to deliver a project up to 83% (59% average)
- 4) Enables owners to utilize the expertise of contractors
- 5) Rated as 30% more transparent

Survey respondents were given the opportunity to provide their opinion on the strengths of the JOC delivery method. Below is a brief analysis of their responses. It was identified that not only did the respondents confirm the above list of strengths, but they also found additional value in use the JOC system. A full list of questions and a summary of owner responses is shown in Appendix E and Appendix F.

Strengths of JOC

In analyzing the results of the written response questions, the authors identified the aspects of JOC that make it useful or desirable for owners. Respondents were asked questions regarding the source of cost savings and the overall impact of using JOC. The major results are as follows:

1. 98% of surveyed owners and 100% of surveyed contractors report that JOC reduces costs (primarily in procurement, project management, and design).
2. 82% of surveyed owners claim that JOC increases overall project efficiency because it requires less time to deliver the project, it is simple to use, and flexible for a variety of project types and sizes.
3. 100% of surveyed contractors report that JOC increases project efficiency by improving the ease of sourcing continual job orders without having to spend time bidding and designing.
4. 90% of surveyed contractors report being able to get involved with project scoping sooner using JOC than compared to other delivery methods.
5. 100% of surveyed contractors report that JOC is more transparent than other delivery methods.
6. Tables 10 and 11 below identifies, in ranked order, 45 owners' motivation for using JOC and 13 contractors' motivation for using JOC

Owner Criteria	Metric
Total Responses	45
Fast Delivery	96%
Simplicity	80%
Flexibility	76%
Cost Savings	64%
Higher Quality Construction	49%
Greater Use of Expertise	36%

Table 11: Owner Motivations for Using JOC

Contractor Criteria	Metric
Total Responses	13
Increased Workflow	58%
Ease of Use	33%
Cost Savings	17%
Fast Delivery	17%
None	8%

Table 12: Contractor Benefits in Using JOC

Survey respondents provided various comments in regards to why they use JOC, or the major benefits of using JOC. The comments are included below:

"We are able to dispatch a contractor immediately for an emergency (within a 2 hour time frame). We would not be able to do this under normal circumstances." – Client

"JOC helps increase efficiency with faster facility repairs, difficult or complicated repairs, and phased, or extended renovations involving multiple moves." – Client

"JOC contracts allow the government to oversee projects with the qualified staff that would be unable to be hired by the government (normally)" – Client

"Executing a project via JOC provides the ability to begin actual work scope earlier than traditional DBB." – Client

"Traditional Invitation for bid projects can take anywhere from 40-50 days from initial preparation to contract award. Most JOC proposals are returned within 1 week." – Client

"The right JOC contractor can create workflows with owner staffing to streamline project procurement, inspection and project close-out processes" – Contractor

"JOC is particularly helpful with low-dollar projects. In many cases, and depending on design development and permitting, a project can be initiated in a couple of days." - Client

"In a partnered relationship, the owner can place more work more quickly and cost effectively without increasing their staffing requirements." – Contractor

Weaknesses of JOC

The JOC delivery method was setup to create an efficient way to deliver multiple projects at one site over a period of time. Due to the system trying to minimize non-value activities, it is based on the assumption that the contractor being hired is an expert. It also assumes that the expert has information on the amount and type of work that they will be performing over the period of time. The main weaknesses of the JOC process are as follows:

- 1) Hiring a contractor with a lower level of expertise affects multiple projects.
- 2) Due to minimized transactions and information exchange, if the owner hires a non-expert contractor multiple issues will arise without the owner knowing.
- 3) The owner is not as involved in the technical work, thus if the vendor is not an expert, it can lead to multiple project issues and misunderstandings.
- 4) JOC is a relatively new delivery method, compared to traditional DBB. Thus, many owners do not have a good understanding of best practices and legal limitations of it.
- 5) JOC seeks to save money through a structure that minimizes transactions. The cost and time savings brought about because of this makes up for minor deviations in costs of specific construction activities. Owners who do not realize this often are caught-up in negotiating costs of construction activities.

The respondents of the survey also had a chance to identify their perceptions of weakness of JOC. There perceptions are below:

Owners feel that the majority if issues come from poor understanding of JOC processes on both the owner and contractor side. 42% of respondents express difficulties using unit price books (UPB) because it might not accurately represent market costs and may not be updated frequently enough. 37% of responding owners feel that a major issue is poor communication and lack of contractor transparency. Table 12 below shows owner responses when prompted to list the major issues with JOC.

Criteria	Metric
Total Client Responses	38/47
Pricing Disagreements	42%
Poor Understanding of JOC Processes	40%
Non-Transparency of Contractors	37%
Initiating JOC at their Company	26%
Low Performing Contractors/Subs	24%
Lack of Communication	18%
Difficulty with Complex Projects	18%
No issues	13%

Table 13: Owners' Issues in Using JOC

Contractors were asked to identify challenges that owners often present that create issues using JOC (Table 13). The greatest error that contractors report is excessive scope adjustments or disregarding the scope schedule and contract requirements. Several contractors report a great detriment when owners overestimate the amount of work they plan to provide through the JOC.

Criteria	Metric
Poor Scope Definition	80%
Poor Communication	40%
Payment Delays	30%
Lack of Involvement	30%
Using Low Bid	20%

Table 14: Issues that Contractors Perceive in Using JOC

In addition, other sources of issues that contractors identified occur when owners perform acts that go against the JOC process, these include:

1. Competing delivery orders among multiple JOC contractors within one contract. This negates the collaborative work process that is the strength of JOC.
2. Use the UPB during contract signing to try to create a lump sum contract instead of a unit price contract.
3. Using a JOC contractor to price out different tasks, and then using that price to compete a separate contract.

Literature Review of State Statutes Concerning JOC

A literature search was performed using both academic databases and state records/resources to find documentation of JOC application and statutes by state. This is not intended to be an exhaustive literature review but rather the goal of this chapter is to provide a small look at how some states implement JOC. This research is not proposing that these States have implemented JOC regulations in the most optimal way. A more in depth study would have to be performed to identify that. In fact, this research did not find any documentation identifying any negative effects of not having any regulations on JOC. The authors search found statutes in 15 states; 23 were found to have documented usage of JOC but no laws were identified, and 12 states did not have documented usage or laws (see Table 14).

Literature Search of JOC Statutes	#
States with statutes and documented use of JOC	15
States with documented use of JOC but no statutes	23
States that have no documentation of JOC or statutes	12

Table 15: JOC Literature Search Findings

In instances where JOC legislation was found the major limitations placed on it involved:

1. Maximum contract limit.
2. Maximum order/project limit.
3. Maximum contract length.
4. Maximum renewal length.
5. Designer restrictions.
6. Specific type of construction to which it applied: landscaping, vertical/horizontal, maintenance, repair, renovation, alteration, remediation, modernization, rehabilitation, etc.
7. Other unique limitations include: quantity of projects, state agency that legislation applied to, approvals necessary for specific projects and minimum order/project cost.

The literature shows that JOC contracts on average are limited to one or two years. However, JOC contracts also come with options to renew for anywhere to one to four years (generally by one year increments). Maximum contract and project limits vary greatly by state, and some impose no limits at all.

Multiple states use JOC but have no specific statutory obligations regarding the usage of JOC. In these instances, JOC satisfies the standards of project delivery statutes without requiring additional legislation. This study verified that in both New Jersey and New York, state government agencies have used JOC, and since there are no JOC statutes, by deduction, JOC specific features (such as the UPB) do not violate current state laws.

Although legal documentation has shown that there are limitations in certain States on size of projects that can be run under a JOC contract, the data shows that many users run larger projects using JOC with high performing results.

In addition to examining state statutes, the stakeholders provided documents detailing audits of publically managed JOC projects. The academic team reviewed 11 audits from 8 different public organizations across 6 different states. The primary focus of the audits was to ensure that state agencies are using JOC in compliance with state statutes. Of the 11 audits, 10 identified JOC as a useful and effective tool if implemented correctly according to standard recommended procedures. Some of the major findings from the audits are as follows:

1. Only one audit (City of Scottsdale) provides data detailing project budget deviations. The audit examines 6 projects that were over-budget. These 6 projects only constitute 1.3% of the estimated

number of JOC task orders for Scottsdale. These 6 projects were over budget by 82%. No data was provided detailing the overall performance of the owner.

