MULTIPLE INCENTIVE CONTRACTS RESULT IN Increased Costs—OR DO THEY?

Robert J. Muretta, Jr.

Department of Defense (DoD) incentive contracts usually contain a predetermined formula for profit or fee adjustment based upon the actual cost outcome. Additional incentives can also be included, provided that a cost incentive (or constraint) also exists. Historically, DoD incentive contracts containing multiple incentives exceeded their cost targets 20% more frequently than those containing only a cost incentive. The author conducted a factor analysis to compare incentive contract outcomes between the DoD and other government agencies to determine if any underlying factors exist. One factor identified that the frequency in which schedule incentives and penalties are utilized is agency-centric, and increased use correlates to better schedule outcomes. Moreover, cost outcomes are not associated with that factor. The non-DoD agencies in this sample used predetermined cost constraints coupled with schedule incentives and/or penalties versus cost-plus incentive/fixed-price incentive (CPI/FPI) cost sharing structures with additional incentives.

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Incentive contracts can result in a win-win scenario for both the government and the contractor should expectations be exceeded at the end of performance. Each can also be negatively impacted if the outcome is less than favorable. Accordingly, the use of incentive contracts can be beneficial in terms of aligning the interests of the government and the contractor based upon contract outcomes, but this alignment can come at a cost. For example, if too many competing incentives exist, a contractor could become more focused on attaining a delivery or performance incentive at the expense of a cost incentive. This research will review the basic parameters of incentive contracts and compare the outcomes of different incentive arrangements over time. Next, incentive contracts from government agencies outside of the Department of Defense (DoD) will be quantitatively contrasted against those from within to search for underlying trends. Finally, a discussion of the results and recommendations for future research will be presented.

**Background**

According to Federal Acquisition Regulation subpart 16.4 (FAR 16.4), incentive contracts are appropriate when a firm-fixed-price contract is not appropriate and the required supplies or services can be acquired at lower costs and, in certain instances, with improved delivery or technical performance. This is done by relating the amount of profit or fee payable under the contract to the contractor’s performance by including appropriate incentive arrangements designed to discourage contractor inefficiency and waste, and motivate contractor efforts that might not otherwise be emphasized. For the U.S. Government, the two basic types of incentive contracts are fixed-price incentive (FPI) and cost-reimbursement incentive where a profit or fee adjustment formula based upon cost outcome is included. The latter is often referred to as a cost-plus incentive fee (CPIF) or cost-plus incentive (CPI) contract. Award-fee contracts are also a type of incentive contract, which will not be included in this research.
Incentive contracts usually only include cost incentives with the aforementioned profit or fee adjustment formula, which is intended to motivate contractors to effectively manage costs. Moreover, no incentive contract may provide for other incentives without also providing a cost incentive (CPI/FPI) and/or constraint (e.g., firm fixed-price contract with a delivery incentive). That said, once an incentive contract has satisfied this requirement, performance (sometimes called technical) and delivery (sometimes called schedule) incentives can also be included. When these additional incentives are included, it is called a multiple-incentive (MI) contract. It should be noted that incentive arrangements may include not only a reward structure, but also a penalty (sometimes called disincentive) structure beyond the impact of not attaining the reward. In any case, a properly structured MI arrangement should both motivate the contractor to strive for outstanding results in all incentive areas and also compel trade-off decisions in that regard.

If too many competing incentives exist, a contractor could become more focused on attaining a delivery or performance incentive at the expense of a cost incentive.

This proper structure can be difficult to craft and also elusive after the award of a contract that was believed to be structured optimally. Countless examples exist of high-profile incentive contracts where cost targets were greatly exceeded (i.e., overran) irrespective of success in other incentive areas or even successful completion of the contract itself. According to previous studies dealing with incentive contracts (Belden, 1969; GAO, 2017a, 2017b; Parker, 1971), little has changed in the aggregate over the last 50 years with respect to the cost outcomes of incentive contracts. As noted in Table 1, roughly 30% of incentive contracts with only cost incentives overran their cost targets in both periods. Conversely, the presence of additional incentives in MI contracts resulted in over 50% of the contract actions resulting in overruns during the same periods (i.e., MI contracts resulted in a negative impact to cost outcomes by an increased frequency of over 20% compared to contracts with cost incentives only). Given the nearly identical result to cost outcomes between studies nearly 50 years apart, it seems like a foregone conclusion that adding any incentives beyond the cost incentive would result in a predictable and significant impact to the cost outcome of DoD contracts.
Many questions emerge from this trend. For example, does this trend in incentive contract cost outcomes in relation to the presence of additional incentives exist in other federal agencies and in lower forms of government or is there another pattern in those domains? What about other aspects of incentive contract arrangements and outcomes from other domains (e.g., schedule outcomes, the presence of penalties, or evidence of misestimated contract costs prior to award)? Summarily, the question that this research will try to address is “What are the underlying factors that impact incentive contract outcomes across dissimilar procuring agencies?”

