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# A Transactions Cost Economics (TCE) Approach to Optimal Contract Type

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## A TRANSACTIONS COST ECONOMICS (TCE) APPROACH TO OPTIMAL CONTRACT TYPE

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# A Transactions Cost Economics (TCE) Approach to Optimal Contract Type

**Presenter: Raymond (Chip) Franck**, Senior Lecturer, Graduate School of Business & Public Policy, Naval Postgraduate School, retired from the Air Force in 2000 in the grade of Brigadier General after thirty-three years commissioned service. He served in a number of operational tours as a bomber pilot; staff positions which included the Office of Secretary of Defense and Headquarters, Strategic Air Command; and was Professor and Head, Department of Economics and Geography at the US Air Force Academy. His institutional responsibilities at NPS have included the interim chairmanship of the newly-formed Systems Engineering Department from July 2002 to September 2004, teaching a variety of economics courses, and serving on a number of committees to revise curricula for both the Management and Systems Engineering disciplines. His research agenda has focused on defense acquisition practices and military innovation.

**Presenter: Francois Melese**, PhD, joined the NPS faculty in 1987. He earned his undergraduate degree in Economics at UC Berkeley, his Master's at the University of British Columbia in Canada, and his PhD at the Catholic University of Louvain in Belgium. After five years as a faculty member in the Business School at Auburn University, Francois joined NPS as part of the Defense Resources Management Institute (DRMI). In his time at NPS, he has taught public budgeting and defense management in over two dozen countries and has published over 50 articles and book chapters on a wide variety of topics. More recently, at the request of the State Department and NATO Headquarters, he has represented the US at NATO Defense meetings in Hungary, the Ukraine, Germany and Armenia. His latest article (co-authored with Jim Blandin and Sean O'Keefe) appeared in the International Public Management Review. The article (available at www.ipmr.net) is entitled "A New Management Model for Government: Integrating Activity-Based Costing, the Balanced Scorecard and Total Quality Management with the spirit of the Planning, Programming and Budgeting System."

**Presenter: John Dillard** joined the NPS faculty in the fall of 2000 with extensive experience in the field of systems acquisition management. His research focuses on defense acquisition policy and its implications. Dillard began his career in program and contract management after attaining a MS in Systems Management from the University of Southern California in 1985. He has been involved with myriad technologies and system concepts that have evolved into fielded products, such as the M-4 Carbine, 120mm Mortar, and M-24 Sniper Weapon. He was the Assistant Project Manager for Development of both the Army Tactical Missile System and, later, the JAVELIN Antitank Weapon System at Redstone Arsenal, Alabama. All of these systems incorporate state-of-the-art technologies, are in sustained production and fielding, and are now battle-proven. He was the Product Manager for the Joint Advanced Special Operations Radio System, and in 1998 was appointed to head Defense Department contract administration in the New York metropolitan area. John has consulted for the governments of Mexico and the Czech Republic on achieving excellence in the public sector. As an adjunct professor for the University of California at Santa Cruz, he teaches courses in project management and leadership to Silicon Valley public and private industry professionals.

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## Abstract

This study examines defense acquisition through the new lens of Transaction Cost Economics (TCE). TCE is an emergent field in economics that has multiple applications to defense acquisition practices. TCE's original focus was to guide "make-or-buy?" decisions that define the boundaries of a firm. This study reviews insights afforded by TCE that impact government outsourcing ("buy" decisions), paying special attention to defense procurement.

The study offers a brief synthesis and review of current Defense acquisition practices. The Department of Defense (DoD) is a unique enterprise that relies heavily on outsourcing. Outsourcing transactions are governed using a wide variety of contracts that share risk between the government and the contractor. Cost, schedule, and technical performance are widely accepted as success parameters in public and private transactions. While recently enacted defense acquisition practices address many of the issues raised by TCE, a key concept called "asset specificity" seems to have been overlooked. The "lock-in" effect achieved by contractors that invest in specific assets, while benefiting the government in the short run, can haunt the government in the long run. The risk is that, after winning a bidding competition, a contractor that invests in specific assets might eventually become a sole supplier that "holds up" the government, resulting in higher costs, schedule delays, or disappointing performance. We discuss some new and old solutions to the "holdup" problem.

We conclude by offering a number of insights for defense acquisition program managers generated by the new perspective of TCE. Whereas there is no universal template for the management and governance of complex and uncertain defense outsourcing relationships, TCE offers a valuable new perspective to improve the design and management of those relationships.

## SECTION 1: INTRODUCTION

This report offers insights for those involved in procurement and acquisition management from a relatively new field in Economics called Transaction Cost Economics (TCE). We begin with a summary and synthesis of TCE—its roots, useful principles for

formulating acquisition strategy, and implications for acquisition management in the Department of Defense (DoD). We then offer a synthesis of management practices in DoD, presenting examples of defense acquisitions and their associated governance strategies. We conclude with recommendations about how the application of fundamental principles of TCE might improve current defense acquisition management practices.

### A) Antecedents of the Project

This paper is part of an ongoing effort to apply the insights of Transaction Cost Economics to DoD acquisition management practices (see Franck & Melese 2005).1 Transaction Cost Economics (TCE) is the study of the "vertical" boundaries of business enterprises—defined primarily by what goods and services are produced within the firm ("make") and which are acquired from the market ("buy" or "outsource"). TCE has a well-established niche in economics as an academic discipline. Among the pioneers of this literature are Nobel Prize winner Ronald Coase and Oliver Williamson. TCE is also a major feature in a movement called the "New Institutional Economics."2 Unfortunately, these literatures focus almost exclusively on the private sector. More recent work by Pint and Baldwin (1997), Franck and Melese (2005), and others have begun to study TCE in a government setting—yielding some interesting insights.

### B) Early Insights from TCE

The initial focus of the work by Franck and Melese (2005) was to examine the key document that guides all federal policy for the competition of commercial activities—Office of Management and Budget (OMB) Circular A-76. For competitive sourcing competitions between a government activity and private sector suppliers, OMB A-76 calls for a one-time 10% production cost advantage to justify outsourcing.

Applying TCE suggests one size does not fit all. Outsourcing relationships vary widely in their characteristics and potential difficulties. A key insight is that increases in transaction costs (required to govern an outsourcing relationship) can more than offset any production cost advantages from outsourcing. Herein, the authors extend their observations to the acquisition of major weapon systems, which largely employ similar outsourcing relationships.

The standard example is where ex-ante competitive bidding leads to an ex-post bilateral monopoly situation. The risk is that the winning supplier can lock-in the government

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[1] Serious research into TCE at the Naval Postgraduate School (NPS) began in the late 1990s with Prof. Francois Melese's inquiries into the relevant literature and applications to government. The intent of this research is to highlight TCE insights useful for public sector acquisition and, accordingly, to improve defense acquisition management practices. Raymond Franck, also at NPS, joined this effort a few years later. Products of this effort so far include several conference presentations, one student thesis (jointly advised by Melese and Franck), and one paper published in the proceedings of the Second Annual NPS Acquisition Research Symposium Proceedings in 2005.

[2] A good summary of New Institutional Economics is available (for example) in *Wikipedia*, http://en.wikipedia.org/wiki/New_institutional_economics.

by making investments in productive assets that are specific to the relationship (and that have little value outside the relationship). While initially advantageous, such investments in specific assets can make it prohibitively costly for other companies to compete in subsequent re-bidding of the contract. As a result, outsourcing relationships can involve extra transaction costs such as measurement, monitoring, and negotiation costs that can quickly overwhelm a simple 10% production cost advantage.

The lesson is that transaction cost considerations need to be added to the current exclusive focus on production costs in OMB Circular A-76. This also suggests more attention be granted to: the proper bundling of goods and services; investing in a well-defined Performance-Work Statement; clearly defining the terms of the contract—to include appropriate incentives; understanding the true costs of the transaction; and carefully designing mechanisms that will govern the outsourcing relationship. The next step is to extend these insights to DoD acquisition management practices.3

### C) Outline of the Report

Section 2 of this report offers a summary and synthesis of the TCE literature. It explores the issues of incentives built into contracts, hedged (or tapered) outsourcing, and issues of governance. Section 3 presents a description of the principle components of defense acquisition transactions that are the most typical: research & development and procurement of weapon systems, along with a summary and synthesis of associated practices in defense acquisition management—to include contract structure and governance of the relationship. Finally, Section 4 offers a synthesis of these two bodies of knowledge. It considers similarities and differences in perspectives and explores possibilities for mutually beneficial sharing of concepts. The section concludes with proposals based on applying TCE principles and insights to DoD acquisitions.

## SECTION 2: REVIEW OF TRANSACTION COST ECONOMICS

Faced with ballooning budget deficits, growing entitlements, and an aging workforce, the federal government is searching for savings by outsourcing both positions and products. This presents senior defense officials with a dual challenge: First, what should the Department of Defense (DoD) make itself and what should it buy in the marketplace?4

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[3] To do so requires collaboration with those having a practitioner's expertise in this area. This occurred when our co-author John Dillard joined this research project. He is largely responsible for the comprehensive review of transaction components and current practices described in Section 3 of the study.

[4] In this study, the term "outsourcing" is used to encompass any situation that involves a government evaluation of whether to (continue to) produce a publicly provided good, service, or intermediate product or activity internally, or to purchase it from the private sector. An underlying assumption is that a decision has previously been made—presumably through a democratic process—for government to *provide* the good or service. The outsourcing evaluation determines whether the current government supplier, another government entity, or the private sector is best suited to *produce* it—or any necessary intermediate products or activities. The US Navy uses the term "strategic sourcing," the US Air Force "competitive sourcing" (the British call it "market testing"). Office of Management and Budget (OMB) Circular A-76 spells out rules and procedures that govern outsourcing at the federal level. In the context of this paper, "privatization" can be interpreted as the outcome of an outsourcing evaluation where it has been decided the private sector will take over public assets to *produce* the

Second, if the decision is to buy (or outsource), how can we ensure better outcomes for taxpayers?

## A) The Make-or-buy Decision

The field of Transaction Cost Economics (TCE) offers an attractive theoretical foundation for business "make-or-buy?" decisions (Coase, 1937; Williamson, 1971,1979; Alchian & Demsetz, 1972; Klein et al.,1978). These make-or-buy decisions ultimately define the boundaries of a company. Although primarily focused on the private sector the TCE literature has occasionally been applied in a government setting (Pint & Baldwin, 1997; Weingast & Marshall, 1988; Williamson, 1999; Ferris & Graddy 1986, 1991, Franck & Melese, 2005).

The dual objective of this section is to synthesize key principles and insights of TCE, and to apply those insights to support the "make-or-buy?" decisions of senior leadership in the Department of Defense (DoD). These make-or-buy decisions ultimately define DoD boundaries. In the course of this investigation, new tools will be revealed for Program Managers and others in the acquisition community to help govern contracting choices and to ensure better outcomes in terms of performance, cost and schedules.

## B) Production and Transaction Costs

Coase (1937) was the first to ask why some profit maximizing firms produce goods and services themselves at higher production costs than can be purchased in the marketplace.5 The answer is that going to market entails "transaction costs," and that these search, information, decision, contracting, measurement, monitoring, and enforcement costs can more than offset production cost advantages from outsourcing.6

TCE views organizations as a complex web of contractual relationships among resource owners. Each relationship—the acquisition of an input, employment of a worker, transfer of a product or service from a supplier to a customer—is a transaction. In TCE, the transaction is the basic unit of analysis. The primary insight of TCE is that the choice of optimal governance mechanism (contracts, organizations, incentives) depends on key characteristics of the transaction (asset specificity, uncertainty, complexity, and frequency—each of which are discussed in this study).

In business, two costs typically drive the "make-or-buy?" decision: production costs and the costs of managing transactions or "transaction costs." Conventional economic analysis focuses on production costs (input costs, competition, learning curves, economies

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good, service, or intermediate product, and where (in many cases) the government also relinquishes its role to *provide* it.

[5] Today, businesses tend to restrict production to their core competencies and acquire the other parts of their products from outside suppliers. For example, one might expect an automobile manufacturer to accomplish the final assembly of the cars it sells, but acquire tires from outside companies. Less obvious is the case of a windshield.

[6] To use a physical analog, the market is not a frictionless medium. Operations in the marketplace require expenditure of time, resources, and management attention.

of scale and scope, etc.). The new field of TCE emphasizes transaction costs (search and information costs, decision and contracting costs, monitoring and enforcement costs, etc.).

One of the most critical contributions of TCE is to focus on the nontrivial costs of managing and coordinating transactions. For example, consider DoD's Defense Contract Management Agency (DCMA). This $1.1 billion organization is made up of 10,500 Civilians and 600 Military whose exclusive responsibility is to help manage and coordinate some 300,000 defense contracts valued at nearly $950 billion.

For a given product or service, the decision whether to "make or buy?" requires minimizing the sum of production and transaction costs. According to TCE, the dual focus of any outsourcing evaluation should be: a) to sort transactions into categories based upon certain key transaction characteristics, and b) to evaluate the costs and consequences of alternative contracts, organizational structures and mechanisms available to govern those transactions. Strategic contracting tools and other governance mechanisms can be applied to lower transaction costs. The lower the transaction costs of outsourcing, the smaller production cost savings need to be to support the decision to outsource.

## C) The Challenges of Coordination and Motivation

Two key components of the "make-or-buy?" decision are highlighted in TCE: coordination and motivation. The issue of coordination arises from the economic opportunity for specialization and exchange. Organizations tend to specialize in "core" (inherently governmental) activities in which they have a comparative advantage, and engage in transactions (or outsource) to acquire other resources (e.g., contract labor), intermediate goods (material supplies, equipment, platforms, etc.), or services (IT, building maintenance, etc.). Transactions between government and industry can generate substantial gains for both parties. In DoD, the gains from specialization and exchange (outsourcing) are expected to take the form of more and better products, delivered more quickly, and with fewer resources (i.e., performance, schedule, and cost).