2. One audit (Los Angeles School District 2012) identified 3 scenarios in which the owner was charged too much for equipment procured through a JOC contract, but the audit does not report on the overall performance of all job orders (45).
3. Two audits (New York DDC and DEP) suggested that many projects exceeded the schedule guidelines set forth by the owners. The audits examined an average of 6% of the owners' total task orders. NY DDC claimed that the auditor schedule guidelines were incorrect and DEP suggests that all schedule deviations were outside of the contractors' scope.
4. One audit (NYC DDC) identifies that the owner was claiming 8-15% cost savings due to JOC, but the auditor concluded that this was inaccurate but did not provide justification. The owner claimed that the cost savings were not overall project cost savings but merely administrative and procurement cost savings. This coincides with the cost savings information shown herein (see Chapter 3)
5. Three audits identified that poor performance was a result of the client *not* properly using the UPB or negotiating new line items in the middle of the JOC leading to budgetary inaccuracies.

After reviewing the audits, the authors conclude that the findings are in line with the data shown within this report. JOCs do experience schedule and costs delays. JOC performance is affected when owners higher non-expert contractors. Cost deviations are more likely to occur when the UPB is not properly utilized and prices are negotiated during the project execution. Overall, the audits provide a closer look at a small sample of JOC task orders (between 1% and 10%). The results shown within this report represent a high level look at JOC programs by owners.

For a complete list of the legal documents and audits reviewed for this study, see Appendix K.

Optimizing Job Order Contracts

In its conception, JOC was used for small, frequently occurring projects. By collaborating with one contractor for several years, owners gain the ability to complete an indefinite amount of projects based on their facility needs. During its lifetime, JOC users have multiplied and it has grown in its variety of applications. As seen in this research, JOC is now being used on small and large projects (up to \$10M) across the public and private sector. The performance of JOC has shown to be highly competitive and ever increasing in an industry of declining performance.

Despite its growth as a delivery system and new applications, several fundamental aspects of JOC remain constant. As discussed in Chapter 1, the effectiveness of JOC can be directly attributed to its ability to minimize the need for owner management, direction, and control (MDC) on contractors. As MDC is minimized, project performance increases.

The objectives of this chapter are threefold:

1. Use survey responses to identify how most clients run JOC today.
2. Outline JOC best practices that lead to the most efficient and highest performing JOC contracts (see Chapter 2).
3. Show preliminary results comparing owners who run JOC using best practices with those who do not.

Current Industry JOC Usage

A section of the owner and client surveys administered in this research focused on identifying how users are implementing JOC. Several questions were asked in the written response section of the survey (see Appendix E and F) which pertained to overall JOC usage. A key focus of the questions is to determine how users approach the four fundamental areas of JOC implementation. The following was found in analyzing the results:

- 56% of owners report using past performance metrics to select contractors
- 28% of owners report using low-bid to select contractors.
- 18% of owners use one contractor per JOC contract.
- 80% of contractors believe that poor scope definition is the fault of the owner.
- 72% of owners believe that they are responsible for scope definition.
- 28% of owners use JOC contractors to provide the design.
- 51% of owners use a separate contract to procure the design.

JOC Implementation Best Practices

The traditional structure of JOC was based on IDIQ delivery. JOC has four fundamental areas of implementation: contractor selection, scope definition, the unit price book (UPB), and project design. The best practices for each area of implementation are show in the sections below.

Contractor Selection

Contractor selection is done by selecting the highest performing contractor(s). The selection method that has been documented with the highest success rate is the Best Value Performance Information

Procurement System (BV PIPS)³². Owners typically source contractor bids by issuing a request for qualifications (RFQ) and/or request for proposal (RFP). Contractors compete by providing justification of their expertise through past performance metrics (time/budget deviations, satisfaction ratings, project experience, etc.) Owners consider contractors' coefficients, but must be careful, because, if the coefficient overrides the importance of other performance factors, the selection reverts to a low-bid process. In certain areas, an owner might be required to select contractors through the low bid process. This is not optimal, but can be done. The survey results show that performance results are still high compared to the industry average. Due to the way a JOC operates, it has been found to be one of the best delivery methods to overcome the negative impact of the low bid process.

Traditionally the best practice was also to select only 1 contractor per JOC master contract agreement. However, due to the amount of work a client might have, selecting more than one contractor has been found to be of benefit. The main issue in selecting more than one contractor is a commonly used practice of trying to compete JOC contractors against each other to award task orders. This practice reverts the JOC system to become similar to the low bid system with the same issues.

Defining the Scope

The owner will traditionally have an idea of what their expectation of the scope of work (SOW) for a task order will be. This is provided to the contractor. However, the contractor is then responsible to use their expertise and identify and clarify the SOW with the owner and provide any suggestions to improve the SOW. Based on what the contractor identifies, the owner can then request changes or more information before the project commences. The owner is in charge of identifying the minimum and maximum project budget and ensuring that enough work is provided to meet these standards.

Establishing the UPB

The UPB is a unique and critical component of JOC, but many users identify it as a source of risk. The UPB contains thousands of differently priced line items that span all aspects of construction. If an item is not in the UPB, it should be decided upon at the beginning of the contract. An expert contractor is one who is able to clearly identify sources of risk before project commencement. Another practice to minimize pricing disagreements during the contract period is that contractors should identify potential new UPB line items for owners to approve before contract signing. There are JOC consultants that have the ability to add new UPB line items. Due to them being a third party and their experience and information, they can minimize issues in creating new UPB line items.

Project Design

The JOC system was designed to maximize the use of the contractor's expertise. This identifies the earlier the owner brings the contractor in for upfront planning the better the performance will be on a project or task order. Many times the owner first brings in the JOC contractor and then gives the design requirement responsibilities to the JOC contractor. If owners use a separate contract to procure designs, then the JOC errs closer to design bid build.

The Current Performance of Traditional Best Practices

Using the data from the 47 owners that were surveyed in this study, an analysis was performed comparing the owners using the best practices of JOC and those that were not using them. Due to the limited number of owners surveyed, this study recognizes that the results found from this analysis are not statistically

³² (Kashiwagi et. al. 2013; Rivera 2014)

significant. However, the results show a trend that should be investigated further. Taking the best practices of JOC, researchers examined how specific aspects affected overall project performance. Project performance being determined by time/budget deviations and satisfaction ratings. Table 15 below shows how performance is affected when:

- Owners only use 1 contractor per JOC (This was used as a factor, because it was the only factor available that ensured the owner was not competing task orders between multiple contractors).
- Owners select contractors using past performance metrics.
- JOC contractors responsible for any designs needed for a task order.
- Owners select contractors by primarily using low-bid.
- Owners do not use only 1 contractor per JOC, do not select their contractors using past performance metrics, and they do not make the JOC contractor responsible for designs needed for a task order. They do use the low-bid method to select their contractors. This category is the baseline for those not following the best practices identified in this chapter. This will be named the Baseline row.

	Number of Respondents	Percent of Projects on Time	Percent of Projects on Budget	Overall Satisfaction Rating (1-5)	Quality of Construction (1-5)	Quality of Design Services (1-5)	Quality of Design Drawings (1-5)
Average of All Survey Owners	47	87%	91%	4.1	4.1	3.7	3.6
One Contractor per JOC	7	81%	92%	4.1	4.1	4.0	4.0
Selection Using Performance	22	90%	92%	4.2	4.2	3.8	3.7
JOC Contractor Provides Design	12	91%	91%	4.3	4.2	3.4	3.4
Selection Using Low-Bid	12	80%	86%	4.0	4.0	3.6	3.6
Baseline (does not use best practices)	6	74%	79%	3.8	3.6	3.7	3.7

Table 16: Factors that Effect the Project Performance of JOC

It is important to note that some owners are included in more than one category in Table 15, depending on how they performed JOC. The top row in Table 15 (owner average), shows the average of all the 47 owners, it shows high performance results on average. The results show that even when not implementing JOC according to the best practices, the system still performs well (found in the “selection using low-bid” and the bottom row in Table 15 (Baseline). The best practices are shown to have a positive effect on project performance. The most impactful best practices being selecting a contractor using past performance metrics and giving the JOC contractor the responsibility to take care of design needs. Additional observations made by the researchers are as follows:

- The top 5 performing owners all use performance metrics to select contractors
- 4 of the 5 owners who report the greatest cost savings select contractors using performance metrics.
- The lowest 5 performing owners all use low-bid to select contractors

In addition to the programmatic best practices, the research also examined how deployment methodology affects the overall project performance (Table 16). JOC can be deployed using the following methods:

1. The owner can contract with a JOC consultant to outsource the deployment.
2. A Co-op (short for cooperative) is a democratically managed association of multiple owners who support each other in JOC deployment.
3. Owners can manage and coordinate their own JOC program through a self-performed deployment.
4. A combination of the previous methods can be used depending on owner preference.