**Methodology**

To explore the underlying trends or patterns of the data, a multivariate data reduction form of analysis was employed. Factor analysis is a quantitative technique that is used to reduce a large number of variables into fewer numbers of factors. Through the interpretation of the factors, patterns that would otherwise be hidden may emerge. Moreover, this method demonstrates how those patterns overlap and indicates the level of either positive or negative correlation.

**Sample**

A search was conducted for contract-specific information concerning government incentive contract outcomes since 2000. Information was obtained from U.S. Government Accountability Office (GAO) reports and peer-reviewed publications using the ProQuest search database. Four sources (GAO, 2017a, 2017b; Shr & Chen, 2004; Sun, Mackley, & Edara, 2013) were available that detailed 67 incentive contract outcomes. Thirty-two contracts were from DoD and 35 were from the Florida and Missouri State Highway Agencies (SHA).
Data Collection and Coding

Six variables that were measurable and common across the sample were coded according to outcome: agency (0 = SHA, 1 = DoD), presence of a schedule incentive (0 = no, 1 = yes), and presence of a schedule penalty (0 = no, 1 = yes), cost outcome (-1 = below target cost, 0 = at target cost or cost constraint in contract, 1 = over target cost), schedule outcome (-1 early delivery or completion, 0 = on time delivery or completion, 1 = late delivery or completion), and whether evidence existed that the target cost was overstated or understated at award as compared to a previous government estimate (-1 = understated target cost, 0 = no evidence, 1 = overstated target cost). The initial intent was to also include variables related to performance incentives and penalties; however, not all of the source references contained information concerning performance outcomes so these variables were omitted. Finally, the presence of a cost incentive was not included as a variable because all DoD contracts with multiple incentives must have a cost incentive or constraint (FAR, 2018, §16.402-1[a]).

Data Screening

The minimum amount of data for a multivariate factor analysis was satisfied, with a final sample size of 67, providing a ratio of over 11 cases per variable when it is commonly believed that between five (Bryant & Yarnold, 1995) to 10 (Garson, 2013) cases per variable is considered adequate. Initially, the factorability of the variables was examined using several well-recognized criteria for determining the appropriateness of factor analysis. Primarily, the Kaiser-Meyer-Olkin measure of sampling adequacy was 0.65385, above the commonly recommended value of 0.6 (Tabachnick & Fidell, 2007). Next, the Bartlett’s test of sphericity was significant ($p < .001$). Finally, the communalities of five of the six variables were above 0.6 and the mean
value of commonalities in the aggregate is above 0.7, further confirming that each item shared some common variance with other items (MacCallum, Widaman, Zhang, & Hong, 1999). Given these overall indicators, factor analysis was deemed to be suitable with all six variables.

**Factor Analysis Results**

A principal components analysis (PCA) was used because the sole purpose was to reduce the variables into identifiable underlying factors (i.e., components) of multiple incentive contracts and associated outcomes. PCA was used versus searching for a potential causal relationship between underlying latent variables and measurable variables because such a search would be better suited for exploratory factor analysis. Given that the variables in this model are dichotomous or ordinal, the intent was to use polychoric correlations (Timmerman & Lorenzo-Seva, 2011; Tran & Formann, 2009); however, the ordinal distributions were fairly symmetric so Pearson correlations were utilized (Muthén & Kaplan, 1985). Initial eigenvalues indicated that the first three factors explained over 77% of the variance (C1 = 43%, C2 = 18%, and C3 = 16%). Moreover, a three-factor solution was preferred because the eigenvalues fell below 1.0 for the fourth and subsequent factors (i.e., a leveling of eigenvalues occurred after three factors). The unrotated factor-loading matrix is presented in Table 2. Subsequently, a varimax rotation was used to simplify factors for interpretation. It should be noted that rotation does not change the results of the unrotated analysis, but rather makes those multivariate results easier to interpret quantitatively. The rotated factor-loading matrix is presented in Table 3.