TCE recognizes these potential gains, but also acknowledges the dark side of transactions—motivation. TCE predicts parties involved in a transaction can benefit from cooperative agreements, but since they are assumed to be self-interested and to have conflicting objectives, they will not always have the motivation to follow through on agreements—particularly when specific assets/investments are involved, and information is imperfect (incomplete and uncertain) or asymmetric (one party has an information advantage over the other). The ultimate outcome depends on specific characteristics of the transaction and on the incentive structures that govern the parties involved.

## D) Limits to Government as an Enterprise

The concepts of TCE also hold inside the government. Coase (1937) and others contend "the operation of the market costs something and by forming an organization and allowing some authority to direct resources, certain [transaction] costs are saved" (p. 392). But the cure—integrating transactions inside the government—can be worse than the disease. When price and contract mechanisms are supplanted by internal coordination, this entails risks of sub-optimization, internal opportunistic behavior, multi-tasking, as well as internal bureaucratic costs of coordinating, monitoring and improving the cost and quality of publicly produced goods and services.

For example, consider the conflicting objectives and incentives that face major players in defense acquisition. The recently released Kadish report raises serious concerns about the ability of the Defense Acquisition System to "develop and deliver required capabilities when needed and at predictable [production] costs" (Kadish et al., Dec. 2005, "Defense Acquisition Performance Assessment, for the Acting Deputy Secretary of Defense," p.1). The authors point to three key challenges: 1) "Requirements developers mandate systems that are technologically unrealistic or unable to be delivered within the 'time-to-need' that is desired by Combatant Commanders;" 2) "Program management teams allow requirements to escalate without discipline, driving costs beyond baseline budget and schedule;" and 3) "Those who hold the budget purse strings in DoD […] reduce annual program budgets to fit within the "top-line" of the President's Budget by trading-off some programs to 'fix' others" (p. 7). Prendergast (1999) provides a valuable overview of principal-agent models that highlight the costs and consequences of various incentive mechanisms designed to address internal coordination and motivation issues.7

In TCE, the successful resolution of resource allocation problems rests on designing mechanisms (incentives, organizations, markets, contracts, etc.) that allow opportunistic individuals with conflicting objectives to overcome their collective action problems in pursuit of mutual gains (Williamson & Masten, 1999). In the case of government outsourcing, TCE assumes government "principals" and industry "agents" each behave according to their conflicting interests. The objective of the DoD "principal" in outsourcing is to obtain goods and services better, faster, cheaper. Meanwhile, industry "agents" must guarantee market returns to shareholders (or maximize profits) to survive. The challenge is to arrive at governance structures that align the interests of both participants in the transaction.

**E) The "Principal-Agent" Model**

TCE assumes that economic actors—say government "principals" and defense industry "agents" in an outsourcing relationship—are motivated to look ahead, recognize potential hazards, and factor these into contracts or organizational design. However, due to the problem of "bounded rationality," so named by Nobel Prize winner Herb Simon, their capacity to do so is limited. Rubin (1990) puts it somewhat differently: "it is impossible to write a [complete] contract to protect a firm's interests in a situation of complex contracting" (p. 26).

While parties to a transaction may jointly benefit from cooperation, they will not necessarily have incentives to live up to the terms of an incomplete contract and cannot expect others to do so (Williamson & Masten, 1999). The challenge is to design contracts, incentive schemes, monitoring and enforcement mechanisms, and to adopt other governance arrangements (property rights, reputation, bonding, warranties, etc.) that allow for credible commitments ex-ante and that promote mutual compliance ex-post (Williamson, 1983).

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[7] An important distinction is made in the literature between complete and incomplete contract theory. Under complete contracting, all payments and actions can be specified ex-ante. The contracting parties can (costlessly) write contracts that describe their actions given all future contingencies. In contrast, under incomplete contracting due to information costs, bounded rationality, asset specificity, etc., some contingencies are left out of contracts, or, if included, might not be enforceable. Incomplete contracting thus implies some actions and payments will have to be determined ex-post, requiring adaptation and renegotiation. Complete contracting theory has developed through principal-agent models such as those reviewed in Prendergast (1999).

In game theory, the principal and the agent are both equipped with full knowledge of the set of actions the agent can engage in, and the principal fully knows those actions he/she is allowed to engage in. The principal is usually only ignorant about the precise effort level of the agent and the realization of an exogenous stochastic variable that impacts the output of the agent.

Instead of focusing exclusively on designing incentives to align the interests of the principal and the agent, Grossman and Hart (1986) and Hart and Moore (1989) address the perspective of incomplete contracting where bargaining problems can constrain efficient production. They demonstrate how the selective ownership of assets or property rights can alleviate many incentive and bargaining concerns. However, this approach to incomplete contracting assumes the outcome of the renegotiation process can be foreseen when contracts are written, and that the process does not involve costly bargaining. Tirole (1998) argues that clever mechanisms can be designed to handle unverifiable contract terms, returning the problem to one of complete contracting in the principal-agent tradition.

Here we take a broader-brush, stylized bargaining-game approach in the spirit of incomplete contracting. This approach is more closely aligned with the governance branch of TCE (Williamson & Masten 1999), where the main focus is on ex-post adaptation under incomplete contracting. In a model presented in Appendix A, the impact of costly ex-post bi-lateral bargaining and rent-seeking activity is explored when the outcome of renegotiation cannot entirely be foreseen.8

## F) A Key Characteristic of Transactions: Asset Specificity

The specialization that takes place in certain transactions creates opportunities for enormous cost savings from productivity improvements, boosts in product performance, and tailored delivery schedules. These gains in cost, performance and schedules are frequently generated by investments in assets that are specific to the transaction. Thus, a vital TCE characteristic that defines many outsourcing transactions is the degree of asset specificity.9 Related to the notion of sunk costs, specific assets are investments made by parties to a transaction that lose much of their value in an alternative use. Examples include:

- Physical Asset Specificity—investments in specialized tools and equipment,
- Human Asset Specificity—investments in specialized skills, methods (government accounting), knowledge, training, etc.,
- Site Specificity—investments in location (of equipment, facilities, etc.) that economize on transportation or inventory costs,

[8] Rent-seeking is the process of an individual seeking to profit from manipulation of the economic situation versus through trade and mutual benefit of the partners.

[9] A crude measure of the degree of asset specificity is to take the cost of the initial investment and subtract any depreciation (physical wear and tear and obsolescence) and the salvage (or current market) value. Transaction Cost Economics (TCE) emphasizes that if the value of such transaction-specific assets is substantially lower in alternative uses (analogous to sunk costs), a “Holdup” problem can arise that limits specific investments, and consequently, the gains from specialization and exchange (or outsourcing).

- Dedicated Asset Specificity—investments in dedicated capacity and infrastructure (e.g., minimum efficient scale production facilities) for a particular customer,

- Brand-name Specificity—investments where the reputation of one party to the transaction depends on the actions/reputation of another (as with franchises, or public activities that represent and reflect the government), and

- Temporal Specificity—investments in "critical path" or bottleneck activities that can have enormous impacts on schedule completion costs and dates.

When specific assets are important and there are many competing suppliers bidding for an outsourcing transaction, it may at first appear that the market is competitive. However, Williamson (1999) points out that in many outsourcing transactions, "the winner of the original contract acquires a cost [or first mover] advantage (such as unique location or learning, including the acquisition of undisclosed or proprietary technical and managerial procedures and task-specific skills)" (p. 27). If the buyer (DoD) becomes dependent on a winning supplier that makes significant investments in specific assets (raising barriers to entry and the costs of switching to alternative suppliers), then ex-ante competition can yield to an ex-post buyer-seller bilateral monopoly situation. Rubin (1990) refers to this as the "fundamental transformation."10

## G) The "Holdup" Problem

In TCE, the combination of transaction-specific investments and an absence of ex-post competition raises the possibility of a "holdup." The "foot-in-the-door" strategy adopted by some defense contractors offers an example. In that case, a low bid induces the government to hire the contractor, but the contractor anticipates that as it works closely with the government, and as it makes specific investments that facilitate that relationship (e.g., human and physical asset specificity), the government will become increasingly dependent on that contractor.

For instance, since research and development contracts are necessarily incomplete and unexpected requirements often arise, a contractor might anticipate higher returns from later "holding up" the government by raising the price for "change orders" (changes in the contract).11 Alternatively, the government has the power to hold up the firm by threatening

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[10] Several demonstrative cases come to the minds of the authors, such as the Army Tactical Missile System (ATACMS) development contract being awarded to the developer of the vehicle platform. And innumerable production contracts have been similarly been awarded to prime system developers. However, one way to address the Holdup concern is with the strategic use of production options in a developmental project. Such was the case when in 1990, LTV Corporation had responded to the Army with "not-to-exceed" missile production costs as part of their proposal for a fixed-price development contract for missile and launcher integration. The options proposed had an expiration date. So the government was incentivized to fund the program and accomplish program decisions before expiration, while the contractor was motivated to seek cost savings in order to maximize profits under an eventual production scenario. The options were, in fact, exercised with only a few days to spare, and just in time to produce missiles employed during the first Gulf War.

[11] Demsetz (1968), Stigler (1968) and Posner (1972) suggest repeated bidding as a means to prevent *ex-post* opportunism in the case of government's outsourcing a (regulated) natural monopoly. However, Williamson (1985, Chap 13) emphasizes that *switching costs*—related to specific investments—pose a hazard associated with government's use of repeated bidding to outsource a natural monopoly. Once two parties have traded,

to “walk away” from the relationship—say if demand for the product or service falls due to changes in the political or defense environment.

If individuals, firms, or organizations cannot be assured of realizing the full value of a transaction-specific investment through a credible commitment not to partake in post-contractual opportunistic behavior, then efficient productivity-, schedule- or performance-enhancing specific investments might not be made. In turn, this reduces both the surplus generated from a transaction and the incentive for parties to engage in that transaction.

The holdup problem arises whenever any party to a contract that involves a specific asset worries that after it has sunk an investment, it may be forced to accept worse terms ex-post, or that its investment might somehow be devalued by its contracting partner. Asset specificity lies at the core of the holdup problem, particularly in the case of complex and uncertain transactions that lead to incomplete contracting.

One concern is that the party that has less invested in the transaction may attempt to expropriate some of the value of its partner’s specific investment(s) through ex-post bargaining—say by threatening to walk away from the relationship. Thus, asset specificity makes asset owners vulnerable to “free-riding” by their contracting partners.

For example, while on one hand, the Kadish Report (2005) talks about the challenge of “motivating industry investments in future technology [and] encouraging industrial investment in areas of importance to the Department” (p.14), on the other hand it observes that government cost (budget cuts) and schedule (stretching out programs) instability has been a problem in all system acquisitions since the Civil War. As a consequence, transactions that require a significant degree of specific investments normally also require contracts and governance structures that protect the investor against early termination or opportunistic ex-post renegotiation.

The added risk faced by military contractors subject to political and budgetary uncertainty tends to dampen their enthusiasm for defense-specific investments. For example, Air Force sources indicate that, in early production stages, faced with uncertainty about the ultimate production run of the F-16, General Dynamics refused to make specific investments in the tooling and equipment required to automate riveting to reduce costs. As a result, the wings of these high-tech aircraft were initially riveted by hand. According to Kadish et al. (2005), while the “defense acquisition process […] requires extended planning horizons, the Department’s budgeting process is based on short-term decision making” (p. 6) . The outcome is “government-induced instability.” The report proposes a new governance structure to mitigate this uncertainty and add stability to major defense acquisition programs—an “Acquisition Stabilization Account.”12

switching costs may increase due to specific training/experience and other investments in transaction-specific assets, such that staying together can yield a surplus relative to trading with other parties.

[12] Another example comes from an author’s experience in the Javelin anti-tank missile program, wherein the procurement objective was halved as the product entered production. This resulted in a change to the production strategy to split a joint venture into two producers—retaining vertical integration.

## H) Solutions to the "Holdup" Problem

The government can overcome incentives for contractors to under-invest in specific assets—for example, to adopt labor-intensive as opposed to more efficient capital-intensive production choices (with consequent higher prices)—by shifting the risk away from contractors. The risk to contractors can perhaps be reduced through stabilization accounts, or through contractual means by introducing contingent clauses that reward these investments through incentive contracts. Solving the asset-specificity problem can also be accomplished—and the risk to contractors eliminated—simply by shifting the ownership of strategic assets to the government. This "property rights" approach is discussed in Grossman and Hart (1986), and Hart (1995). In DoD facilities, for example, government ownership of specific assets is known as "Government Owned, Contractor Operated" (GOCO).

In the extreme, the government might choose to internalize the entire transaction (vertical integration), or to make rather than buy (as in Government Owned, Government Operated—GOGO facilities). The optimum choice for DoD (COCO, GOCO or GOGO) ultimately depends on an evaluation of production and transaction costs, product performance, and schedule and delivery options.13

## I) Alternative Governance Structures

TCE recognizes that transactions can be organized under a spectrum of governance structures ranging from spot markets to vertical integration. Between these two poles are contracts of increasing duration and complexity—from Fixed Price (FP) to Cost Plus (C+), and from simple short-term contracts, to incentive, long-term, and relational contracts (McAfee & McMillan, 1988). Outsourcing involves a move away from vertical integration to spot market transactions or one of the intermediate or "hybrid" contracting options.14

According to Williamson (1999), three key attributes differentiate governance structures: 1) incentives, 2) administrative controls, and 3) dispute settlement (or adaptation). Spot market purchases are characterized by high-powered incentives, little administrative control and a legalistic dispute settling mechanism. Unfortunately, while market governance provides strong, high-powered incentives for quality and cost, it offers little protection for specific investments since buyers and sellers can easily walk away from transactions. Thus, the transaction costs of dealing with markets increases with the potential for holdups. In contrast, whereas vertical integration (organic production) alleviates holdups since dispute settlement takes place largely within the organization, it combines low-powered incentives with extensive administrative (bureaucratic) controls.

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[13] The government might also retain some in-house (perhaps standby) capability to provide the good or service in question (known as "tapered integration."). This, and similar measures, could enhance the DoD's bargaining position in the event of renegotiation or contract-enforcement actions. Changing the ownership of assets associated with relation-specific investments can also reduce the scope for opportunistic behavior. This can take the form of government-furnished equipment in defense transactions (GOCO). However, such hedging measures entail costs that can dissipate the potential gains from outsourcing.