	Number of Respondents	Percent of Projects on Time	Percent of Projects on Budget	Overall Satisfaction Rating (1-5)	Quality of Construction (1-5)	Quality of Design Services (1-5)	Quality of Design Drawings (1-5)	Number of Legal Disputes
Outsourced	13	90%	93%	4.4	4.5	3.8	4.0	0
Co-op	2	90%	90%	2.5	2.5	1.0	1.0	0
Self-Performed	18	90%	89%	4.2	4.1	3.8	3.7	2
Combination	14	76%	91%	3.9	3.9	3.8	3.7	3

Table 17: The Effect of JOC Deployment Methodology on Project Performance

The data in Table 16 suggests that all JOC deployment methods yield high performance results, but projects have the greatest performance, highest satisfaction ratings, and lowest number of legal disputes when an owner outsources their JOC deployment.

Conclusions

The construction industry has struggled with delivering high performing services for the last 20 years. Multiple studies have shown that the majority of issues that occur on projects are due to low-bid selection of contractors and associated attempts at management, direction, and control (MDC) of a contractor. As MDC increases and the usage of best practices decrease, the ability to use contractor expertise diminishes. The most successful solutions have been found to minimize the need for MDC and increase the utilization of the vendor's expertise, while increasing transparency between all parties involved in project delivery.

JOC was developed by the military as a delivery method that minimized the owner's administration and management of projects. JOC was created using an indefinite delivery indefinite quantity (IDIQ) contract to hire a high performing contractor that could respond quickly to work needed by the client. It minimized cost disputes by presetting costs using a price book with every type of work needed and allowing the vendor a coefficient that would take care of overhead. A national survey was performed in 1998. The survey found that 94% of owners believe that JOC was more efficient than traditional delivery systems and owners were satisfied with 87% of JOC work. Due to its success with the military JOC spread to other government agencies and is now being utilized by private organizations.

JOC is a non-traditional delivery system that is structured to minimize required transactions in the supply chain and increases the utilization of the vendors' expertise. JOC is widely considered to be a LEAN construction method. The system also increases transparency, which minimizes issues and complaints of the owner. The JOC system has been the only delivery model to be able to protect an owner against issues caused by the traditional low bid environment. Given these facts, questions have arisen among owners about the most effective usage and implementation of JOC. This is what led to the conception of this research effort.

This research surveyed 55 owners across the U.S. to identify how well JOC is performing with the changing construction industry. The major concerns owners had with the use of JOC were:

- Understanding the fundamentals and industry best practices in implementing JOC
- Pricing disagreements that arise from the Unit Price Book (UPB)
- The roles of owners and contractors, and proper communication between the two
- How to avoid poor performing contractors
- The type of projects that JOC is best suited for

The results of the study also found that JOC has maintained its high performance. With the greatest success being when the system is used with its original requirements and intent (best practices). Some of the most impactful results of the survey are as follows:

1. 99% of facility owners recommend JOC.
2. 96% of JOC projects are completed with satisfactory results.
3. 87% of JO projects are delivered on time.
4. 91% of JOC projects are delivered on budget.
5. Owners estimate an average of 24% administrative cost savings by using JOC instead of traditional delivery methods.
6. Compared to other delivery methods, JOC increase transparency by 30%.

Through an analysis of the legal limitations that have been put on JOC contracts by State governments, it was identified that there is a perception that JOC is best suited for relatively smaller and simpler projects.

However, the survey data showed that both clients that have used JOC for larger and smaller projects/task orders (up to \$9.9M) have experienced high performance (time, cost, quality). Overall, the survey found that regardless of what type of construction was performed or what the size of the projects, JOC performed the same.

When the survey participants were asked to compare their satisfaction and the performance of JOC to other delivery systems (DBB and DB), clients were found to feel that JOC was a better delivery system in terms of delivery time, cost, and satisfaction. Some of the key findings are as follows:

1. JOC projects are 8% more on budget.
2. JOC projects are 5% more on time.
3. JOC projects have a 60% greater client satisfaction rating.

Clients and contractors also identified several valuable aspects of JOC that could not be quantified. They are as follows:

1. 98% of respondents report that JOC reduces costs (primarily in procurement, project management, and design).
2. 82% claim that JOC increases overall project efficiency because it requires less time to deliver the project, it is simple to use, and flexible for a variety of project types and sizes.
3. 96% of clients agreed that the largest motivation for using JOC is its ability to reduce time. The next most important factors were its simplicity and flexibility.

The research has found that overall, JOC is a very high performing delivery method, regardless of how the system is used. Nevertheless, the research suggests that JOC performance may increase largely when users adhere to traditional JOC best practices. In its traditional usage, and today, JOC focuses on decreasing the need for owners to manage, direct, and control contractors by:

1. Optimizing the number of contract awards to best fit the program volume thereby eliminating unnecessary contractor competition and thus ensuring maximum usage of contractor expertise
2. Encouraging early contractor involvement to provide more scope clarification
3. Ensuring accurate unit price book items before contract signing so as to provide thorough coverage for anticipate task orders
4. Allowing contract involvement with project designs instead of procuring design work completely outside of the JOC project

According to the Construction Industry Institute, 2.5% of all global projects are delivered on time and on budget resulting in a high change order rate³³. Research suggests that using the Best Value Approach can save owners up to 30%³⁴. This report identifies that using JOC results in an average cost savings of 24%. The cost of running a JOC program with the assistance of a JOC consultant only ranges from 2% to 10%³⁵. Deductive Logic identifies that owners can definitely save money and increase performance by using JOC.

³³ (PwC, 2009)

³⁴ (Kashiwagi D., et. al., 2013)

³⁵ (PBSRG, 2014)

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APPENDIX A - List of Stakeholders

APPENDIX B - List of Survey Participants

APPENDIX C - Owner Survey Results

APPENDIX D - Contractor Survey Results

APPENDIX E - Owner Written Responses

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APPENDIX G - Case Studies

APPENDIX H - Owner Survey

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APPENDIX J - Research Objectives

APPENDIX K – State Legislation Sources

APPENDIX A
List of Stakeholders

Organization	Type
4Clicks Solutions, LLC	Software Provider
American Fire Equipment	Sub-Contractor
ARC Construction, LLC	Contractor
Caliente Construction Inc.	Contractor
Centennial Contractors	Contractor
The Center for JOC Excellence	Professional Org
Corbins Electric	Sub-Contractor
CSW Contractors, Inc	Contractor
The Gordian Group / RS Means	Consultant
J. Banicki Construction	Contractor
Jokake Construction	Contractor
Chicago Community Colleges	Owner
CJE	Professional Group
Noble Aquarius Consulting	Consultant
Purdue University	Owner
SDB Contracting Services	Contractor
TALIS Construction	Contractor
TCPN	Co-Op
The Job Order Contract Group	Consultant
ACE	Research Group
Greg Ohm	Researcher
Frank Mulkahy	Researcher
Penn State	Owner
University of Illinois Urbana-Champaign	Owner

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Stakeholder Information

Banicki



Established in 1991, J. Banicki Construction, Inc. is a heavy civil construction market leader in the Southwest United States. Leveraging the strength of over 100 dedicated employees - from Executive Management to Field Craft Workers - Banicki delivers innovative, quality projects to municipal, state and federal governmental agencies through traditional design-bid-bid delivery and alternative delivery methods including Construction Manager at Risk (CMAR), Design-Build (DB) and Job Order Contracting (JOC).

Banicki's Job Order Contracting Division services City, Municipal and County Governmental agencies utilizing fixed unit as well as project-based pricing models, delivering key municipal infrastructure services as an extension of client resources, within emergency situations, or through the provision of speciality services and work scopes.

Banicki's "JOC Division" structure meets these needs through a robust capacity and has been recognized for quality and safety practices in the field.

The Center for Job Order Contracting Excellence

The Center for JOC Excellence (CJE) was created in 1995 by industry experts as the designated professional non-profit organization and resource center for education, research, sharing best practices, and JOC certification. CJE proudly serves as the designated organization integrating JOC providers, JOC owners/users and educators in one forum to provide collaboration and continuous improvement for the most utilized project delivery method in America.