<table>
<thead>
<tr>
<th>VARIABLE</th>
<th>C1</th>
<th>C2</th>
<th>C3</th>
<th>Communality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agency</td>
<td>-.933</td>
<td>.039</td>
<td>-.035</td>
<td>.873</td>
</tr>
<tr>
<td>Cost Outcome</td>
<td>.029</td>
<td>-.927</td>
<td>-.251</td>
<td>.924</td>
</tr>
<tr>
<td>Schedule Incentive</td>
<td>.811</td>
<td>-.253</td>
<td>-.004</td>
<td>.721</td>
</tr>
<tr>
<td>Schedule Penalty</td>
<td>.719</td>
<td>.093</td>
<td>-.077</td>
<td>.532</td>
</tr>
<tr>
<td>Schedule Outcome</td>
<td>-.740</td>
<td>-.274</td>
<td>-.038</td>
<td>.625</td>
</tr>
<tr>
<td>Under/overstated</td>
<td>-.006</td>
<td>.244</td>
<td>-.965</td>
<td>.991</td>
</tr>
</tbody>
</table>

TABLE 2. UNROTATED FACTOR LOADINGS AND COMMUNALITIES BASED ON A PRINCIPAL COMPONENTS ANALYSIS (N = 67)
TABLE 3. FACTOR LOADINGS AND COMMUNALITIES BASED ON A PRINCIPAL COMPONENTS ANALYSIS WITH VARIMAX ROTATION (N = 67)

<table>
<thead>
<tr>
<th>VARIABLE</th>
<th>Schedule Outcomes</th>
<th>Cost Outcomes</th>
<th>Over or Understated Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agency</td>
<td>.931</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cost Outcome</td>
<td></td>
<td>.961</td>
<td></td>
</tr>
<tr>
<td>Schedule Incentive</td>
<td>-.801</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Schedule Penalty</td>
<td>-.722</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Schedule Outcome</td>
<td>.749</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Over/understated Costs</td>
<td></td>
<td>.995</td>
<td></td>
</tr>
</tbody>
</table>

Note. Loadings lower than .400 omitted.

Typically, at least three variables per factor are needed to adequately interpret any factor (Costello & Osborne, 2005). Consequently, the only interpretable factor from a standpoint of statistical validity deals with schedule outcomes, which entails contract terms for both schedule incentives and penalties in relation to schedule outcomes by agency. Explicitly interpreted, the use of schedule incentives and penalties is agency-centric and directly influences schedule outcomes (i.e., the greater use of both schedule incentives and penalties by SHAs resulted in better schedule outcomes). Although interpreting the two other factors would pose a threat to validity given that they are each loaded by one variable (evidence of under- or overstated costs and cost outcomes), it is noteworthy in itself that the corresponding variables didn’t load with the interpretable factor, which will be discussed in detail later.

Discussion and Future Research

In this dataset, SHAs achieved better schedule outcomes by using schedule incentives and schedule penalties more frequently than the DoD, but not to the same extent. The use of schedule penalties by the DoD is negatively correlated when compared to SHAs (-0.722), but an even greater negative correlation of schedule incentives exists (-0.801). More explicitly, the sample displayed more instances where DoD multiple incentive contracts contained only schedule penalties versus contracts that contained schedule incentives or the combination of both schedule incentives and penalties. The GAO (2017b) report detailed eight multiple incentive Navy contracts without schedule incentives; however, each contained a penalty of
up to a 100% reduction in the cost incentive if the schedule criteria were not met. Incidentally, the same penalty to the cost incentive was present for not meeting technical parameters in light of not having a technical incentive. In all eight cases, the necessary schedule and technical performance outcomes were achieved and officials reported being satisfied. In terms of cost outcomes, five contracts were reported as underruns ranging from just under target cost to 7.7% under target cost. Of the three contracts reported as overruns, two were slightly over target (0.1% and 0.2%, respectively) and the other overrun was reported at 2%. At first glance, it appears that the presence of a penalty associated with not meeting schedule criteria seems to be effective in terms of both schedule and cost outcomes, especially when comparing the cost outcome results with the historical outcomes in Table 1. Notwithstanding these favorable results, the factor analysis results indicate that SHAs use schedule incentives and penalties more frequently than the DoD and also achieve better schedule outcomes.