[14] Note that the recent wave of mergers and acquisitions that emphasized vertical integration in the US may finally be giving way to the so-called virtual corporation. It appears strategic outsourcing through contracts, partnerships, alliances, and joint ventures may be redefining organizational boundaries over the next decade (Michaels, 2001).

A path-breaking econometric study (Masten et al. 1991) based on the procurement of components and services by a large naval shipbuilder indicates overall organization costs represent about 14% of total costs for components and activities in the sample. More importantly, "these costs vary systematically with the nature of the transaction and […] savings from choosing organizational arrangements selectively can be substantial." Interestingly, the authors find that "subcontracting work currently performed inside […] would, on average, generate market organization costs almost three times those incurred managing that work internally," and that as "the costs of dealing across a market interface […] rise the greater the potential for holdups in a given transaction […]" (p. 2). Of course, adopting new technology like the Internet and leveraging the falling cost of computer and communications equipment can reduce the "costs of dealing across a market interface."

Short of vertical integration (in-house production), contracts, strategic alliances, partnerships, joint ventures, etc., can be designed to provide some protection for assets while still preserving market incentives. The challenge is that the benefits from the transaction be divided in such a way that they induce the efficient amount of specific investment(s) in the contracting relationship. This involves writing a contract with enough precision to assure desired performance, but with enough flexibility to allow productive adaptation, as circumstances require. The challenge increases the greater the degree of asset specificity and the more complex and uncertain the transaction.

Combined with bounded rationality, imperfect information tends to preclude comprehensive ex-ante contracting, making many contracts inherently incomplete. In turn, this raises the opportunity for holdups and ex-post renegotiation. In summary, TCE predicts the higher the degree of asset specificity, the greater the likelihood that vertical integration, longer-term contracts, and other mechanisms (reputation, GOCO, etc.) will be used to promote and protect transaction-specific investments.

## J) Some Empirical Evidence

On the whole, the results of the empirical literature are consistent with these theoretical predictions. In the case of vertical integration, Monteverde and Teece (1982a) found automobile components that required greater design engineering (human asset specificity) were more likely to be vertically integrated (or less likely to be outsourced).15 Moreover, according to the Masten et al. (1991) study of subcontracting practices in naval construction, the probability of vertical integration increased with the temporal specificity of particular construction activities. This is because any delay in these key critical path activities would disrupt the overall completion time of the project. If such a product was outsourced instead of vertically integrated, subcontractors could threaten a delay (holdup) in exchange for price concessions (increasing transaction costs). Reputation is another important enforcement mechanism that can be used to alleviate this problem, especially in the case of repeated relationships.16 We'll observe in Section 3 that "past performance" is

[15] A specific example comes from the decision of prime system developer Texas Instruments to make their own critical component of the Javelin anti-tank missile system: the matrix focal plane array. This item became the pacing item in the entire program—leading to a holdup situation—and eventually had to be outsourced to another vendor.

used as a criteria for subsequent contract awards, revealing that reputation is indeed a mechanism used to encourage specific investments and avoid holdups in practice.

There is evidence that longer term contracts are used as a mechanism to mitigate the risk of holdup between coal mines and electric utilities that involve greater levels of asset specificity. Joskow (1987) examines transactions between coal mines (sellers) and electric utilities (buyers). The study reveals two interesting cases. In the West—where there are few coal mines, more limited transportation, and different grades of coal—there is a higher degree of asset specificity associated with transactions, and greater threat of ex-post opportunism. As predicted by TCE, Joskow reports transactions in the West tend to be governed by longer-term contracts, and that spot markets are virtually non-existent.17

In sharp contrast, in the Eastern United States—where there are many electric utilities and coal mines, abundant and competitive transportation, and coal is largely homogeneous—there is a lower degree of asset specificity associated with transactions, and consequently a smaller threat of ex-post opportunism. As predicted by TCE, Joskow reports transactions largely occur in spot markets governed by short-term contracts.

With respect to other mechanisms that can help promote and protect physical asset specificity—such as Government Owned, Contractor Operated (GOCO) specific assets—Monteverde and Teece (1982b) found automobile manufacturers were more likely to own the tooling used by their suppliers, the more specialized and expensive it was. Moreover, according to Klein et al. (1978), General Motors' decision to acquire (or vertically integrate) Fisher Body was partly influenced by the need for transaction-specific investments in new stamping presses and dies (physical asset specificity). (The Fisher Body story has become a matter of some controversy.18)

Finally, an important lesson is that government must commit not to expropriate assets from contractors or regulated firms if it wants them to invest in transaction-specific assets. Levy and Spiller's (1994) international comparison of telecommunications regulation demonstrates that only if regulators commit not to pursue arbitrary administrative actions that threaten the value of specific assets, will private (specific) investment be forthcoming. For instance, where regulators failed to commit not to set arbitrarily low prices, regulated

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[16] For example, Acheson (1985) found that in fish markets, given a price for a catch, buyers (sellers) could act opportunistically by sorting individual high-quality (low-quality) fish. Monitoring could be used to avoid this, but increases transaction costs and lowers the surplus enjoyed by both parties. Instead, informal reputation-based agreements served to avoid these extra costs.

[17] Moreover, Joskow (1985) reports that when electricity plants locate themselves near coal mines to avoid high transportation costs (site specificity), they must be tailored to the grade of coal (physical asset specificity). As TCE predicts, the measures of vertical integration and explicit long-term contracts are common. In fact, these so-called "mine-mouth plants" were six times more likely to own the associated mine than other electricity generators. Those contracts are typically twenty to fifty years in duration, with provisions that prohibit price renegotiation for extended periods, specify in detail quantities to be supplied over the period, specify the quality of coal, index costs and the prices of substitutes, and defined procedures for arbitration in the event of disputes.

[18] Coase (2000), Casadesus-Masanell and Spulber (2000) regard the standard story as a "fable," flawed in both fact and interpretation. Freeland (2000) goes further and contends that vertical integration made General Motors *more* vulnerable to rent-seeking behavior. However, a rejoinder from Klein (2000) defends the 1978 analysis cited above.

firms were unwilling to make specific infrastructure investments because they feared they might not be able to recover the value of those investments.

## K) Other TCE Characteristics: Complexity, Uncertainty and Frequency

Besides asset specificity, transactions are also characterized by complexity and uncertainty. Crocker and Masten (1988) address the impact of uncertainty on contract duration. They find that government's regulation of the price of natural gas, in reducing the ability of parties to adapt long-term contracts to reflect future uncertainty, reduced contract lengths in the industry by an average of 14 years.19 The greater the uncertainty, the shorter was the duration of the contract.

A study by Bajari and Tadelis (1999) on construction contracts provides evidence that complexity and uncertainty are sufficient to generate ex-post adaptation and renegotiation—even in the absence of specific investments. It turns out that the decision to govern construction transactions with Fixed Price (FP) type contracts, as opposed to Cost Plus (C+) type contracts, is sensitive to the complexity and uncertainty in the transaction. Interestingly, a counterpart to this example exists in governance options prescribed by the US military for outsourcing various phases in a new product's development (see Table 1 below).

Evidence uncovered by Bajari and Tadelis (1999) reveals that in cases where a construction transaction is easy to define and measure—i.e., there is little complexity, and only a few minor changes are expected, there is little uncertainty and FP contracts tend to dominate. However, the more complex and uncertain the transaction (and the more difficult and costly it is to define and measure performance) the more likely a change in the contract will be required, and the more severe the adversarial relationships experienced ex-post when FP contracts were chosen.

In the latter case, FP type contracts often ended in costly renegotiations where any surplus generated in the transaction was dissipated in the course of negotiations through unproductive bargaining and influence activities. Thus, even in the absence of asset specificity, complexity and uncertainty can force parties to turn to C+ type contracts and to rely heavily on reputation and other enforcement mechanisms to avoid ex-post opportunistic behavior that can dissipate the surplus (or value) generated by a transaction.

Relating these observations to military outsourcing for major weapon systems, empirical evidence uncovered by Crocker and Reynolds (1993) for the manufacture of US Air Force aircraft engines mirror the findings in Bajari and Tadelis (1999). In the initial production stages—when modifications were expected—contracts that governed transactions tended to be of the cost reimbursement variety (C+). In later production stages—after initial problems had been ironed out—contracts tended to be of the fixed price variety (FP). Of course, this kind of selection of contract type has become a matter of well-known policy. For purposes of illustration, Table 1 summarizes prescribed contract types employed by the US Air Force and Navy at each stage of development of a new product (Federal Acquisition Institute, 1998).

[19] Moreover, uncertainty caused by the 1973 oil embargo reduced contract lengths by another three years.

**Table 1. Stages of Product Development and Contract Types**

| Stages of Product Development | Basic Research | Exploratory Development | Test & Demonstration | Full-Scale Development | Production | Follow-on Production & Spares |
|---|---|---|---|---|---|---|
| **Contract Specification (PWS)** | Not Well-Defined (C+) ← | | | | → Well-Defined (FP) | |
| **Contract Type** (see list below) | C+I | C+I, C+FF | C+I, FPIF | C+I, FP, FPI | FP, FPI, FPEPA | FP, FPI, FPPR |
| **Gov't Cost Risk** | High ← | | | | | → Low |

1. **Fixed Price Contracts (FP)**

   a. FP—Fixed Price: Ex-ante negotiated contract price is not subject to any adjustment based on actual ex-post costs of performing the contract.

   b. FPI—Fixed Price plus Incentive Fee: Contract provides for incentive based on pre-determined share of actual costs (profits) over (under) target costs (profits), or based on subjective measures of performance against standards. Firm ceiling price limits overall payments.

   c. FPEPA—Fixed Price with Economic Price Adjustment: Contract provides for price adjustments to reflect exogenous cost increases/decreases.

   d. FPPR—Fixed Price with Prospective Re-determination: Contract provides fixed price for first period and timetable for re-pricing over subsequent periods.

2. **Cost Reimbursement Contracts (C+)**

   a. C+FF—Cost-plus-fixed fee: Contract pays allowable costs plus fixed fee (If FF=0 then same as Time & Materials, If FF<0, then Cost Sharing between government and contractor).

   b. C+I—Cost-plus-incentive fee: Contract pays allowable costs plus incentive fee based on assessments of performance (such as actual costs and delivery dates, and/or more subjective measures).

Table 1 indicates FP (C+) type contracts are prescribed in later (earlier) stages of product development when complexity and uncertainty have (have not) been resolved, and the Performance Work Statement (PWS) is well (not well) defined, and that this results in relatively low (high) risks to the Government. Note that while these prescribed contracts focus on the characteristics of complexity and uncertainty, apparently overlooked is the vital role of asset specificity—one of the key insights of TCE.

Another significant characteristic of transactions is frequency. Recurrent transactions often justify the setup costs of specialized assets and special governance requirements. They also offer the opportunity to apply learning curves (cumulative cost-quantity relationships) to lower production costs, and for gradual reductions in uncertainty as both parties learn more about costs. Recurring transactions also offer the possibility for the accumulation of goodwill and to build reputations. In summary, TCE emphasizes four key characteristics of transactions: asset specificity, complexity, uncertainty, and frequency.20

## L) Solving Governance Problems through Vertical Integration

When asset specificity, bounded rationality (complexity and uncertainty), and opportunism make contracting problems too difficult (or external transaction costs too high), "the problems of incomplete contracting are often relieved by unified ownership" (Williamson, 1999).21 But when transactions occur within an organization, calculations must also include the costs of internal coordination and motivation. Whereas vertical integration brings transaction-specific assets under the control of one organization and reduces opportunism from holdup, hierarchies can't control costs as effectively as markets—or suffer from "low-powered" incentives. Moreover, bounded rationality limits the span of effective internal managerial control, so that lower-level managers and employees often engage in multitasking, sub-optimizing, and unproductive rent-seeking behavior (Prendergast, 1999).

Hierarchy in a government organization can lead to legitimate sub-optimization, where the joint pursuit of lower-level goals fails to coincide with the global objectives of the

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[20] For purposes of illustration, consider two polar examples: A transaction that involves routine aircraft maintenance and one that involves defense Research & Development (R&D) on a major weapon system. In the case of recurring purchases of routine maintenance, the service is relatively homogeneous, not especially complex, and, therefore, can be well specified. Assuming there are mild information asymmetries and many competing suppliers employing mostly non-specific assets, market governance can be prescribed to minimize both production and transaction costs. Anytime competition exists among suppliers of well-specified homogeneous products, spot market purchases or simple FP contracts generally offer adequate governance structures to induce cooperative adaptation and minimize transaction costs. If government performs such functions, then public-private competitions are likely to reveal both production and transaction cost savings from outsourcing. In sharp contrast, a complex, nonrecurring defense R&D program involves challenges in specifying the product, service, or project as well as significant technical uncertainty over the results. Moreover, even if the R&D contract is let through ex-ante competitive bidding, "holdup" problems due to asset specificity may present significant cost control and ex-post bilateral dependency hazards.

[21] If such agreements turn out to be too costly to implement and enforce—or "maladaptation hazards" are too great—then outsourcing can give way to insourcing (or vertical integration) (Williamson, 1999). An important result of TCE is that internalizing transactions can reduce customer and provider incentives to engage in opportunistic behavior, and promotes the sharing of specialized information. Internalizing some activities under the direct control of a manager can economize on transaction costs, and (together with production cost considerations) these cost savings provide an efficiency basis for defining the boundaries of an organization. The main value of ownership integration is that it reduces buyer and seller incentives to engage in opportunistic behavior and promotes the sharing of specialized information. The choice of governance structure for any transaction—either insourcing (or vertical integration), or outsourcing (or spot market purchases)—depends upon both *production* and *transaction* costs.

organization.22 This often happens in the budget planning process with internal lobbying for resources. However, opportunism can compound the problem by introducing strategic efforts to gain local advantage at the expense of the larger group. Sub-optimization can thus expand to include the strategic use of asymmetric information for local benefit. As a consequence, while government in-sourcing can reduce ex-post opportunism due to holdup, the tradeoff includes: a) low-powered incentives, b) internal opportunistic behavior, and c) an increase in administrative costs. 23

Anytime ex-ante competition among suppliers is transformed into an ex-post bilaterally dependent relationship, additional governance structures are required to induce cooperative adaptation.24 These structures can include anything from agreements to share and verify cost and performance information in incentive contracts to the careful crafting of dispute settlement mechanisms. However, such agreements often increase external transaction costs. The higher external transaction costs, the larger production cost savings need to be to support the decision to outsource. An underlying objective of TCE is to contribute to the design of contracts, organizations, and other governance structures to reduce transaction costs and improve the gains from exchange.