We are honored to reach over 20-years of achievement with volunteers across the county working together. Facility managers, owners, end-users, procurement managers, municipal departments, construction companies, cost data & technology providers, industry consultants, and educators benefit from CJE and the best practices developed for Job Order Contracting and IDIQ construction practices. CJE also participates in a strategic alliance with ASU's Alliance for Construction Excellence (ACE) for education and certification programs.

CJE's mission is to educate, promote and provide resources for the collaborative and efficient project delivery method called Job Order Contracting. Through the development and education of the industry, facilities and infrastructures will benefit from the performance-based delivery method.

Caliente Construction



Caliente Construction is a family-owned, award-winning, commercial general contractor founded in Arizona in 1991. Based in Tempe, Arizona, we also offer our services in California, Nevada, Colorado, New Mexico, Utah, Wyoming, Montana and Idaho. We provide a full range of renovation, tenant improvement, MEP infrastructure and new build construction services to commercial, industrial, educational, healthcare, hospitality, energy and mission critical clients. In addition to our Design-build and Construction Manager at-Risk services, we have been providing JOC and IDIQ Task Order services to private and public clients since our inception. Caliente currently serves school districts, municipality, state and higher educational customers under 13 Job Order Contracts and four major national clients under task order contracts. Our goals are simple; every client gets our full attention and we take care of the details by providing exceptional quality, and personalized, cost-conscious, timely and innovative design-assist and construction solutions. As a result of our client’s confidence, over 90% of our work is repeat business generated from the relationships we have built with our customers, business and construction industry colleagues.

Centennial



“Centennial provides nationwide performance-based IDIQ and job order contracting, including pre-construction services and incidental design. We are a leader in responsive construction services supporting government, healthcare, educational, and business facilities and infrastructures, providing the best value when speed, flexibility and trust are critical, with safety and quality always a requirement. Our locally based project teams specialize in repair, renovation, and infrastructure upgrades, focusing on construction solutions integrated with your needs, budgets, and operations. We have placed over \$3 billion in construction services across the country by working closely with our customers to fully understand their mission. “Customer satisfaction is the measure of our success.”

The Gordian Group



The Gordian Group, founded in 1990, is a leading provider of construction data, software and services that companies rely on to pursue efficient and effective construction planning, estimating and procurement. In 1982, Gordian’s Chairman and Founder Harry H. Mellon invented the family of contracting systems known as Job Order Contracting (JOC) while serving as Chief Engineer at the Supreme Headquarters Allied Powers Europe in Mons, Belgium. In 1990, Mr. Mellon started The

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Gordian Group to provide these products and services with the realization that others could greatly benefit from the time and cost saving advantages of this leading-edge construction procurement solution.

Today, Gordian's unique combination of comprehensive data, robust software and specialized expertise enable facility and infrastructure owners, architects, engineers and contractors to efficiently manage all facets of construction procurement, from project estimation and scope identification to project management. Gordian's solutions and brands include RSMMeans, the leader in estimating data, analytics and life cycle cost analysis for commercial and residential construction, and Sightlines, the leading provider of facilities benchmarking data and expertise to higher education institutions. The Gordian Group draws on its highly specialized staff, software and unique proprietary data sets to solve the construction information, planning and management needs of people in building construction, building products manufacturing, education, healthcare, retail, insurance, legal and government. Over 1.4 billion in construction work is completed annually with Gordian's solutions.

Job Order Contracting Group

The Job Order Contract Group (The JOC Group) provides Job Order Contract (JOC) 3rd Party Independent Estimating Auditing Services of line item estimates throughout various government & private agencies. The JOC Group's 3rd party Unit Price Book (UPB) estimate auditing services and compliance reviews offer transparency with agencies contract documents and the construction contractors proposed scope of work. Our goal is to provide transparency and contract compliance for the JOC industry as a 3rd party independent JOC estimate review source and to provide overall managed JOC solutions

4Clicks Solutions



We are a veteran owned small business that specializes in providing cost estimating and project management software, service and training. We empower Facility Owners, Contractors, and AEs to work faster, easier, and smarter. Anyone can say this; however we have spent the last 15 years doing this! By Estimators for Estimators™ isn't just our tagline. We are estimators, engineers, and project managers who have worked on both sides as Facility Owners and as Construction Contractors.

Purdue

Purdue Universities Physical Facilities provides a range of construction services to customers on a campus of more than 380 buildings. Within Physical Facilities, the Energy and Construction (E&C) department is currently engaged in approximately 1 billion dollars in construction projects, from planning through construction. For the past several years, E&C has managed nearly 200 million dollars per year in actual construction projects. Currently, Purdue is utilizing in-house, DBB, DB, CMc, and JOC construction procurement methods. Purdue's JOC contracts have no minimum value and a maximum value of four million dollars (\$4,000,000) per term. The term of the contract are for twelve months or the time when The Trustees of Purdue University has ordered work equal to the maximum value of the

Contract, whichever occurs first. The Contract provides options for four additional terms, which have no minimum value. Purdue has awarded two separate Job Order Contracts for all four option terms.

SDB Contracting Services

SDB is a solutions-oriented general contractor specializing in job order contracting. Since its inception in 1980, SDB has become known for providing exceptional quality and service in support of the high-tech, government, healthcare, K-12 and higher education markets. Our award winning safety program and expert staff have built SDB's reputation as an industry leader able to deliver safe projects within budget and schedule regardless of size while ensuring customer satisfaction.

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APPENDIX B List of Survey Respondents

The following table is a list of organizations that participated in the research by completing an owner or contractor survey. Some organizations have elected to remain anonymous, and are thus not included in the list below.

Organization	Type
Abbott General Construction, Inc.	Contractor
ADOA	Owner
Alpha Building Corporation	Contractor
Atlas	Contractor
Bellevue	Owner
Centennial Contractors	Contractor
Chicago Emergency Management & Communication	Owner
Chicago Transit Authority	Owner
City of Mesa	Owner
City of Miami	Owner
City of Naperville	Owner
City of New Orleans	Owner
City of Phoenix	Owner
City of Tempe, Arizona	Owner
Cook County	Owner
CORE Construction	Contractor
County of Sacramento	Owner
County of San Diego	Owner
Dormitory Authority of the State of New York	Owner
DC Housing Authority	Owner
Don Ana County	Owner
Flagstaff Unified School District	Owner
Fort Riley Northcon	Contractor
Ft. Stewart, GA	Owner
Harris County	Owner
Horizon Group International	Contractor
IEC-Allstar	Owner
Jackson Health Systems	Owner
Kowalski Construction, Inc.	Contractor

Organization	Type
Los Angeles Unified School District	Owner
Marta	Owner
Mohave Education Services	Owner
Monterey County	Owner
NJ Department of Transportation	Owner
Northcon	Contractor
NYC - Department of Education	Owner
NYC - Department of Design and Construction	Owner
NYC - School Construction Authority	Owner
NYC - Housing Authority	Owner
Odyssey International	Contractor
Penn State University	Owner
Prestige Building Companies	Contractor
Purdue University	Owner
San Antonio	Owner
SDB, Inc	Contractor
Stanford University	Owner
State University of New York	Owner
UCSF	Owner
University of Arizona	Owner
University of California Oakland	Owner
University of Illinois Urbana-Champaign	Owner
University of Missouri Schools	Owner
University of North Texas	Owner
University of Washington	Owner
US Postal Service	Owner
Ventura	Owner
Washington Elementary School District	Owner
Wight Construction	Contractor

**APPENDIX C
Owner Survey Results**

	Unit	All Owners	University	K12 Education	State, County, City	Federal Government	Private
Number of Response	#	47	12	3	27	4	1
Approximate Total Awarded Amount (in Millions)	\$M	\$144	\$331	\$753	\$1,776	\$2,300	\$50
Average Years of JOC Experience	#	10	9	14	10	18	15
Total Years of JOC Experience	#	440	92	42	238	53	15
Percent of Unsatisfactory Contracts	%	4.3%	6.4%	3.0%	3.8%	3.7%	0.0%
Percent of Unsatisfactory Task Orders Per Contract	%	3%	4%	1%	4%	2%	3%
Average Procurement Time (Days)	Days	138	98	167	132	252	180
Average Maximum Contract Duration	Years	3.3	2.9	4.3	3.1	5.0	5.0
Average Number of Contractors Per Contract	#	5	9	1	4	1	1
Average Number of Task Orders Per Contract	#	12	6	32	11	16	10
Importance of JOC Support Technology (1-5)	#	4.2	4.1	3.0	4.2	5.0	5.0

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APPENDIX D Contractor Survey Results