To be sure, this sample (or any sample) may not be entirely generalizable to the universe of incentive contracts due to the differing nature of the contracting efforts and methods. For example, SHAs procure highway construction projects where cost estimating is straightforward based upon countless historical projects versus the DoD, where many incentive contracts are for innovative research and development programs, and cost estimating can be difficult at best. That said, all contracts are executed with a firm-fixed price, distinct cost target, and/or not to exceed constraint that should be reflective of fair and reasonable consideration for the given effort, regardless of the scope or structure. Moreover, what is generalizable to the universe of incentive contracts is how the outcome(s) of any given contract compare to the original terms at award. Concisely, this study is targeted at the broad comparison between incentive contract structures and the
corresponding outcomes by agency versus the idiosyncrasies associated with the efforts and methods at a lower level of analysis, which could be addressed by future research.

Accordingly, the cost outcomes associated with the schedule incentive structure by agency depicted in Table 4 are noteworthy. Twenty-four of the 35 SHA contracts observed are referred to as Incentive/Disincentive (I/D) contracts for having both incentive and disincentive provisions for completion (i.e., schedule incentives and penalties). Twenty-three of the 24 I/D contracts were completed within the targeted timeline and 20 of those 23 earned an incentive. An additional six SHA contracts are referred to as A+B contracts or cost-plus time contracts. The abutted words “cost-plus” may seem like a misnomer to someone familiar only with federal contracts. To clarify, “A” is the predetermined labor and materials constraint and “B” is the amount of time that the contractor bid to complete the effort and to which incentive or penalties will be assessed for early or late completion. All of the A+B contracts completed early and five of the six earned an incentive. The remaining five contracts are termed “no excuse bonus projects” because the contractor only earns an incentive if the original completion timeline from the bid was met regardless of otherwise excusable delays in terms of default (e.g., weather, government-caused delays). All five of these contracts were completed early, but only four earned an incentive. In the aggregate, 97% of SHA contracts met the schedule expectations and 82% earned incentives for exceeding them. All SHA contracts concluded within cost expectations; however, this could be due to the differing nature of the contract requirements and the predictability of the associated costs between agencies as noted previously.

<table>
<thead>
<tr>
<th>Schedule Incentive Structure</th>
<th>Agency</th>
<th>Achieved Cost Target (at or below)</th>
<th>Cost Constraint</th>
<th>Above Cost Target</th>
</tr>
</thead>
<tbody>
<tr>
<td>Schedule Incentive</td>
<td>SHA</td>
<td>0</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>DOD</td>
<td>2</td>
<td>0</td>
<td>6 (6 late)</td>
</tr>
<tr>
<td>Schedule Penalty</td>
<td>SHA</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>DOD</td>
<td>5</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Schedule Incentive and Penalty</td>
<td>SHA</td>
<td>0</td>
<td>30 (1 late)</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>DOD</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>No Schedule Incentive</td>
<td>SHA</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>DOD</td>
<td>10</td>
<td>0</td>
<td>5</td>
</tr>
</tbody>
</table>
Concisely, SHAs used schedule incentives and/or penalties more frequently than the DoD and experienced better schedule outcomes without exceeding cost parameters. The difference appears to be in the use of predetermined cost constraints coupled with schedule incentives and/or penalties versus CPI/FPI cost sharing structures with additional incentives. This is further evidenced within the DoD given the previously mentioned Navy contracts that penalized cost incentives for schedule infractions and achieved favorable outcomes, especially when compared to the results of typical CPI/FPI multiple incentive contracts within the DoD. This is not to say that the use of CPI/FPI contracts should be restricted in a wholesale fashion, but rather that the structure of CPI/FPI contracts could potentially be modified to compel improved outcomes. For example, CPI/FPI contracts with multiple incentives could be structured with aggressive cost share lines both below and above the target cost. Such structuring could provide a very lucrative incentive for a contractor to underrun and make any overrun scenario as consequential as possible, irrespective of the delivery or performance incentives.

Explicitly interpreted, the use of schedule incentives and penalties is agency-centric and directly influences schedule outcomes (i.e., the greater use of both schedule incentives and penalties by SHAs resulted in better schedule outcomes).