## M) A Case Study: Competitive Sourcing and OMB A-76

Outsourcing relationships vary widely in their characteristics (asset specificity, uncertainty, complexity, frequency, etc.) and potential difficulties. As a consequence, increases in transaction costs (required to govern an outsourcing relationship) can more than offset any production cost advantages from outsourcing. Outsourcing relationships can

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[22] A further complication (but beyond the scope of this discussion) is employee goals not congruent with the government's. This includes the strength of incentives for efficient operation. Why, for example, should a contracting officer who is spending public funds (and not his own) be more diligent in monitoring performance when dealing with outside contractors than "in-house" supervisors are in dealing with internal procurement?

[23] Wintrobe (1977) offers a good review of the literature that analyzes the strategic behavior of a public monopolistic, budget-maximizing bureau—or internal agent (Niskanen, 1971), that can make take-it-or-leave-it budget proposals, and its sponsor—or internal principal. Mueller (1989) later replaces the assumption the bureau is allowed to make take-it-or-leave-it budget proposals with a model in which the sponsor chooses a desired level of output based on the bureau's announced price per unit of output. Claar (1998) expands the role of the sponsor to regulate the bureau by allowing it to select both the level of output and the allowed price per unit, based on the bureau's reported marginal cost. Adapting Baron and Myerson's (1982) incentive compatibility framework for regulating a monopolist with unknown costs to the sponsor's problem of monitoring a bureau with unknown costs, the welfare-maximizing pricing policy deviates from the standard efficient pricing policy, P=MC. The deviation of the optimal pricing policy from the usual P=MC pricing rule arises due to asymmetric information—or the informational advantage the bureau has concerning its own costs. Internal transaction costs must, therefore, include a subsidy paid by the sponsor in addition to MC to induce the bureau to report its costs truthfully. Baron and Besanko (1984) modify the Baron-Myerson model to permit the regulator to conduct random audits of costs. This introduces an additional transaction cost—monitoring costs. These examples point to the internal transaction costs (a subsidy to induce truthful reporting or monitoring costs to establish correct costs) that must be weighed against any production cost advantages that might exist from insourcing or internalizing transactions in government's *make* or *buy* decisions.

[24] According to Williamson and Masten (1999), the "central problem of economic organization is adaptation" (p. xi). The challenge of adaptation is especially acute when ex-ante competition leads to ex-post monopoly power. Whenever products, services or projects cannot be well specified in advance (due to complexity, uncertainty about future conditions, measurement difficulties, etc.), and they involve transaction-specific assets, then ex-ante competition (e.g., competitive bidding) can lead to ex-post monopoly/monopsony power. In turn, this leads to costly adaptation through bilateral bargaining and renegotiation.

involve extra transaction costs such as measurement, monitoring, and negotiation costs that can quickly overwhelm a simple 10% production cost advantage.

Another crucial insight of transaction cost analysis is that different ex-ante contracts offer different incentives for unproductive ex-post bargaining and influence activities.

If the performance work statement (PWS) describing the desired product, service or project can be specified precisely as an Invitation for Bid (IFB), and there are no transaction-specific assets involved, then FP type contracts have the benefit of creating cost-reducing incentives that reward the buyer through ex-ante competition between potential suppliers. In this case, FP contracting increases contractor incentives to invest in cost reduction, and ex-ante competition can transfer these cost-savings directly to the buyer.

In contrast, if the PWS cannot be specified precisely such that there is a Request for Proposal (RFP), and/or if there are significant specific assets involved in the transaction, then some surplus will be eroded by the frictions of ex-post negotiation. This loss from bargaining activity is part of the cost of using a FP contract in this case. The more complex and uncertain the transaction, the less complete the PWS, the greater the cost in using FP, and the more attractive other contracting options become.25

However, Bajari and Tadelis (1999) (citing Ashley & Workman, 1986) demonstrate that providing cost incentives in a contract is more likely to lead to disagreements and spoiled relationships and ex-post friction in interpreting the outcomes. In fact, avoiding these frictions and reducing the advantages to renegotiation can be accomplished by investing in a more complete PWS, and by adopting alternative mechanisms (reputation, etc.) to reduce the return from opportunistic bargaining behavior.

TCE suggests that the degree of completeness of the PWS and the contract is an optimizing decision by both parties that reflects their trade-offs between an ex-ante investment in the PWS and contract design, and the potential ex-post cost of opportunistic bargaining and renegotiation. Moreover, since the principal insight of TCE is that the choice of optimal governance structure depends on the characteristics of the transaction, the dual focus of any outsourcing evaluation should be: a) to sort transactions into categories based on their principal characteristics (asset specificity, uncertainty, complexity, and frequency), and b) to evaluate the costs and consequences of alternative contracts, organizational structures and mechanisms available to govern those transactions.

## N) Results from a Bargaining-game Model of Transactions

A fundamental insight of TCE is the importance of uncovering both production and transaction costs associated with the “make-or-buy?” decision. Here, comparative static results from a stylized bargaining game model developed in Appendix A are applied to the special case of public-private competitions regulated by OMB Circular A-76. This approach reveals characteristics of transactions that can be used to distinguish between two

[25] This might best be illustrated with the A-12 advanced stealth bomber aircraft program: an example of false security from government risk placed in a fixed-price type of contract chosen for a large complex development contract, the result of the project being costly for both parties on a grand scale (Stevenson, 2001).

categories of internal government transactions: “good” as opposed to “more challenging” candidates for outsourcing.

According to the documents, five steps are required to conduct a public-private competition for an activity currently done by the government:

1. Develop a Performance Work Statement (PWS) to define performance and a Quality Assurance Surveillance Plan (QASP) to measure performance.

2. Construct a Most Efficient Organization (MEO) for the insourcing (in-house) cost estimate.

3. Prepare an Invitation for Bid (IFB) for well-defined, routine commercial activities, or a Request for Proposal (RFP) for ill-defined, complex, uncertain projects that involve specific assets.

4. Compare bids or proposals with the in-house estimate, and select a winner. In the case of an IFB, the concern is to minimize costs. In the case of an RFP, the concern is cost-effectiveness. In the case of an IFB, continue to in-source unless the government can obtain equivalent performance and threshold savings are above 10% of direct personnel costs or a cumulative $10 million over the performance period. The same holds for the case of RFP, with the further possibility of outsourcing if it is judged significantly better performance can be achieved at the same cost as the MEO.

5. Address appeals.

## O) Characteristics of Good Candidates for Outsourcing

Where a transaction requires little in the way of specific assets (no holdup problem), and involves a product or service that is a) well-defined and homogeneous (IFB), b) easy to measure (limited complexity and mild information asymmetry), c) routinely used (recurring/frequent purchases), d) not subject to change (limited demand uncertainty), and e) is offered by competing suppliers, then there is little room for negotiation (price and performance are market-driven), and the marginal benefit of unproductive bargaining is essentially zero. With little room for bargaining over such routine and uncomplicated transactions, substantial production and transaction cost savings can be expected from outsourcing, or from purchasing directly in spot markets (say over the Internet). (This can be seen directly from [3a,b] in Appendix A: since if $\sigma$=0, then b=0).

Moreover, since administrative, incentive, and enforcement costs tend to be low for goods and services produced in competitive markets, the marginal cost of engaging in the transaction is small, and the marginal cost of unproductive effort is high. This ratio encourages greater effort (ei) and investment in the transaction and, ceteris paribus, tends to generate a larger surplus (S), or a higher return to outsourcing (See Appendix A).

In general, the less complex and uncertain a transaction, the easier it is to write an explicit contract that covers all relevant contingencies. Moreover, the lower the

administrative and enforcement costs of that contract, the higher the expected marginal cost of ex-post bargaining or rent-seeking activity, and the lower the expected return from that activity. This reduces optimal ex-post bargaining (b), thus lowering transaction costs associated with outsourcing. The favorable characteristics of these so-called good candidates tend to encourage greater productive effort that in turn contributes to a larger surplus (value) enjoyed by both parties, increasing the returns from outsourcing.

## P) Characteristics of More Challenging Candidates for Outsourcing

More challenging candidates include transactions that involve non-standard (differentiated) products or services that take place in a bilateral contractual setting. In this case, assuming no specific assets are required, the results (bargaining, b, effort, e, and surplus, S) depend on the degree of contractual ambiguity governing the transaction, as well as on any administrative and enforcement costs involved. However, as complexity, uncertainty, and opportunism due to specific investments increase, so does the marginal benefit of bargaining or ex-post renegotiation. This results in higher external transaction costs that need to be offset by more substantial production cost savings in order to justify outsourcing.

Productive investment (effort in the model) can be thought of as involving two types of assets: general and specific. The greater the ratio of specific assets to total investment, the greater the risk of "holdup." Moreover, as the threat of bilateral dependency increases, the more incomplete the contract (and the lower the penalty for reneging or renegotiation), the lower the marginal cost to each party of engaging in unproductive bargaining or influence activities (i.e., the lower $\gamma$). In the face of incomplete contracting, the holdup problem poses a hazard Williamson calls "maladaptation." Maladaptation is captured here as an increase in the return to both parties in unproductive bargaining (i.e., an increase in $\sigma$). From Appendix A, as $\sigma$ increases and $\gamma$ decreases, a greater amount of unproductive bargaining (b), and a lower productive effort or investment (e) can be expected, that will lower the surplus (S) enjoyed by both parties to the transaction.

Any time ex-ante competition among suppliers is transformed into an ex-post bilaterally dependent relationship, additional governance structures may be required to induce cooperative adaptation. The challenge is to write a contract with enough precision to encourage desired performance, but enough flexibility to allow productive adaptation (adjustments), as circumstances require. But in the case of complex transactions and uncertain outcomes, "bounded rationality" precludes comprehensive ex-ante contracting (contracts are inherently incomplete) which raises the possibility of gains from (unproductive) ex-post opportunistic bargaining and renegotiation (e.g., the "holdup" problem).

Contracting, therefore, offers an imperfect solution to opportunism. What are required are additional governance mechanisms (rules and regulations, reputation mechanisms, GOCO, etc.) to settle disputes and adapt to new conditions, and ex-ante efforts to screen for reliability and reputation or to safeguard and protect transaction-specific investments (i.e., lowering the marginal return to bargaining, $\sigma$, and raising the marginal cost, $\gamma$). These structures can include anything from agreements to share and verify cost and performance information through incentive contracts, to the careful crafting of dispute settlement mechanisms. Appendix B offers a simple Stoplight scheme to help defense

managers recognize key characteristics of transactions that could guide them to choose an appropriate contract type and governance mechanism to improve outcomes in terms of performance, cost and schedule.

## SECTION 3: DEFENSE MATERIEL ACQUISITION

This section describes the current acquisition transactional environment and provides a synthesis of acquisition transaction components and their strata of governance, followed by an overview of associated management practices in the DoD.

### A) The Transactional Environment

> *The Defense Acquisition System exists to manage the nation's investments in technologies, programs, and product support necessary to achieve the National Security Strategy and support the United States Armed Forces. The investment strategy of the Department of Defense shall be postured to support not only today's force, but also the next force, and future forces beyond that. The* ***primary objective of defense acquisition is to acquire quality products that satisfy user needs with measurable improvements to mission capability and operational support, in a timely manner, and at a fair and reasonable price.*** (Department of Defense Directive 5000.1)

"Acquisition" is the acquiring of supplies or services (including construction) by contract with appropriated funds by and for the use of the Federal Government through purchase or lease (FAR Part 2.101b). The realm of defense acquisition extends from the development and procurement of materiel, to purchasing services and sustaining support for our military. Government acquisition is unique as a public enterprise.

While many businesses and public agencies conduct internal product development for themselves and others (or conduct external projects for others), the Department of Defense, for the most part, commissions external suppliers to conduct projects for its internal use. In short, the DoD outsources much of what we consider to be "acquisition," with all of the attendant transaction costs of search, information, decision, contracting, measurement, monitoring, and enforcement.

Defense developmental projects, and their later procurement, are often seen as among the most challenging acquisition endeavors, because of their large size and technological complexity. Such transactions are undertaken with contracts in the context of inter-firm collaboration: where a client firm engages an outside supplier to design and/or engineer a component, subsystem or process (Carson, Madhok, Vasrman & John, 2003). Unique also are the performance, quality and security requirements of materiel. The extremes of combat environments often place products and end-users at risk of physical harm, and any failures in performance, timeliness or cost can significantly impact national security.

The government's goal orientation in its development and procurement pursuits is provided in the guiding principles of the Federal Acquisition Regulation:

> *The Federal Acquisition System will—(1)* ***Satisfy the customer in terms of cost, quality, and timeliness of the delivered product or service*** *by, for example—(i) Maximizing the use of commercial products and services; (ii) Using contractors who have a track record of successful past performance or who demonstrate a current superior ability to perform; and (iii) Promoting competition; (2)* ***Minimize administrative operating costs****; (3) Conduct business with integrity, fairness, and openness; and (4) Fulfill public policy objectives.* (FAR, 2004, Part 1.102)

This is in concert with the opening quote above from DoD Directive 5000.1, but goes a bit further by describing the desired nature of acquisition transactions. It can be assumed that there is often significant goal incongruence in public-private outsourcing relationships: the government seeks the best possible value of goods and services for the least cost to the taxpayer, while private industry typically seeks to maximize profit and avoid competition. But such fundamental goal differences notwithstanding, this buyer-seller partnership has historically yielded supreme American military capability, as well as profit for shareholders. Of course, the two questions often asked are whether we have purchased this capability at the best price, and whether the equipment, supplies and services get into the hands of our military in a timely manner.