	Unit	Average
Number of years performing JOC work:	Years	14
Total number of years in business	Years	33
Total number of owners contractor has contracts with:	#	41
Total number of owners contractor has JOC contracts with:	#	14
Total number of current JOC contracts participating in:	#	14
Contractor Satisfaction with the JOC system:	(1-5)	4.3
Average contractor satisfaction with how the owner uses the JOCs:	(1-5)	3.4
Contractor satisfaction with the flexibility of the JOC system:	(1-5)	3.9
Transparency of JOC contracts compared to other delivery systems:	(1-5)	4.1
Average % cost savings on JOC projects due to increased efficiency	%	21%
Percent of Projects on Budget	%	89%
Percent of Projects on Time	%	94%

APPENDIX E Owner Written Responses

This appendix summarizes the “short answer and other questions” section of the JOC Client Survey. In total 46/47 clients responded to 12 questions. The results of each question are represented in the corresponding tables below. The questions asked to each client are as follows:

1. What major areas of administration and actual cost of construction do JOC contracts help you to save costs in? (Please list in order of greatest savings).
2. Are there any other areas that JOC contracts help you increase efficiency that is not related to cost?
3. How do you use designers in JOCs?
4. How do you select JOC contractors? Do you use performance information to select? If yes, please identify what type of performance information?
5. What major tasks are required for performing JOC systems? (List tasks in order of importance).
6. What should be the roles for contractors, subcontractors and owners (procurement/contracting, engineering, budgeting, management) in successful JOCs?
7. What are your main motivations for using the JOC method? (List in order of importance).
8. Please identify any issues with using JOC contracts? (List in order of the most occurring issue).
9. Identify the role of and key characteristics of a “Good” Unit Price Book (UPB).
10. As an *owner*, what program requirements are important for an owner to provide to ensure a successful JOC program? (List in order of importance).
11. As an *owner*, what program requirements does the contractor need to be able to provide to ensure a value-added and successful JOC program? (List in order of importance).
12. Can you identify the position and skill sets of the people needed to run a JOC program? (Please list in order of importance).

Survey Findings

Table 1: Question 1.1

“What major areas of administration and actual cost of construction do JOC contracts help you to save costs in?”

Criteria	Metric
Total Responses	44/47
Respondents who Agree that JOC Reduces Costs	98%
Procurement Time	86%
Project Management Time	73%
Less Documentation	34%
Less Bureaucracy	32%
More Efficient Designs and Drawings	30%
Fewer Staff	25%
Unit Price Book Cost Savings	20%
Fewer Marketing Requirements	16%
Decreased Construction Time	14%
Decreased Contractor Time Requirements	11%
No Savings	2%

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Dominant Findings: In general, 43 out of 44 (98%) of clients identify that the source of cost savings in JOC is due to decreased time demand in all aspects of service delivery and the decreased need for documentation and management.

Table 2: Question 1.2

“What major areas of administration and actual cost of construction do JOC contracts help you to save costs in (in order of greatest savings)?”

Criteria	Ranking
Procurement Time	1
Project Management Time	2
More Efficient Designs and Drawings	3
Unit Price Book Cost Savings	4
Less Documentation	5
Less Bureaucracy	6
Fewer Staff	7
Fewer Marketing Requirements	8
Decreased Contractor Time Requirements	9
Decreased Construction Time	10

Dominant Findings: In question 1 respondents were also asked to rank the order of importance for each question. The authors calculated the total votes for each entry. Table 2 above shows the ranked order of each response from question 1.

Table 3: Question 2

Are there any other areas that JOC contracts help you increase efficiency that is not related to cost?

Criteria	Metric
Total Responses	39/47
Respondents who Believe that JOC Increases Efficiency	82%
Improved Time Efficiency	64%
Ease of Use and Implementation	33%
Flexibility	26%
Scope Improvements	23%
Greater Contractor Experience and Expertise	23%
Less Bureaucracy	13%
Fewer People	10%
Improved Construction Methods/ Design	10%

Dominant Findings: 82% of clients believe that JOC contracts help them become more efficient in more ways than just cost savings.

Table 4: Question 3

How do you use designers in JOCs?

Criteria	Metric
Total Responses	43/47
Separate Contract	51.2%
Included in JOC	27.9%
Unspecified (not JOC)	16.3%
Owner Provided	16.3%

Dominant Findings: The majority of owners (51%) use a separate contract to provide designs. 28% state that they use the JOC contractor for design work, but several respondents specified that they only use the contractor for simple design work and to meet safety regulations. The general consensus is that it is uncommon for the JOC contractor to also provide designs, but it can be done in special cases.

Table 5: Question 4

How do you select JOC contractors? Do you use performance information to select? If yes, please identify what type of performance information?

Criteria	Metric
Total Responses	43/47
Past Project Performance (Time, Cost, Quality)	51%
Experience	44%
Low Bid	28%
Feasibility (Location, Availability, Legality)	30%
Relationship	16%

Dominant Findings: Owners express that the primary method for selecting contractors is by using past performance metrics or past contractor experience.

Table 6: Question 5

What major tasks are required for performing JOC systems? (List in order of importance)

Criteria	Metric
Total Responses	34/47
Pre-planning [scope, schedule, budget]	100%
Procurement of Work	87%
Contract Management Administration	43%
Contractor Negotiations	30%
Construction	27%
Pre-education	22%
Project Closeout	22%

Dominant Findings: Overall, 100% of respondents feel that preplanning (in terms of scope, schedule, and budget) is most important, with 86% rating procuring services as its second most important task.

Table 7: Question 6

What should be the roles for contractors, subcontractors, and owners (procurement/contracting, engineering, budgeting, management) in successful JOCs?

Criteria	Owner	Subs	Contractor
Total Responses	37/47	31/47	36/47
Contract/Scope Management	70%	19%	72%
Construction Management	41%	29%	86%
Construction Services	0%	74%	44%
Design & Engineering	19%	3%	8%
Communication & Collaboration	46%	16%	31%

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Dominant Findings: Owners express that overall contract management and procurement requires equal involvement from contractors and owners and high involvement from sub-contractors. Owners also believe that contractors should be primarily responsible for ensure good communication between parties.

Table 8: Question 7
What are your main motivations for using the JOC method?

Owner Criteria	Metric
Total Client Responses	45/47
Fast Delivery	96%
Simplicity	80%
Flexibility	76%
Cost Savings	64%
Higher Quality Construction	49%
Greater Use of Expertise	36%

Dominant Findings: 96% of clients agree that the largest motivation for using JOC is its ability to reduce time. The next most important factors were its simplicity and flexibility.

Table 9: Question 8
Please identify any issues with using JOC contracts.

Criteria	Metric
Total Responses	38/47
Pricing Disagreements	42%
Poor Understanding of JOC Processes	40%
Non-Transparency of Contractors	37%
Initiating JOC at their Company	26%
Low Performing Contractors/Subs	24%
Lack of Communication	18%
Difficulty with Complex Projects	18%
No issues	13%

Dominant Findings: Clients identify pricing disagreements and lack of JOC understanding as their largest issues. Many of the reported issues are directly related to poor JOC education and preparation. Some key focuses of JOC are: ease of use, transparent systems, decreased need for communication, and utilization of high performing contractors. With a greater understanding of JOC processes, the authors propose that many of these issues would vanish, which would lead companies to use JOC more often.

Table 10: Question 9
Identify the role of and key characteristics of a “Good” Unit Price Book (UPB).

Criteria	Metric
Total Responses	42/47
Accurate/Consistent with Market Pricing	60%
Simple/Clear	52%
Up-to-date	36%
Unique Items / Price Adjustments Specific to Region	24%

Dominant Findings: Overall, clients believe that a good unit price book is one that is on par with current market trends and is simple and clear enough they can understand.

Table 11: Question 10

As an owner, what program requirements are important for an owner to provide to ensure a successful JOC program?

Criteria	Metric
Total Responses	45/47
Upfront Collaboration	73%
Detailed Scope & Contract	60%
Well-Trained Staff	33%
Timely Payments	16%
Continuous In-Flow of Projects/Task Orders	16%
Simple UPB Cost Breakout	16%
Customizable Estimates	13%
Fair Project Disbursement	11%
Cloud capable tools	9%

Dominant Findings: Respondents report that the most important factor for owners is to collaborate upfront between all parties (clients, contractors, and subs). Second, being able to manage the contract and procurement of the project was critical. Equally important was ensuring the contractors have a detailed scope.

Table 12: Question 11

As an owner, what program requirements does the contractor need to be able to provide to ensure a value-added and successful JOC program?