In any case, the improved outcomes associated with multiple incentives and/or penalties in this sample present compelling implications for practice. It should be noted that extraneous factors exist that challenge the feasibility of employing such practices universally across agencies or even across contracts within an agency or service. For example, a requirement could be satisfied from a highly competitive market (i.e., numerous sources). Conversely, the requirement may be satisfied by a limited field of competitors or even a sole source in some instances. Such an approach would greatly impact the amount of leverage that the buying agency would have in getting the contractor’s cooperation in accepting penalties or cost constraints in a multiple incentive arrangement, regardless of the level of performance risk associated with the effort. Nevertheless, these results provide a powerful impetus for future research that may result in actionable knowledge for structuring multiple incentive contracts.
In terms of additional future research, the variables associated with cost outcomes and misestimated costs prior to award explain over 34% of the variance in the factor analysis model. Nevertheless, neither of those variables explains any underlying relationships between the type of agency, schedule incentives, penalties, or schedule outcomes in this study (i.e., data reduction to an underlying factor did not occur). Both of those variables seem to explain some underlying factor that is unique to itself; therefore, more research is needed in this realm to yield a valid and interpretable factor structure that explains the relationships among cost outcomes, misestimated costs, and other variables.

In addition and as mentioned earlier, this study did not include any variables related to performance incentives due to the limited amount of homogenous information concerning outcomes. Research in this realm has the potential to be very enlightening when compared to its relation to the cost incentive. More explicitly, delivery incentives tend to correspond directly to cost incentives in an underlying fashion as a result of variable costs (i.e., if time is reduced, so are costs and if time is exceeded, so are cost targets). This is not the case with performance incentives. Such incentives tend to operate independently of the cost incentive and, some believe, inversely in some cases where the contractor is in a position where no incentive remains to control costs, but incentive is still available (e.g., cost-plus fixed fee [CPFF], cost-plus incentive fee [CPIF] at minimum fee). More research is needed in this realm to verify such beliefs and uncover any underlying trends in that regard.

Finally, utilizing information from databases such as the Federal Procurement Data System (FPDS), Contractor Performance Reporting System (CPARS), etc., would allow a researcher to capture contract-specific terms and contrast those with the outcomes. Moreover, utilizing information from government contract databases would potentially allow for much larger data sets across the various agencies of the federal government. This would not only increase the reliability of any future research, but also could be used for further exploration of the underlying factors of multiple incentive contract outcomes to include performance incentives.

**Summary**

Incentive contracts can be a useful tool in aligning the interests of the contractor and the government in an acquisition context. Most DoD contracts include only a cost incentive with a predetermined formula for profit or fee adjustment based upon the actual cost outcome in relation to a target cost. That said, other incentives can also be included, provided that a cost incentive
(or constraint) also exists. Previous studies, however, spanning over 50 years of contract outcomes (Belden, 1969; GAO, 2017a, 2017b; Parker, 1971) indicate that multiple incentive contracts in the DoD exceed their target cost over half of the time and 20% more often than contracts with a cost incentive only. This research investigated incentive contract outcomes from within and outside of the DoD in order to use multivariate statistics to contrast the results and determine if any underlying factors exist. One valid and interpretable factor demonstrated that the frequency in which schedule incentives and penalties are utilized is agency-centric and increased use correlates to better schedule outcomes. Moreover, cost outcomes as a variable is not associated with that factor, which is noteworthy given the documented history of DoD multiple incentive contracts incurring higher costs. SHAs tend to use predetermined cost constraints coupled with schedule incentives and/or penalties versus the typical DoD approach of using cost sharing structures with multiple incentives. More research is needed that examines the relationship between cost outcomes and other multiple incentive variables across a larger and more diverse sample of completed contracts. Moreover, research is needed that examines performance (or technical) incentives and performance outcomes in relation to other multiple incentive variables.
References


Author Biography

Dr. Robert J. Muretta, Jr.

is a professor of Contract Management at Defense Acquisition University (DAU). Prior to joining DAU, he was the procuring contracting officer for Sustainment at the F-35 Joint Program Office and served as a contracting officer for various programs at the Naval Air Systems Command (NAVAIR). Dr. Muretta received his PhD from Trident University and is a graduate of the Naval War College command and staff program.

(E-mail address: bob.muretta@dau.mil)