**B) Contracting and Project Management**

Contracts are the governance mechanisms and transaction vehicles used to facilitate development or procurement expenditures. Guiding the choice of contracts is the Federal Acquisition Regulation (FAR) and its DoD supplement, the Defense Federal Acquisition Regulation Supplement (DFARS). The FAR consists of over 1900 pages that codify uniform policies and procedures for acquisition by all executive agencies of the US government. The DFARS adds over 1100 more pages of agency-specific policy and procedures to be followed by the Defense department in its contracts and purchases. Authority for the award and administration of government contracts is vested in warranted contracting officers. They typically reside in service-specific acquisition centers: organizations within larger "systems commands"* usually organized by commodity item, such as communications and electronics, aviation, and armaments, etc.

The DoD uses project management techniques (GANTT Charts, Critical Path Methods, PERT, etc.) as a methodology to conduct its outsourced product development efforts, recognizing the unique and temporary nature of many projects. Project management provides for a single point of contact, the program manager, who is the major force directing systems through their evolution and lifecycle: including design, development, production, deployment, operations and support, and disposal. The program manager (PM) has management authority and accountability for all business and technical aspects of a specific program.

* Also service Inventory Control Points and Defense Supply Centers.

Program Managers lead Program (Project or Product) Management Offices. Program Management Offices (PMOs) are part of the transaction costs of overseeing contracts. They provide the PM with further resources to manage the acquisition of materiel, supporting warfighters as end-users. Many members of the acquisition workforce furnish either core or matrix support to a PMO.

At the beginning of FY2000, the size of the DoD's acquisition workforce was estimated to be 124,000 personnel (ADR, 2000). The Defense industry's suppliers typically follow the project management methodology established by the PM, and often contractors will staff and operate their program offices to parallel that of the government programs they support. Both types of DoD managers, PMs and contracting officers, act as transaction agents to ensure that public funds are being used prudently to accomplish the mission, while also promoting public policy mandates (e.g., small and disadvantaged businesses), and ensuring that relevant Government regulations (e.g., safety) are enforced.

The DOD 5000 series of regulations serves as overarching guidance for the acquisition of materiel—primarily materiel requiring new development and subsequent investment in production. DOD Directive 5000.1, The Defense Acquisition System, provides policies and principles to govern the management of all DoD acquisition programs. There are five major thrusts governing the overall acquisition system: 1) flexibility in shaping individual programs to meet needs, 2) responsiveness in achieving capabilities in accord with their timelines of need, and doing so in increments via evolutionary acquisition, 3) innovation via practices that reduce cycle-time and cost, 4) discipline in the adherence to goals, with program baseline parameters serving as control measures, and 5) effective management through decentralized responsibility and authority (DODD 5000.1, 2003).

DoD Instruction 5000.2, Operation of the Defense Acquisition System, establishes a management framework that translates mission needs and technological opportunities into stable, affordable, and well-managed acquisition programs (DODI 5000.2, 2003). The instruction provides procedures for operation of the acquisition management system in conjunction with a system of prioritizing and allocating funds (the Planning Programming, Budgeting and Execution System (PPBES)), as well as a system to generate materiel requirements (the Joint Capabilities Integration Development System (JCIDS)). Together, they produce bonafide transaction needs, resources and technical performance solutions. The successful interaction of these three decision-support and management systems are the governance mechanisms relied on to produce advanced warfighting capability.

**C) Cost, Schedule and Performance Attributes are Stratified**

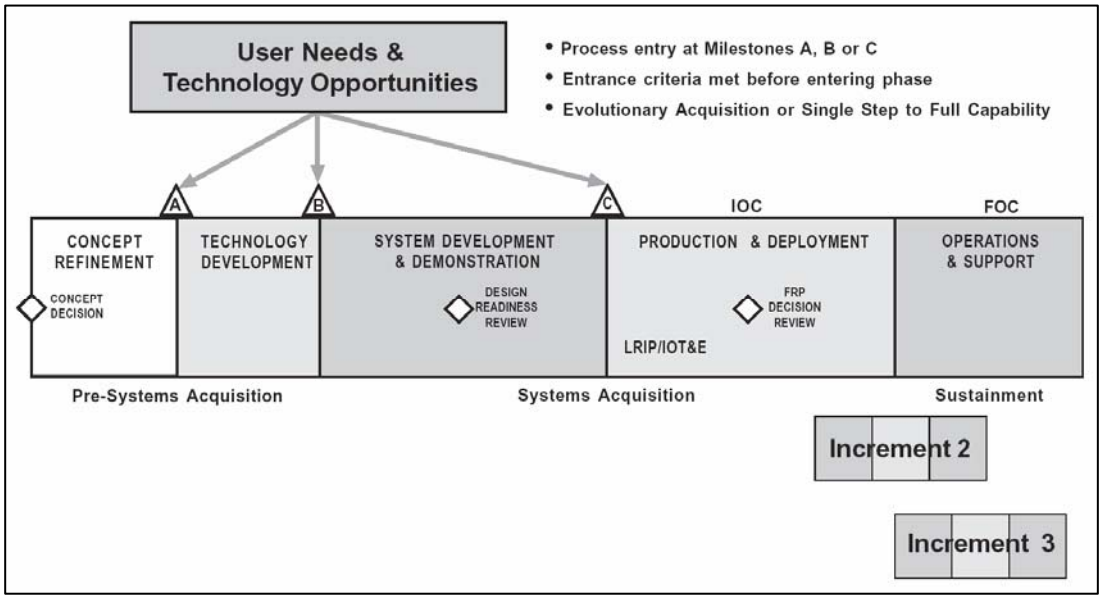
The first FAR principle stated above of customer satisfaction (including "cost, quality, and timeliness of the delivered product or service") encompasses many of the key features of acquisition transactions. Acquisition transactions can largely be categorized by their timeliness, dollar value, and technical performance requirements and characteristics (which are translated into measures of project management success).

These characteristics are often identified and stratified in various policy and regulatory documents that affect acquisition procedures and governance. The TCE characteristics of uncertainty and complexity are largely incorporated within the parameters of cost, schedule, and performance. Asset specificity is not addressed per se; however, the DoD has long acknowledged the dangers of becoming "locked-in" to propriety technology (or unique expertise, i.e., human asset specificity) (DOD Guidebook, 2004). Interestingly, we

observe much less of this cautionary language today, possibly because of highly inelastic demand due to wars fought in Iraq and Afghanistan, or perhaps because the potential for "holdup" is simply being overlooked.

Materiel acquisition is often viewed as occurring over a *lifecycle*—moving from initial concepts to engineering and development, into production (procurement) and to operations and maintenance/support until eventual disposal. See Figure 1 below. This lifecycle involves a product's maturation that tends to reduce uncertainty and complexity as the product is developed and fielded.

**Figure 1. Defense Acquisition Decision Reviews and Phases**




The funding comes from several different sources and involves different contracts. For developmental systems acquisition endeavors, the funding comes from the Research Development, Test and Evaluation (RDT&E). Procurement appropriations are used to acquire the actual systems, with sustainment expenditures coming from Operations and Maintenance. RDT&E and Procurement appropriations are often termed the "investment accounts," and together they typically comprise roughly one-third of the annual defense budget in any given year.

RDT&E funds are further categorized to reflect different types of research efforts: 1) Basic Research, 2) Applied Research, 3) Advanced Technology Development, 4) Advanced Component Development and Prototypes, 5) System Development and Demonstration, 6) RDT&E Management Support, and 7) Operational System Development. In Table 2 below,

it can be noted that the activity categories and purposes correlate somewhat to degree of end product (i.e., system) applicability or technological maturity (corresponding with a reduction in uncertainty and complexity), and that funding and management agents change depending upon the research category.

**Table 2. Research, Development, Test and Evaluation Categories (DOD 7000.14-R)**

## Major Force Program 6 - RDT&E

| CAT# | ACTIVITY | BA* | PURPOSE | WHO | FUND MANAGED |
|---|---|---|---|---|---|
| 01 | Basic Research*/ RESEARCH # | BA-1 | EXPAND KNOWLEDGE/ STUDIES / EXPERIMENTS | UNIV / LABS | RDT & E COMMANDS / SERVICES |
| 02 | Appl Research*/ EXPLOR DEVEL # | BA-2 | DEVELOP & EVALUATE TECHNICAL FEASIBILITY | UNIV / LABS / CONTRACTOR | RDT & E COMMANDS / SERVICES |
| 03 | Adv Tech Devel*/ ADV DEVEL # | BA-3 | PROOF OF CONCEPT/ BRASSBOARDS | LABS / FIELD / CONTRACTOR | RDT & E COMMANDS / SERVICES |
| 04 | Adv Tech Devel & Prototypes*/ DEM / VAL # | BA-4 | SPECIFIC WEAPON SYSTEM | LABS / CONTRACTOR | PMO |
| 05 | Sys Dev & Demo*/ ENGR DEVEL # | BA-5 | PROTOTYPE / EMD | CONTRACTORS / FIELD ACTIVITY | PMO |
| 06 | RDTE Mgmt Spt*/ MGMT & SPT # | BA-6 | TEST RANGES / CIVILIAN RANGES | TEST RANGES | RDT & E COMMANDS / HEADQUARTERS |
| | Operational Systems Devel # | BA-7 | IMPROVE PERFORMANCE OF PRODUCTION SYSTEM (R&M) | CONTRACTOR/ FIELD ACTIVITY | PMO (FUNDING IS NOT ALWAYS RDT&E, THE MFP IS NOT 6, R & D) |

# Per FYDP Structure Mgt Hnbk (DoD 7045.7-H)

* Per FMR (DoD 7000.14-R)

Legend
FYDP = Future Years Defense Plan
FMR = Financial Management Regulation

Depending upon the type or purpose of a research and development transaction, an appropriate “color of money” must be used to satisfy financial management regulations. Procurement funds are used for items the DoD wishes to have produced, or for items already developed and commercially available for purchase.

It is also apparent in both the 5000 series and FAR/DFARS documents that acquisition procedures and governance vary according to dollar size of transactions. The DODI 5000.2 prescribes Acquisition Categories (ACAT) per Table 3 below.

**Table 3. Description and Decision Authority for ACAT I – III Programs**

**(DODI 5000.2, May 2003)**

| Acquisition Category | Reason for ACAT Designation | Decision Authority |
|---|---|---|
| ACAT I | • MDAP (10 USC 2430, reference (n))<br>o Dollar value: estimated by the USD(AT&L) to require an eventual total expenditure for research, development, test and evaluation (RDT&E) of more than $365 million in fiscal year (FY) 2000 constant dollars or, for procurement, of more than $2.190 billion in FY2000 constant dollars<br>o MDA designation<br>• MDA designation as special interest | ACAT ID: USD(AT&L)<br>ACAT IC: Head of the DoD Component or, if delegated, the DoD Component Acquisition Executive (CAE) |
| ACAT IA | • MAIS: Dollar value of AIS estimated by the DoD Component Head to require program costs (all appropriations) in any single year in excess of $32 million in fiscal year (FY) 2000 constant dollars, total program costs in excess of $126 million in FY2000 constant dollars, or total life-cycle costs in excess of $378 million in FY2000 constant dollars<br>• MDA designation as special interest | ACAT IAM: ASD(C3I)/DoD CIO<br>ACAT IAC: CAE, as delegated by the DoD CIO |
| ACAT II | • Does not meet criteria for ACAT I<br>• Major system<br>o Dollar value: estimated by the DoD Component Head to require an eventual total expenditure for RDT&E of more than $140 million in FY2000 constant dollars, or for procurement of more than $660 million in FY2000 constant dollars (10 USC 2302d, reference (o))<br>o MDA designation4 (10 USC 2302(5), reference (p))<br>• MDA designation as special interest | DoD CAE or the individual designated by the CAE |
| ACAT III | • Does not meet criteria for ACAT II or above<br>• Less-than a MAIS program | Designated by the DoD CAE at the lowest level appropriate |

Notes:
1. In some cases, an ACAT IA program, as defined above, also meets the definition of an MDAP. The USD(AT&L) and the ASD(C3I)/DoD CIO shall decide who will be the MDA for such programs. Regardless of who is the MDA, the statutory requirements that apply to MDAPs shall apply to such programs.
2. An AIS program is an acquisition program that acquires IT, except IT that involves equipment that is an integral part of a weapon or weapons system, or is an acquisition of services program.
3. The ASD(C3I)/DoD CIO shall designate programs as ACAT IAM or ACAT IAC. MAIS programs shall not be designated as ACAT II.
4. As delegated by the Secretary of Defense or Secretary of the Military Department.

ACAT designated programs are further arrayed by application or functional area (currently Battlespace Awareness, Command & Control, Focused Logistics, Force Application, Force Protection, Joint Training, Net Centric warfare). This is the "traditional" approach for the acquisition of items that are not yet mature enough for production nor commercially available.

Contract purchase thresholds, along with associated degrees of governance, are also stratified in the DFARS. For example, a "micro-purchase" is an acquisition of supplies or services, the aggregate amount of which does not exceed the micro-purchase threshold. That threshold varies somewhat according to the operational significance of the transaction: it generally means below $2,500, but it can mean $2,000 for construction projects subject to

the Davis-Bacon Act; and $25,000 for acquisitions of supplies or services contracted outside the United States in support of a contingency operation or catastrophic recovery.

To minimize transaction costs for these relatively simple and straightforward, low-dollar-value transactions, maximum use of the government purchase card (vice written purchase orders) is encouraged. Similarly, "Simplified Acquisition Threshold (SAT)" generally refers to transactions below $100,000, except for acquisitions of supplies or services that are to be used to support a contingency operation or catastrophic recovery, for which the amount is up to $250,000 for any contract to be awarded and performed, or purchase to be made, inside the United States; or $1,000,000 for any contract to be awarded and performed, or purchase to be made, outside the United States.