Criteria	Metric
Total Responses	44/47
High Customer Satisfaction	66%
On-Time Delivery	57%
JOC Knowledgeability	50%
Past Performance Metrics	39%
Minimal Project Deviations	34%
On-Budget	36%
Simple & Accurate Proposals	27%
Feasibility [Available, licensed, location]	25%

Dominant Findings: Clients feel that the contractor should provide past performance metrics that identify their quality of work and ability to meet the allotted schedule. Additionally, clients feel it is important for contractors to have a good understanding of the JOC methodologies.

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Table 14: Question 12.2
Can you identify the skill sets of the people needed to run a JOC program?

Criteria	Metric
Total Responses	41/47
Construction Knowledge	93%
JOC Process Knowledge	76%
Professional [cordial, motivated, accurate, simple, accountable]	73%
Contract Administration Experience	61%
Interpersonal Skills	39%
Design Experience	27%
Negotiation Experience	20%

Dominant Findings: Clients feel that JOC administrators need to have three fundamental skill sets: construction knowledge, JOC knowledge, and high professionalism.

APPENDIX F
Contractor Written Responses

This appendix summarizes the “short answer and other questions” section of the JOC Contractor Survey. In total 13 contractors responded to 10 questions. The results of each question are represented in the corresponding tables below. The questions asked to each client are as follows:

1. Average % cost savings on JOC projects due to increased efficiency. (see Chapter Four)
2. What major areas do JOC contracts help you save costs?
3. Are there any other areas that JOC contracts help you increase efficiency that is not related to cost?
4. What major tasks are required for correctly administering JOC system?
5. What should be the roles for contractors and clients in successful JOCs?
6. What are the major benefits of working on JOC contracts?
7. Are you able to get involved in JOC projects sooner than other delivery methods?
8. Does a JOC contract enable you to be more transparent? How?
9. Do you have any “good” or “bad” examples of successful JOC contracts or delivery orders that you would like to share? List any major lessons learned. (see Appendix G)
10. Please identify the top errors that owners perform when administering JOC that minimize your performance and efficiency:

Table 2: Question 2
What major areas do JOC contracts help you save costs?

Criteria	Metric
Procurement	73%
Change Orders	45%
Time	27%
Design	27%
Overhead	27%

The majority of respondents report that the greatest area of cost savings in procurement. Contractors identify that in using JOC procurement is shorter and less frequent. Respondents also report that JOC has fewer change orders.

Table 3: Question 3
Are there any other areas that JOC contracts help you increase efficiency that is not related to cost?

Criteria	Metric
Sourcing Work	55%
Estimating	45%
Training	36%

Respondents identify that it is easier to source work in JOC because it encourages a continual partnership with owners. Contractors are able to decrease the amount of sales, marketing, and bidding.

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Table 4: Question 4

What major tasks are required for correctly administering JOC system?

Criteria	Contractors	Owners
Scope Definition	50%	75%
Pricing	67%	0%
Construction Management	17%	8%
Site Management	33%	0%
Meetings/Documentation	8%	25%

Most respondents specified that both contractors and owners should be involved in creating the scope. Respondents believe that neither party should take full responsibility.

Table 5: Question 5

What should be the roles for contractors and clients in successful JOCs?

Criteria	Contractors	Owners
Contract/Scope Management	13%	50%
Construction Management	25%	0%
Construction Services	13%	0%
Communication & Collaboration	63%	63%

Respondents once again specified the need for collaboration on scope definition and management between the contractor and the owner.

Table 6: Question 6

What are the major benefits of working on JOC contracts?

Criteria	Metric
Increased Workflow	58%
Ease of Use	33%
Enables Better Collaboration	33%
Reduced Cost	17%
Saves Time	17%
None	8%

The greatest benefit of JOC to contractors is the steady flow of new job orders removing the burden of looking for more work. In addition, contractors identify that JOC is easy to use and understand. One contractor also mentioned the time that is saved through design, specifying that JOC can turn a 2 – 4 month design process into a 2 – 5 day process.

Table 7: Question 7

Are you able to get involved in JOC projects sooner than other delivery methods?

Criteria	Metric
Yes	90%
No	10%

Several respondents state that they are able to get involved earlier to participate in scope definition.

Table 8: Question 8

Does a JOC contract enable you to be more transparent? How?

Criteria	Metric
Yes	100%
No	0%
<i>Yes, how?</i>	
Pricing	50%
Relationships	20%

Respondents specify that JOC increases the ease of sharing costs through the unit price book. Several contractors state that they share pricing information during scope definition and are open to audits during the project duration. Contractors also believe that transparency results from trusting relationship between contractors and owners through using JOC.

Table 9: Question 10

Please identify the top errors that owners perform when administering JOC that minimize your performance and efficiency.

Criteria	Metric
Poor Scope Definition	80%
Poor Communication	40%
Payment Delays	30%
Lack of Involvement	30%
Using Low Bid	20%

The greatest error that contractors report is excessive scope adjustments or disregarding the scope schedule and contract requirements. Several contractors report that owners overestimate the amount of work they plan on providing through the JOC.

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APPENDIX G Case Studies

Research participants were given the opportunity to provide examples of successful and unsuccessful implementations of JOC. The responses listed below are direct quotations. Organization names, and identifying features have been removed from the quotations.

Examples of Successful JOC Implementations

University

During sub-freezing weather, a sprinkler main broke in the penthouse of one of our research buildings. Several hundred thousand gallons of water flooded three floors of research/office facility. The damage was contained to one wing of the building, yet it was extensive. JOC was the only option that could provide an accelerated start and expedited completion date. Being a public institution, the ability to have a contractor under contract was a huge benefit in this case, where we were able to start dialog before the final scope was established.

While water mitigation was still in progress, we were able to start developing a scope with our JOC contractor and they provided a proposal in a very timely manner. Once the affected areas were dried, our JOC contractor was ready to mobilize and began construction immediately. This expedited progress did not only benefit the office staff, but also allowed critical scientific research to begin several months earlier than if we had used the DBB procurement method.

County Government Agency

A good case for JOC – Roofing: our roofing JOCs have experienced consistent satisfaction marks in speed, defining of scope of work, and straight forward proposal reviews based on quantity X construction task catalog item X contractor's adjustment factor. Our JOC consultant attributes this to the consistency of the workload we have (e.g. all of our facilities roofs have single ply roofing or built up asphalt roofing), and members of our local roof contractor community seem to know each other and the local market very well where contractor adjustment factors are very close to each other (e.g. within one or two percentage points).

City Government Agency

Our agency completed so many emergency projects to repair the damage caused by Hurricane Sandy. The contractors were already on board so all we did was brought them to the site to assess the damage and establish a scope of work that the contractor could price. Once we finalized the review of the cost proposal and agreed on the price, the contractor was at the job site after a few days, doing physical work. Hope this helps. Regards.

The size of the work order ranged from \$100,000 to around \$300,000. The type of work done were: mold removal, boiler/ water heater replacements, replacement of water damaged plasters/woodwork, interior restoration work, electrical conduit and wiring replacements, ductwork and other equipment replacements. The average completion time was 3 months. Three GCs, 1 electrical and two HVAC contractors were used.

City Government Agency

We installed 2 new generators and a complete new chiller system within our Communication/911 call center. Without the flexibility and collaboration of the JOC, it would not have gone as smooth as it did if we used a traditional DBB method.

Contractor

In 2008, Houston was hit by a category 3 hurricane. At the time we had JOC contracts in place with two universities. Under emergency work provisions for both contracts, we had almost 100 people working on both university campuses less than 24 hours after the passing of the storm; clearing roadways, repairing roofs, covering broken windows, drying buildings, and pumping flood water. All of this began before any university staff had gotten on site.

Examples of Unsuccessful JOC Implementation

University

While we don't have a project that was negative due to JOC specifically, we had a situation where both of our JOC contractors fail to meet the contract terms. With one contractor, they failed to perform. We dealt with the situation, but eventually, their contract was terminated. In addition, our second contractor request dismissal from the program during their first option term. One lesson learned- have language in the proposal that would allow for the next qualified bidder to be eligible without the need to rebid.

University

On projects that have gone sideways, the root cause has been communication. Additionally in the past we had a person responsible for the JOC process who wasn't 100% bought in to the partnering and team aspect. One thing that I tried to do is be clear about expectations and risk mitigation. I work hard to ensure that when things do go sideways that the entire team works to resolve the issue and not point fingers. I often will say, "At the moment in time we made 'x' decision, it was based upon 'y'". It is a challenge getting PM's and CM's who come from a DBB background to trust the process. The process is flexible and nimble, however if team members are not comfortable with the "squish" they quickly resort back to the black and white bounds of the contracts.

County Government

Bad cases in JOC when adjustment factors are below construction task catalog prices: During slow economic times, JOC contractors lowered their adjustment factors to remain competitive, win contracts, and keep their work crews employed at profit loss. Sometimes, adjustment factors are below 1 (meaning the contractor is giving a discount across the entire construction task catalog). To mitigate profit loss, contractors seem to become less transparent with their proposals. Poor proposals would include duplicate task items to inflate quantities. Assembly costs would be broken down into component costs which would add up to be greater than assembly costs. A premium product was listed in the proposal only to be substituted out with a lower cost product during installation. Non pre-priced exceptions were abused – a task item may be listed in the construction task catalog, but the contractor would argue that a technicality of his proposed product was not equivalent and therefore must charge the higher non pre-price. Contractor claims of scope definition increased such as surface prep and priming was not included in original painting proposal and therefore required change order even though construction task catalog states surface prep and priming is included in task line item. Similar contractor claims were regarding furniture moving and clean up not included with carpet install when in fact the construction task catalog includes these items. I mention these specific items because we do a great number of paint and carpet jobs whenever tenants relocate, and we do not have time to deal with nonsense claims. JOC general contractors file

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claims, subcontractors file lien notices, our agency issued stop notices; and everything comes to a grinding halt and monies frozen over paint and carpet jobs.

Contractor:

1. Where owner uses JOC contract for only maintenance type work, less than \$50K projects, mostly \$10K or less. No opportunity to demonstrate value add and contract should probably have been a unit price or cost plus contract.
2. Owner decides to compete JOC contractors against each other. All incentive for VE, value-added safety, scoping initiatives is immediately removed.
3. Owner decides he wants a JOC at the highest level, directs this staff to implement without their buy-in. The staff creates roadblocks to not make it work for either party.
4. Owner worked out the scope of work with a subcontractor, including the pricing for a specific task. Then came to us as the JOC contractor as directed us to use the subcontractor for the scope. The subcontractor was not qualified or adequately experienced for this scope of work and it resulted in a poor project performance with an unhappy owner, subcontractor and JOC contractor.
5. When owners use JOC incorrectly and request multiple contractors bid under JOC and select the low bid. Therefore saving time/money not having to issue a solicitation using a Hard Bid. This should not be allowed.

**APPENDIX H
Owner Survey**

JOC Owner Survey and Interview Questions

Respond to the following questions as accurately as possible, estimate when needed and please give your honest opinion. **All information is confidential!** Use a range of 1-5 for questions requiring a rating (5=very satisfied, superior quality, or important; 3=satisfied, average quality, or don't know; and 1= very unsatisfied, poor quality, or not important). You can put N/A if there is question that you cannot answer.

Company Operations Information

1	Type of organization (private or public):	<input type="checkbox"/> Public <input type="checkbox"/> Private	
2	What Role do you play in your JOC? (Contracting or Procurement, Engineering, PM, Estimator, Manager or others)		
3	Client Type (e.g. Private, Commercial, Public Limited Companies, University, Local Gov., State and Territory Gov. Fed. Gov.):		
4	How do you deploy JOC (Co-op, Self-Performed, Outsourced or Combination (Outsource/Self-Perform))		
5	Past delivery methods used other than JOC:		
6	Delivery methods <i>currently</i> being used: (DB, DBB, CMAR, JOC etc.)		
7	Do you maintain facilities?	<input type="checkbox"/> Yes <input type="checkbox"/> No	
8	Would you recommend JOC to another facility manager?	<input type="checkbox"/> Yes <input type="checkbox"/> No	
9	Do the contractors get involved in the contracting process much earlier under JOC delivery method?	<input type="checkbox"/> Yes <input type="checkbox"/> No	
10	Do you have any "good" or "bad" case study examples of successful JOC contracts or delivery orders that you would like to share?	<input type="checkbox"/> Yes <input type="checkbox"/> No	
11	Would you like to have a registry of local/regional JOC contractors?	<input type="checkbox"/> Yes <input type="checkbox"/> No	
12	Do you use a JOC specific software application?	<input type="checkbox"/> Yes <input type="checkbox"/> No	
13	If the answer to previous question was yes, what applications?		
14	Do you use JOCs for horizontal or vertical construction, or both?		
15	Number of years owner has been using JOCs:	#	
16	Percentage of JOC projects by your agency with unsatisfactory results:	%	
17	Total number of current JOC contracts (master agreements):	#	
18	Number of projects (job/task orders) to date:	#	
19	Total award amount to date:	\$	
20	Average time it takes to procure a JOC contract (master agreement):	Days	
21	Average maximum duration of JOC contracts (master agreement):	Years	
22	Average number of contractors per contract (master agreement):	#	
23	Average number of projects (job/task orders) a contract handles at once:	#	
24	How important is technology to your JOC program?	(1-5)	

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Administration Information

Comparison of persons needed to administer alternate delivery systems:

#	JOC	Design-Bid-Build	Design Build	CMAR
# of people it takes to administer the delivery system				

Performance Criteria	Unit	Savings
Average % cost savings on Administration due to using JOC:	%	

For each JOC contract please identify the following for each contract:

#	Contracts		1	2	3
1	Type of JOC contract (Renovations, HVAC, etc.):				
2	Number of Personnel Required to Administer the JOC:	#			
3	Number of contractors:	#			
4	Number of projects (job/task orders) performed:	#			
5	Number of projects (job/task orders) being dealt with at once:	#			
6	What percentage of projects (job/task orders) on your JOC contract are you dissatisfied with?	%			
7	Total dollar amount of projects (job/task orders) performed:	\$			
8	Maximum Dollar amount allowed per project (job/task order)	\$			
9	Maximum duration (base year & optional year):	Years			
10	Quality of construction:	(1-5)			
11	Customer satisfaction:	(1-5)			

JOC Project Performance

1. Client satisfaction comparison with alternatives. Please rate questions using the 1-5 scale:

Criteria	JOC	Design-Bid-Build	Design Build	Other:
Overall Satisfaction rating				
Quality of Construction				
Quality of Design Services				
Quality of Design Drawings				
Level of Transparency				
Level of Flexibility				
Allows the achievement of organizational goals				
# of Legal Disputes	#	#	#	#

% Projects on budget	%	%	%	%
% Projects on time	%	%	%	%

2. Project speed comparison of JOC vs alternative delivery methods (days):

Average days per project	Design	Procurement / Response time to project (job/task orders)	Construction	Total average time needed
JOC				
Design-bid-build				
Design-build				
Other:				
Other:				

3. Average cost comparison of JOC vs Design-bid-build, alternative methods: (Units cost per project)

Average Cost	Procurement Administration	Construction	Design	Consulting	Project Management	Total
JOC	\$	\$	\$	\$	\$	\$
DB	\$	\$	\$	\$	\$	\$
DBB	\$	\$	\$	\$	\$	\$
_____	\$	\$	\$	\$	\$	\$

4. Average JOC response time:

Average days	Cost estimates	“basic” drawings on “routine” delivery orders	“basic” drawings on “emergency or urgent” delivery orders
Average Response Time			

Short answer and other questions:

1. What major areas of administration and actual cost of construction do JOC contracts help you to save costs in? (Please list in order of greatest savings)
2. Are there any other areas that JOC contracts help you increase efficiency that is not related to cost?
3. How do you use designers in JOCs?
4. How do you select JOC contractors? Do you use performance information to select? If yes, please identify what type of performance information?
5. What major tasks are required for performing JOC systems? (List tasks in order of importance)
6. What should be the roles for contractors, subcontractors and owners (procurement/contracting, engineering, budgeting, management) in successful JOCs?

Contractors:

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Subcontractors:

Owners:

7. What are your main motivations for using the JOC method? (List in order of importance)
8. Please identify any issues with using JOC contracts? (List in order of the most occurring issue)
9. Identify the role of and key characteristics of a “Good” Unit Price Book (UPB).
10. As an *owner*, what program requirements are important for an owner to provide to ensure a successful JOC program? (List in order of importance)
11. As an *owner*, what program requirements does the contractor need to be able to provide to ensure a value-added and successful JOC program? (List in order of importance)
12. Can you identify the position and skill sets of the people needed to run a JOC program? (Please list in order of importance)

**APPENDIX I
Contractor Survey**

JOC Contractor Survey and Interview Questions

Respond to the following questions as accurately as possible, estimate when needed and please give your honest opinion. **All information is confidential!**

Rating System Definition: Use a range of 1-5 for questions requiring a rating (5=very satisfied, superior quality, or important; 3=satisfied, average quality, or don't know; and 1= very unsatisfied, poor quality, or not important). You can put N/A if there is question that you cannot answer or doesn't apply.