Micro-purchase and simplified acquisition thresholds are important identifying characteristics of transactions used by the DoD that allow the use of simplified acquisition procedures in order to reduce transaction costs (the recognized administrative burden, and cost incurred in larger transactions). Levels of decision move along this scale as well. Purchases of up to $5 million or even $10 million, depending upon circumstances, such as urgency or whether the item procured is “commercial,” can sometimes be made under such streamlined procedures (FAR Parts 2 and 13).26

Competition as a governance mechanism (a powerful economic force for price reduction) is explicitly required for large purchases, both in statute and regulation. Although the possibility of ex-ante competition followed by ex-post lock-in and bi-lateral monopoly is somewhat overlooked.

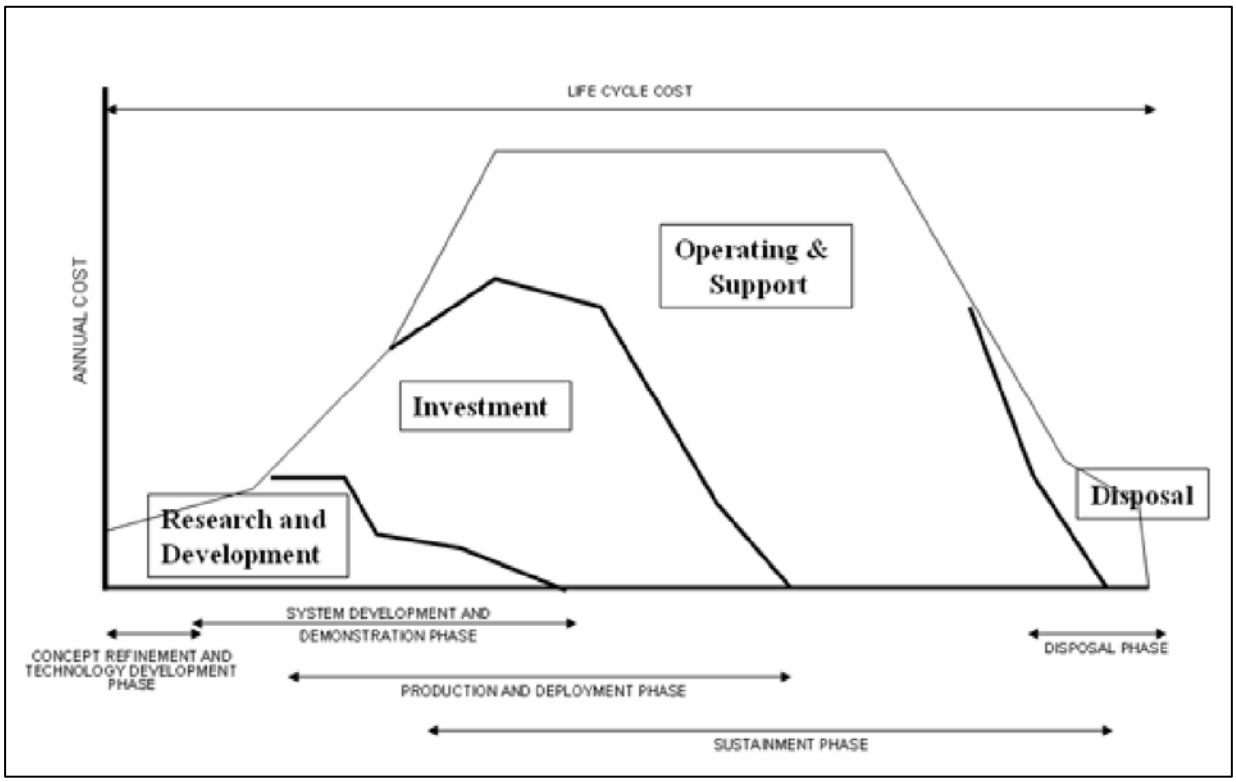
Some allowances are made for contracting officer discretion and determination. For example, exceptions to the rule that permit contracting without providing for full and open competition are: 1) only one responsible source and no other supplies or service will satisfy agency requirements, 2) unusual and compelling urgency, 3) industrial mobilization; or engineering developmental, or research capability; or expert services, 4) international agreement, 5) authorized or required by statute, 6) national security, and 7) public interest (FAR 6.302). Each of these statutory authorities must be fully supported, documented, and approved by the designated contract agency approval authority in the form of a Justification and Approval (J&A). Note the danger that many of these exceptions can subject DoD to a subsequent “holdup” resulting in higher costs, lower performance or schedule delays.

Finally, with regard to the acquisition transaction feature of cost, a long-standing paradigm exists in the DoD with regard to system lifecycle costs. As shown in Figure 2, phases of a notional program’s lifecycle correspond to budgetary appropriations and cost categories. While the relative amounts shown in each category may not hold across every program or technical commodity, this model has been demonstrated often enough to be a widely accepted view of how costs are typically distributed.

[26] It is also within the FAR that socio-economic objectives are expressed as constraints upon transactions, such as those purchases between $2,500 and $100,000 being set aside for small and disadvantaged businesses.

**Figure 2. Illustrative Program Lifecycle**

(Defense Acquisition Guidebook, Nov. 2004, p. 43)




An interesting aspect of TCE can be introduced into the Lifecycle Production Cost graph illustrated in Figure 2. The first stage of the lifecycle is characterized by great uncertainty and complexity as the product is being developed. Our earlier discussion of TCE suggests transaction costs are likely to be high in this phase (especially as a fraction of the total dollar costs of this phase of the program) as these early transactions tend to be governed more by Cost Plus contracts. However, once the technology is well understood and the product clearly specified, uncertainty and complexity are reduced and transaction costs are likely to be a much smaller part of the Investment phase, where contracts are more likely to be governed by competition for fixed-price contracts. However, towards the end of that phase, asset specificity could lead to opportunistic renegotiation of the production contract if the company is in a position to "hold up" the government (say by significantly raising the cost of any change orders). Both production and transaction costs in the classic Lifecycle cost model illustrated in Figure 2 could end up being very helpful to Program Managers.

We have already revealed a broad range of defense acquisition transactions with varying degrees of governance and administration requirements according to dollar size. But we can also point out that operational significance, specifically the implication of time urgency or compelling need (temporal specificity), can be at least as important a feature.

A recent initiative to accommodate joint urgent operational needs is codified in CJCSI 3470.01 (July 15, 2005). It establishes policy and procedures to facilitate procurement of urgent, execution-year combatant commander needs outside of the DoD 5000 series process, specifically for programs of ACAT II level or below. Generally, these are considered to be life- or combat mission-threatening needs, which were previously unforeseen and that are now required to be fulfilled within months versus years.

While this new process is not intended to replace the JCIDS process of formal requirements development, it is meant to accelerate the fielding of readily available systems for wartime use. Each of the services has a similar initiative for rapid response or accelerated deployment capability using COTS or Nondevelopmental Items (NDI). One such example is the Army's Warfighter Rapid Acquisition Program (WRAP). It is a fund of approximately $100 million per year that the Army uses to rapidly procure relatively low-cost but high-leverage systems that performed well in experimentation. The WRAP effort has reportedly reduced acquisition cycle-time for systems procured by an average of 12 months. The Marine Corps and the Air Force* have established similar rapid acquisition programs in FY 2001 and FY 2002, respectively (ADR, 2000).

In keeping with the aspect of timeliness as it relates to transaction procedures and governance, we have also noted above that commercial availability can serve as an important factor. Likewise, within the realm of system development, technology maturity (or "readiness") levels dictate the appropriate RDT&E funding categories to be employed, and determine whether progression into advanced development or production is warranted.

Technology Readiness Levels (see Table 4 below) are measures used to assess the maturity of evolving technologies prior their incorporation into a system. This characteristic can be viewed as addressing both timeliness and customer quality-of-use or degree of technical performance. Usually, when new technologies emerge, they are not suitable for immediate application. Both hardware and software typically go through a process of experimentation, refinement, and increasingly rigorous testing until they are considered mature enough to be applied by end-users in military applications. The scale below is now used by the DoD to assess maturity before the Department commits to further investments in technology. This paradigm correlates well to a scale of increasing certainty or declining uncertainty. For example, depending on a trade-off between urgency of the requirement and cost, it may be desirous for technology to be at a 6 or 7 rating on the scale before commencing an advanced development (system-level development and demonstration) program.

* Air Force Instruction 10-602 defines their Quick Reaction Capability (QRC) procedures for "any system or equipment that will or must be deployed (dictated by mission requirements) in a period of time that does not allow for routine planning, budgeting, and procurement. Deployment may occur with less than a complete support package. However, special provisions shall be made to effect lifecycle support."

**Table 4. Technology Readiness Levels in the Department of Defense (DoD)**

(Source: DOD (2004), *DODI 5000.2 Acquisition System Guidebook*)

| Technology Readiness Level | Description |
|---|---|
| 1. Basic principles observed and reported | Lowest level of technology readiness. Scientific research begins with to be translated into applied research and development. Example might include paper studies of a technology's basic properties. |
| 2. Technology concept and/or application formulated | Invention begins. Once basic principles are observed, practical applications can be invented. The application is speculative and there is no proof or detailed analysis to support the assumption. Examples are still limited to paper studies. |
| 3. Analytical and experimental critical function and/or characteristic proof of concept | Active research and development is initiated. This includes analytical studies and laboratory studies to physically validate analytical predictions of separate elements of the technology. Examples include components that are not yet integrated or representative. |
| 4. Component and/or breadboard validation in laboratory environment | Basic technological components are integrated to establish that the pieces will work together. This is relatively "low fidelity" compared to the eventual system. Examples include integration of 'ad hoc' hardware in a laboratory. |
| 5. Component and/or breadboard validation in relevant environment | Fidelity of breadboard technology increases significantly. The basic technological components are integrated with reasonably realistic supporting elements so that the technology can be tested in a simulated environment. Examples include 'high fidelity' laboratory integration of components. |
| 6. System/subsystem model or prototype demonstration in a relevant environment | Representative model or prototype system, which is well beyond the breadboard tested for TRL 5, is tested in a relevant environment. Represents a major step up in a technology's demonstrated readiness. Examples include testing a prototype in a high fidelity laboratory environment or in simulated operational environment. |
| 7. System prototype demonstration in a operational environment | Prototype near or at planned operational system. Represents a major step up from TRL 6, requiring the demonstration of an actual system prototype in an operational environment, such as in an aircraft, vehicle or space. Examples include testing the prototype in a test bed aircraft. |
| 8. Actual system completed and 'flight qualified' through test and demonstration | Technology has been proven to work in its final form and under expected conditions. In almost all cases, this TRL represents the end of true system development. Examples include developmental test and evaluation of the system in its intended weapon system to determine if it meets design specifications. |
| 9. Actual system 'flight proven' through successful mission operations | Actual application of the technology in its final form and under mission conditions, such as those encountered in operational test and evaluation. In almost all cases, this is the end of the last "bug fixing" aspects of true system development. Examples include using the system under operational mission conditions. |

**Technical** complexity within a system can be thought of as moving along a graduated scale, from low to high.27 The integration of multiple technologies in various states of component maturity (uncertainty) could hinder the attainment of system availability or performance reliability until fully state-of-the-art (Simon, 1996). Another transaction approach to satisfying user needs in a timely fashion is through Advanced Concept Technology Demonstrations (ACTDs), introduced in 1994 to enable rapid, cost-effective introduction of new capabilities.

ACTDs seek to rapidly field near-term materiel solutions, generally within two to four years. ACTDs have three principal objectives: understanding the "in-the-field" military utility of a new technology's application before committing to procurement, developing operational concepts to employ the best use of a new capability, and providing residual capabilities directly to the combatant forces as equipment by-products of the demonstration (positive spillovers or externalities). ACTDs are prioritized to respond to critical military needs as determined by the Joint Requirements Oversight Council (JROC) with near-term solutions based on mature or nearly mature technologies. If successful, ACTDs may transition into the more formal DoD 5000 acquisition process at the appropriate juncture as "non-traditional acquisition" (ADR, 2000).

Several other non-traditional acquisition approaches to enhance timeliness, satisfy user needs, or reduce administrative burdens are worthy of mention here:

Limited Production-Urgent is an Army-type classification allowing for limited numbers of items to be procured on an urgent basis without full classification as a standard type item. This could foreseeably provide capability prior to completion of all required testing, man-rating, etc. for a normal materiel release by organizations representing end-users. (AR 71-32, March 3, 1997, HQDA)

In 1994, Congress authorized the use of Other Transactions (OT) for the development of weapon prototypes such as projects often undertaken by the Defense Advanced Research Projects Agency (Technology Investment Agreements or TIAs). Under 10 USC § 2371, the term refers to any transaction vehicle other than a procurement contract, grant or cooperative agreement. Under such authority, the transactions need not comply with procurement laws and regulations such as the FAR/DFARS. A principal objective of the legislation was to encourage a larger number of commercial firms to participate in developing defense systems, thus expanding the technology base and tapping into commercial technologies.

Born from the Goldwater-Nichols legislation of 1986, the commander of the US Special Operations Command has unique acquisition authorities vested by Title 10 United States Code, Section 167. It provides for the development and acquisition of special operations forces peculiar equipment, the authority to exercise the functions of the head of agency (HOA), and the authority to execute funds (through the establishment of Major Force Program 11). This separate authority and funding account places all aspects of

[27] And though these authors have found no similar rubric or strata, the classical systems theory description of "many parts and many interactions" is a useful construct, along with other system properties such as non-linear relationships among components, etc.

requirements, acquisition, and resources in one organization for SOF-peculiar materiel. In FY05, the total MFP-11 budget was $6.6 billion, one-third of which was for acquisition-related transactions.

Thus far, we have briefly described a range of transactions within the wide realm of materiel acquisition—from small, inexpensive items that are commercially available to large, complex developmental systems that are still beyond the reach of technical maturity and purchase availability (where much contracting uncertainty lies). We have also noted common and relative aspects of timeline availability, dollar size, and technical performance, and how such attributes impact the governance of those transactions.