Overview Questions

1	Type of contractor (general or subcontractor):	<input type="checkbox"/> General <input type="checkbox"/> Subcontractor	
2	Type of work performed (HVAC ³⁶ , Electrical, etc.):		
3	Number of years performing JOC ³⁷ work:		
4	Delivery methods contractor has performed work under (DB ³⁸ , DBB ³⁹ , CMAR ⁴⁰ , IPD ⁴¹ , etc.):		
5	Total number of years in business	#	
6	Total number of owners contractor has contracts with:	#	
7	Total number of owners contractor has JOC contracts with:	#	
8	Total number of current JOC contracts participating in:	#	
9	Contractor Satisfaction with the JOC system:	(1-5)	
10	Average contractor satisfaction with how the owner uses the JOCs:	(1-5)	
11	Contractor satisfaction with the flexibility of the JOC system:	(1-5)	
12	Transparency of JOC contracts compared to other delivery systems:	(1-5)	

³⁶ Heating, Ventilation, and Air Conditioning

³⁷ Job Order Contracting

³⁸ Design Build

³⁹ Design Bid Build

⁴⁰ Construction Manager At Risk

⁴¹ Integrated Project Delivery

JOC Project Performance

1. Comparison of contractor satisfaction and performance of JOC projects compared to other delivery systems

#	Criteria	Unit	JOC	Design-Bid-Build	Design Build	CMAR	Other:
1	Contractor's Satisfaction Rating	(1-5)					
2	Average Customer Satisfaction Rating of the Contractor	(1-5)					
3	% Projects on budget	%					
4	% Projects on time	%					

2. Speed comparison of JOC vs low-bid, alternative methods: average time needed, please express in number of days:

3.

#	Average Time	Unit	Full Bid Preparation	Construction	Design	Response time for cost estimate of an emergency project	Response time for cost estimate of an average project
1	JOC	Days					
2	Low-bid	Days					
3	Others_____	Days					

4. Average cost comparison of JOC vs low-bid, alternative methods (A 0% means that the cost is the same as other delivery systems. Anything over a 0% identifies the average % the cost is **decreased** due to the delivery model in comparison with the other deliver systems). Example: 5% indicates the method is 5% less effective

#	Average Cost Decrease	Unit	Procurement	Construction	Design	Total
1	JOC	%				
2	Low-bid	%				
3	Others_____	%				

Please provide any additional commentary or justification for question 3 in the space below

Administration Information

1. Average % cost savings on JOC projects due to increased efficiency:
2. What major areas do JOC contracts help you save costs?
3. Are there any other areas that JOC contracts help you increase efficiency that is not related to cost?

Short answer and other questions

4. What major tasks are required for correctly administering JOC system? *(Please identify by using C for contractor, O for owner and B for both)*
5. What should be the roles for contractors and clients in successful JOCs? *(Please identify by using C for contractor, O for owner and B for both)*
6. What are the major benefits of working on JOC contracts?
7. Are you able to get involved in JOC projects sooner than other delivery methods?
8. Does a JOC contract enable you to be more transparent? How?
9. Do you have any “good” or “bad” examples of successful JOC contracts or delivery orders that you would like to share? List any major lessons learned.
10. Please identify the top errors that owners perform when administering JOC that minimize your performance and efficiency:

APPENDIX J

Research Objectives

Desired Outcomes of JOC Research	Completion Status	Page
Owner participation in the study (Bests practices, examples, testimonies).	Partial	19
Time and cost comparison of JOC vs Traditional Delivery Methods (DBB, DB, CMAR, etc.).	Completed	19
Examples of successful JOC implementation.	Completed	57
Client satisfaction comparison with Alternative Delivery methods.	Completed	23
Comparison of small and large, simple and complex, horizontal and vertical, JOC projects.	Completed	19
Demonstrate the need for transparency and accountability when using JOC.	Completed	24
Role of and key characteristics of a “Good” Unit Price Book (UPB)	Completed	27, 31
Identify best practices in qualifying owners/ contractors for JOC projects.	Completed	31
Identify and address any objections and complaints of JOC process.	Completed	23, 51
Overall performance of JOC projects (time, cost, and customer satisfaction).	Completed	19
Identify if JOC process supports the development of small businesses. (also value of freely competitive JOCs, government is not only place for JOC)	Completed	21
Identify how JOC mitigates risk of procurement and helps them to do the right action.	Complete	5, 7
Identify JOC best practices and lessons learned. Clearly define roles, responsibilities, and deliverables.	Complete	31, 50
Show that JOC is more successful when performance information is used to select the contractor.	Complete	31
Identify if JOC users would like a registry of local JOC vendors	Complete	-
How to work with designers within JOC.	Complete	31
Identification of the process a new user would perform to implement JOC system.	Partial	31
Discussion and explanation of coefficients, localization factors, and potential variants.	Complete	13
The value JOC provides to facility managers.	Complete	19
Identification of JOC terminology, processes, key components, and characteristics.	Complete	13
Various perceptions of JOC in the industry	Complete	13, 57
Collect information identifying if bidding a JOC master contract satisfies requirements for bidding above statutory thresholds.	Complete	29
Identify if JOC increases transparency and accountability, and reduces corruption.	Complete	24
Case studies in various regions across the United States and Internationally.	Complete	29
Identify if the JOC Cost Book (CTC/UPB) used as a basis for bidding JOC (including cooperatively purchased JOC contracts) satisfies the routine statutory provisions in most states that plans and specifications be prepared for bidding.	Complete	29

APPENDIX K
Sources for State Statutes and Audits

The references included within this appendix are not intended to be an exhaustive literature review, but rather provide a small look at common state statutes. The reader is advised to seek additional guidance on statutes regarding JOC in their states of operation.

State	Source
Arizona	City of Scottsdale City Auditor's Office Audit Report No. 1409
Arkansas	2010 Arkansas Code Title 19 - Chapter 4 - Subchapter 14 (19-4-1416)
California	Office of the Inspector General Los Angeles Unified School District CA 09-865 October 17, 2011 Annual Report Fiscal Year 2012 CA 15-1044 October 30, 2015 Office of the Controller City and County of San Francisco Audit report July 18, 2013 April 6, 2015
Florida	City of Miami Capital Improvements Program ITB Number: 08-09-043 Brevard County Internal Audit Review of Facilities Construction July 15, 2003
Georgia	Georgia State Purchasing Division SWC-90818 Indefinite Quantity Construction Services SPD-CP031b
Kansas	District Inspector General for Audit Great Plains District Report: 98-KC-204-1001 March 10, 1998
Massachusetts	Massachusetts Government (mass.gov) Administration and Finance Job Order Contracting Program
Minnesota	Minnesota Statutes 2015 16C.35
New Mexico	State of New Mexico General Services Department Property Control Division RFP Number: 30-350-13-05444

New York	<p>Dormitory Authority of the State of New York (DASNY) Job Order Contracting (JOCS)</p> <p>The New York State Senate Senate Bill S6618</p> <p>City of New York Office of the Comptroller Audit Report on Job Order Contracting by the Department of Environmental Protection FR07-121A June 30, 2008</p> <p>City of New York Office of the Comptroller Audit Report on Job Order Contracting by the Department of Design and Construction 7e11-120A June 28, 2012</p>
South Carolina	<p>Job Order Contracting Blog Legislation for Job Order Contracting March 20, 2009</p>
Texas	<p>Attorney General of Texas Opinion No. GA-1028</p> <p>City of Austin Website Job Order Contracting Related Documents</p> <p>University of Houston Job Order Contract - Guidelines & Procedures July, 2010</p> <p>Houston Independent School District Internal Audit of the Design and Selection Process of Job Order Contracts May 10, 2015</p>
Virginia	<p>[1]Associated General Contractors of Virginia Legislative Reports</p> <p>[2]General Assembly of Virginia Virginia Public Procurement Act</p>
Washington	<p>[1]House Bill Analysis Job Order Contracting HB 2412</p> <p>[2]Washington State Legislature RCW 39.10.440</p>
Wyoming	<p>Laramie Community College Division of Contracting and Procurement Contracting & Procurement Procedures Manual</p>