**D) Government Contract Types and Risk**

> ***The contracting officer's primary concern is the overall price the Government will actually pay****. The contracting officer's objective is to negotiate a contract of a type and with a price providing the contractor the greatest incentive for efficient and economical performance.* ***The negotiation of a contract type and a price are related and should be considered together with the issues of risk and uncertainty to the contractor and the Government****. Therefore, the contracting officer should not become preoccupied with any single element and should balance the contract type, cost, and profit or fee negotiated to achieve a total result—a price that is fair and reasonable to both the Government and the contractor*. (FAR, Part 15.405(b))

Among the key events in any government acquisition transaction is the contract award. The DoD employs contracts as vehicles for the accomplishment of acquisition objectives. The FAR (and DoD Risk Management literature) state that the three attributes we have been discussing here: cost, timeliness and technical performance/quality, are also the primary areas of risk in any transaction (FAR, Part 7.105(a)(7)). The policy dictates that determination of contract type "should be closely related to the risks involved in timely, cost-effective, and efficient performance" (FAR Part 15.404-4(d)). "Type" of contracts refers to the contract compensation arrangement for defense contractors. And contract type selection is the principal method of allocating cost risk between the Government and the contractor.

As discussed earlier, a variety of contract types are available to the DoD and its contractors to provide flexibility in acquiring the large variety and volume of supplies and services needed. Selecting the best contract type and price is a matter for negotiation and requires the exercise of sound judgment by both parties, judgment that this study proposes can be sharpened through the application of Transaction Cost Economics. Both parties seek to negotiate the most appropriate contract type for the kind of work to be performed in order to minimize spending and performance from the government's perspective and to maximize profits from the contractor's perspective.

As seen in the FAR statement above, the government's objective is to negotiate a contract type and price (or estimated cost and fee) that will result in reasonable contractor (profit) risk and provide the contractor with the greatest incentive for efficient and economical performance. Contracting officers are directed to consider the complexity as well as commercial availability and urgency of their transactions (FAR Part 5.203(b)). The larger the scale or more technical complexity of the transaction, the greater the perceived contract risk.

As briefly introduced above in Section 2.I, contracts are typically grouped into two broad categories: cost-reimbursement contracts and fixed-price contracts (FAR, p. 16.1-1). In cost-reimbursement type contracts, the government assumes more of the risk. These contracts are suitable for use in research and development efforts "when uncertainties involved in contract performance do not permit costs to be estimated with sufficient accuracy to use any type of fixed-price contracts" (FAR, p. 16.3-1). Such contracts epitomize the conditions of incomplete contracting described earlier, where there is significant uncertainty (and/or complexity) that impacts both sides of the transaction.

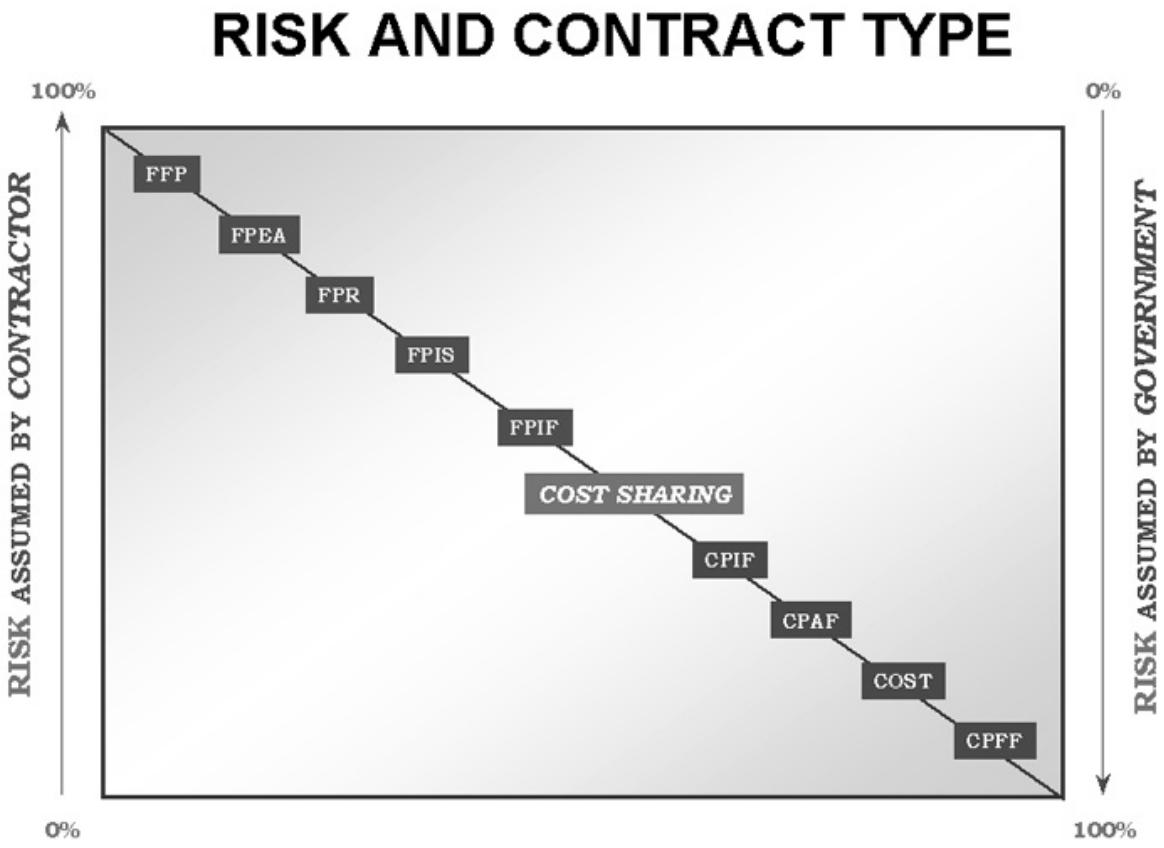
Cost-reimbursement type contracts include: cost-contracts, cost-sharing contracts, cost-plus-incentive-fee contracts, cost-plus-award fee contracts, and cost-plus-fixed-fee contracts, and place the burden of risk upon the government. The government is willing to accept the risk of a cost-reimbursement type contract in order to motivate contractors to participate in the transaction, encourage them to propose solutions, and to provide products for which there is often a limited market. In these cases, the government will attempt to tie the contractor's profit to his performance, often based upon cost, schedule or technical performance parameters.

Conversely, fixed-price contracts are usually used for production (for commercially available products, or after completion of system development) or paper studies (prior to advanced development) when the overall risk is "minimal or can be predicted with an acceptable degree of certainty" (FAR, p. 16.1-1). Complete contracting conditions exist in instances where there is limited uncertainty and complexity.

Fixed-price contract types include: firm-fixed-price contracts, fixed-price contracts with economic price adjustment, fixed-price incentive contracts, fixed-price contracts with prospective price redetermination, fixed-ceiling-price contracts with retroactive price redetermination, and firm-fixed-price level of effort contracts. All of these enable the government to negotiate a payment for the desired effort with the additional capability, in some instances, to adjust for changes in the economy, or level of work produced. The risk is placed on the contractor because the government's price is fixed regardless of the costs incurred by the contractor. However, the further assumption is that these "best utilize the basic profit motive of business" by allowing the contractor to profit based on whatever savings he can generate. Again, while ex-ante competitive bidding for a fixed-price type contract may reveal the best price to the government, the possibility of asset specificity leading ex-post to a holdup (for instance, a renegotiation of the price) does not appear to be explicitly addressed.

A graphic representation of risk and contract types is shown below in Figure 3. (See Appendix B for a Comparison of Major Contract Types for stratification of contract types, when they are used, risk, etc.)

**Figure 3. Continuum of Contract Risk and Type**




There are two primary methods of awarding contracts, as mentioned earlier in Section 2. The sealed bidding method is the simplest and is used for smaller, less complex transactions—normally fixed-price (via IFB). The contract is awarded after a review and evaluation of bids determined as "the responsible bidder whose bid, conforming to the invitation for bids, will be most advantageous to the Government, considering only price and the price-related factors included in the invitation" (FAR, p. 14.1-1). This is essentially an attempt to minimize transaction costs in the case where there is little uncertainty or complexity or asset specificity involved in the transaction (as proxied by relatively low dollar values).

The other method of awarding contracts is by negotiation (via RFP). This process is significantly more complex—to award and administer—requiring proposals, information and sometimes demonstration of technologies before the final contract is awarded. Table 5 below shows typical contract types by current acquisition phases.

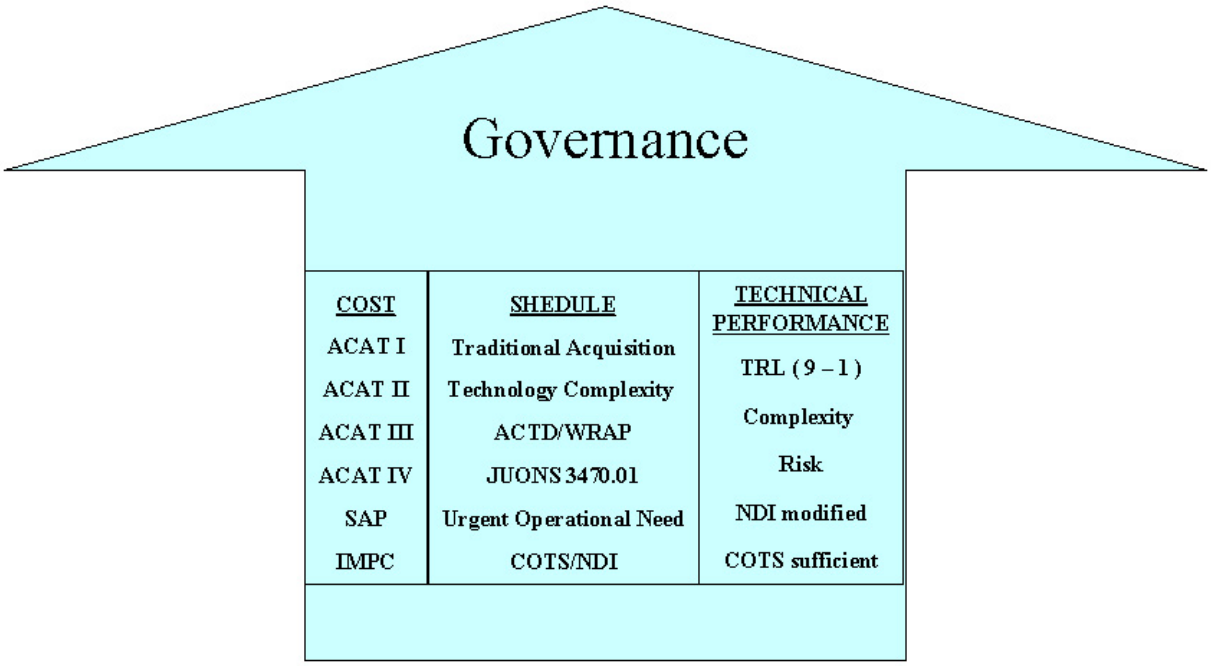
**Table 5. Typical Contract Type by Phase (DAU, 2004)**

| CR | TD | SDD/SI | SDD/SD | PROD |
|---|---|---|---|---|
| CPFF, FFP | CPFF, FFP | CPFF, CPIF | CPIF, CPAF | FPI(F), FFP |

### E) Transaction Attributes Affect Acquisition Governance

The limited scope of this research study can hardly do justice to the vast arena of contract management by our mere mention of contract types according to risk, etc. Our purpose is to simply emphasize that defense acquisition transactions are multi-faceted with multiple variants, but primarily focus on aspects of cost, schedule and technical performance as success measures, governance determinants, and influences on the contracting vehicle. Other factors that have an important bearing on acquisition transactions include economic factors such as whether or not the supplier base is highly competitive; whether or not requirements are fully known (the degree of uncertainty); the materiel mission environment, etc. However, our observations of the many types of transactions for acquiring materiel and the range of contract vehicles employed exhibit a somewhat linear incorporation of governance along the growth lines of cost, schedule and technical performance risks, as in Figure 4 below. Perhaps the most important conclusion to draw from this discussion is that the TCE characteristic of asset specificity does not appear to have been captured as a key concern of acquisition transactions in the traditional applied literature or in defense and other federal acquisition policy documents; although, we have found practices that (at least indirectly) address this important characteristic of economic behavior.

**Figure 4. Governance According to Transaction Attributes of Cost Schedule and Technical Performance**



## F) The Cost of Acquisition Transactions

While much attention in defense acquisition is placed upon what is spent on contracts or in budgetary categories as production costs, less emphasis seems to fall upon the costs of the transactions themselves. However, Congress has focused upon the size of the acquisition workforce, presumably as a driver of administrative costs associated with acquisition. Congress passed legislation throughout the 1990's aimed at significant reductions in the acquisition workforce over a span of 5-10 years (CSRS Acq Reform Issues, 2002).

For example, the Defense Contract Management Agency (prior to the March 2000 Defense Contract Management Command) had reduced its size from approximately 24,000 contract administration services personnel in 1990 to approximately 11,000 personnel in 2001. In 2000, it was estimated that of $91 billion dollars of unliquidated obligations on defense contracts were being administered under the purview of the Defense Contract Management Agency. Upwards of 25% of the transactions were for "small dollar contracts"—purchase orders valued under $2,500—with an approximate administration cost of $300 each. As Eiband suggests, "procurement complexity, lead time, and administrative costs all increase as one ascends the hierarchy" (Eiband, ARJ). Similar oversight or administrative services are also performed by agencies such as the Defense Contract Audit Agency and the Defense Finance and Accounting Service, who audit and pay contractors respectively.

## G) Acquisition Practices

Described below are other areas where the DoD has attempted to address transactions costs, though perhaps not using TCE terminology. The business of defense materiel acquisition has gone through a number of reform cycles, with particular emphasis on adoption of best practices and approaches to constrain cost, improve cycle-time, improve discipline. Such initiatives include using electronic commerce to reduce paperwork and its associated costs, use of commercial standards and processes, off-the-shelf components, and best business practices. Others include using performance (versus technical) specifications and contracting techniques for sharing of cost savings with contractors, such as Value Engineering Change Proposals. Rand cited a total of sixty-three such initiatives in their recent report on the status of reforms undertaken in the 1990s. Some of the most widely accepted are described below, each involving a strategic shift in the relationship between government buyers and private industry sellers. Interestingly, each example is associated with some aspect of economic behavior emphasized in the TCE literature.

### 1. Multi-year Contracting and Frequency

Motivating and incentivizing industry partners in DoD acquisition typically focuses on ensuring competition through the use of multiple sources, component breakout, leader/follower development and production, dual source of critical components, etc. The DoD assumes that a competitive business environment exists, and indeed is compelled under the Competition in Contracting Act of 1984, as amended, to acquire supplies and services through the use of full and open competition. However, as indicated above, sole source procurements can be justified; and in that environment, cost savings might still be attained through the use of a variety of business initiatives such as value engineering, multiyear procurements and other types of shared cost savings between government and the contractor.

Multi-year contracting is seen by many to provide a more stable and longer-term relationship between the government buyer and industry supplier, versus the more typical annual commitments from congressional appropriations and authorizations. The TCE characteristic of frequency emerges in multi-year contracting, whereby the government commits to purchase of goods or services beyond a single year (retaining its unilateral right to terminate for convenience). If it is credible, this limited commitment on the part of government can afford contractors the perceived stability needed to motivate investments in capital improvements. The Federal Acquisition Streamlining Act of 1994 encourages longer-term supplier relationships. But multi-year contracts must still demonstrate significant advantage in pricing over annual contracts and may not extend for more than a five-year period. Full funding need not necessarily be in place for the total duration of the buy, but termination/cancellation charges apply if the contract has to be cancelled or is not funded in accord with the programmed buy (Rand, 2005).

### 2. Integrated Product and Process Development and Asset Ownership

Integrated Product and Process Development (IPPD) was instituted to save costs by ensuring a "systems" approach to acquisition. IPPD helps prevent additions and/or changes late in the lifecycle for factors "forgotten" earlier, such as supportability, testability, and producibility. The idea was not new, and grew out of systems management thinking which was became prevalent in the 1970s. A primary tenet of IPPD is to recognize the multi-disciplined nature of complex projects, like weapon system development, incorporate a cross-functional methodology to planning and analysis of requirements at the front end of systems development. Absolute necessity for both early problem discovery and buy-in of all participants at all levels—if and only if—well led. Integrated Product Teams (IPTs) are the means through which IPPD is implemented. IPTs are cross-functional teams that are formed for the specific purpose of delivering a product for the customer. IPT members should have complementary skills and be committed to a common purpose. DoD zealously implemented the IPPD philosophy with four formal levels of hierarchical IPTs—from project-level working groups to over-arching OSD-level "teams." Key in the IPT concept is the idea that a multiple perspective view of a problem early on may go a great ways toward advanced problem discovery and total realization of requirements across areas like designing, testing, supporting and maintaining, improving, manufacturing, packaging, etc. Changes in the design of a system early on prevent much costlier changes later.28

### 3. Cost as an Independent Variable (CAIV)—Heightened Awareness/Shared Risk

Another one of several recent initiatives aimed at controlling costs in the DoD is cost as an independent variable (CAIV), where a system's ultimate objectives of performance are re-examined as costs increase greatly relative to performance gains. The CAIV philosophy means that cost will be treated as a constraint or fixed variable, much like a fixed budget, among the three variables (cost, schedule and performance). In past endeavors, performance was seen as the paramount objective and was the more programmatically stable variable. Cost and

[28] IPT/IPPD is now a core tenet embodying the belief that a breadth and diversity of perspectives is a problem-solving strength, and operationalizing systems-theory principles such as Ashby's Law of Requisite Variety, replacing traditionally adversarial relationships among key players (users, acquirers, testers, funds managers, contractors, and other stakeholders) with cooperation and teamwork improves product quality and supportability.

schedule increased as needed to deliver the desired capability. Under the CAIV philosophy, stronger consideration is to be given for fixing the costs of system development programs. Program managers are now required to establish realistic objectives for their programs early on and trade off performance and schedule continually to achieve a balanced set of goals that achieve cost objectives. The policy accompanies evolutionary acquisition as a means of delaying full performance delivery, if necessary.

Implementation of the philosophy could be extended to contracting strategy, whereby the contractor might be required to address cost targets derived from CAIV estimates in his proposal and later be rewarded with specific incentives for their attainment. Incentives for government program managers to use CAIV to trade off excessive performance requirements of a system are that funds might perhaps be better applied toward the most achievable parameters, and ultimate cancellation of the program may be avoided. Contractors involved would foreseeably share these aims as well as continued profit motivation from viable business programs (Rand, 2005).

**4. Alpha Contracting for ex-ante Discovery**

Alpha contracting is all about ex-ante discovery about the contract terms within incomplete contracting, to encourage mutual compliance ex-post. The government and industry partnership is central in the military acquisition domain—with both parties pursuing both common and separate goals based upon their buyer and seller roles. The government's traditional contracting approach (before acquisition reforms of the last decade) required successive iterations between the client and the supplier—to discover the client's requirements and the applicable supplier technologies—until a relatively complete contract could be written. In Alpha Contracting, this traditional sequential interdependency relationship has changed to a closer reciprocal interdependency relationship, a more symmetrical one, in which the client and supplier work together to define the requirements and discover solutions. Again, the Federal Acquisition Regulation gives guidelines for this dialogue:

> The Government must not hesitate to communicate with the commercial sector as early as possible in the acquisition cycle to help the Government determine the capabilities available in the commercial marketplace. The Government will maximize its use of commercial products and services in meeting Government requirements. (FAR, Part 1.102-2)

Alpha Contracting has evolved from a 1990s-era reform initiative aimed at improving government and contractor communications in order to increase efficiency and effectiveness. At its very foundation is a need for increased trust and teaming toward common government/industry objectives, within the paradigm of their buyer/seller relationship. By encouraging more collaboration early in the contracting negotiations phase, Alpha Contracting reduces procurement costs and cycle-time via joint and concurrent processes and information flows. Key activities in the process are: specification of requirements, preparation of the statement of work, negotiations and executive review. Cumulatively, these activities reduce uncertainty and complexity, allowing for writing a more complete contract and, thereby, reducing transaction costs.

Even though direct savings may be hard to quantify, most agree the savings derived from Alpha Contracting are substantial, even if the only savings counted is the increase in the program office staff's time free to solve other problems (Nissen, 1997). As Siemsen (2002)

explained, the indirect benefits extend to both government and contractor as monitoring costs of other agencies like Defense Contract Audit Agency (DCAA) and Defense Contract Management Agency (DCMA) are precluded. This initiative actually seeks and obtains the information that enables a trust-based partnership. The shift from sequential to concurrent requirements definition and design is happening in many industries, not only DoD acquisition. For example, the construction industry has adopted the design/build approach.

In addition to collaborating on the requirements definition and contracting phase of new product development, the interpersonal closeness developed in the Alpha Contracting approach can be carried over to the development stage. The use of Integrated Product Teams (IPT) encourages the government's user representatives and the contracting supplier's engineers to work together as the new product is designed and the initial prototypes are built. In some instances, the government's representatives and the contractor's engineers are co-located in the same building. The potential advantages of this increasingly close interdependency between client and supplier are to shorten the design process, reduce development costs and, hopefully, to increase the quality of the resulting product. These advantages mainly apply to the government, but the advantage to the contractor in such closer interaction might be a perceived as generating a reputation that increases its likelihood of winning a future competitive bid. The potential disadvantages of this trend towards more concurrent engineering include the difficulties of achieving higher interdependencies between everyone involved in the project, including the government representatives and the contractor's engineers, designers and developers (Dillard & Zolin, 2005).

**5. Evolutionary Acquisition Addresses Uncertainty Incrementally**

A series of influential GAO reports on defense acquisition from 1996 through 2002 concluded that the DoD had repeatedly spent more time and money than originally planned on weapon systems, and urged that the Department:

Carefully assess technology (GAO 02-39 2001) and separate its research and development from its more advanced product development (i.e., mature the candidate technologies before commitment to advanced development) (GAO NSIAD-99-162, 1999).

Move to a "knowledge-based" approach, to learn more about a design's capability to satisfy requirements and a prototype's ability to be manufactured, earlier in the process (GAO 02-701, 2002).

Change the incentive environment to allow PMs to identify unknowns as high risks without suffering criticism and loss of support (GAO NSIAD-98-56, 1998).

An approach to mitigate these technological challenges, which are all related to uncertainty and complexity, is evolutionary acquisition, referred to by some outside of DoD as progressive acquisition. Also advocated by the General Accountability Office, it has evolved worldwide as a concept over the past two decades.

Evolutionary acquisition is an incremental development approach, using iterative development cycles versus a single grand design. DoD's adaptation of this approach is a major policy thrust in the series, and is the stated "preferred approach" toward all new system developments. This particular policy thrust is important as it offers an incremental approach to reducing uncertainty and complexity. It actually separates projects into smaller, less complex

increments, thus having an impact on the amount of monitoring and controlling to be performed during system development.29

### 6. Single Process Initiative Uses Frequency and Specialization

The Single Process Initiative was another coordinated idea among DoD and industry partners to allow contractors to use a single process for manufacturing both commercial and military products within their facilities, and to have common management and reporting on all defense contracts, versus multiplicity of same across separate contracts. Similar efforts through the 1990s were aimed at reducing DoD peculiar requirements seen as "bureaucratic." They are: use of performance ("what to") versus military ("how to") specifications, and even such application to service contracts, elimination of non-value-added packaging and reporting requirements, and elimination of detailed cost and pricing data for procurements under $550,000 thresholds (Rand, 2005).

### 7. Reputation and the Use of Past Performance Data and Award for Best Value

Reputation has been shown to be an important enforcement mechanism to reduce ex-post opportunistic behavior, and is operationalized under this initiative. It incorporates individual contractor "Past Performance Data" for competitive contract award decisions and makes such information a key factor in the source-selection process. The concept is to further motivate positive cost schedule and performance outcomes across multiple DoD contracts by heightening performance visibility and requiring its evaluation and consideration. In a similar vein, the initiative of "Best-value Contracting" has also emerged, meaning that contracts can and should be awarded on the basis of "best value" (i.e., of cost, schedule and technical performance) rather than simply accepting the lowest bid. This was designed to simplify performance evaluation criteria, and to allow more flexibility for innovations to meet program objectives (Rand, 2005).

## SECTION 4: SYNTHESIS AND CONCLUSIONS

### A) TCE AND PUBLIC SECTOR OUTSOURCING

Transactions costs are not the only consideration for make-or-buy decisions. If that were so, then one might conclude the government should generally insource production of complex weapon systems and outsource janitorial services. For good reasons, the opposite is the more typical practice.30 In evaluating transactions for their "make-or-buy?" decisions, firms typically consider both production costs and the cost of managing transactions (transaction costs).

The goal of this paper was to integrate and apply key principles of TCE (that previously focused on the firm) to government outsourcing. TCE recognizes organizations enter into bilateral contracts with suppliers, workers, managers, customers, firms, and other organizations that require costly governance (coordination and incentive) mechanisms.

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[29] These activities, while important in addressing uncertainty, are substantially increased under evolutionary acquisition (Dillard, 2003).

[30] However, advocates of the arsenal system could argue (and have) that the hazards illuminated by TCE indicate production of complex weapon systems should be done internally.

It is time for government to do the same. The process for outsourcing determinations should have both credibility and precision. "Credibility" means, among other things, that the right competitions are held with rules assuring both products and services are adequately provided regardless of the winning proposal. "Precision" means established guidelines usually ensure the services in question are indeed provided at least cost to the public.

The implications of this discussion involve precision. In the case of outsourcing a transaction where complexity, uncertainty and asset specificity can lead to renegotiation, the choice of governance structure drives productive effort and unproductive bargaining. Ideally, contracts can be written that specify measures of performance, conflict resolution procedures, and conditions under which the contract can be modified, as well as provisions for sharing gains from transaction-specific investments. In reality, the tradeoff as it applies to outsourcing might be stated as follows. On the one hand, efforts to suppress opportunism contractually are limited by the costs of writing and enforcing contractual agreements, and rise with the complexity, uncertainty, and asset specificity associated with the transaction. This works against outsourcing. On the other hand, while integration within the organization mitigates these problems, internal principal-agent issues arise that sacrifice the high-powered incentives of the market and consequently require greater monitoring and administrative costs. This works in favor of outsourcing.

In summary, like private firms, government "make-or-buy?" decisions should look beyond production cost savings and forecast likely transaction costs associated with outsourcing. Moreover, government rules that prescribe particular contract types should be based on the four principal characteristics of transactions, and should offer contracts and mechanisms that encourage productive effort, protect transaction-specific investments, and discourage unproductive bargaining, influence and rent-seeking activities. The conventional wisdom in the transaction costs literature is that the decision to outsource should not be taken lightly. While the potential production-cost savings may well be tempting, there are associated costs and risks, albeit less obvious. They are less important (and might be negligible) for simple, one-time transactions where alternate suppliers are readily available. Yet, they can be critically important when the outsourcing arrangement is such that there is only one supplier readily available in a complex and lengthy relationship. Hence, the decision to outsource must weigh production cost savings against the costs and risks associated with a critical source of supply being outside the firm's control. Those are generally referred to as the transaction costs of the outsourcing relationship. Thus, outsourcing is preferred only if the total costs are less than the costs of production with the firm's (in-house, organic) assets. That is, a firm should outsource only if the following is true:

Cost of in-house production + Agency Costs > Outsourcing + Transaction Costs.

## B. IMPLICATIONS OF THIS SYNTHESIS

Comparing the two bodies of knowledge (TCE theory with DoD acquisition practice) leads to some interesting insights. There are two basic questions to consider. First, what does TCE tell us about improving DoD acquisition practices? And second, what does the body of practice in DoD acquisition management indicate for new research in TCE? Since our audience for this effort is DoD acquisition managers, we focus primarily on that first question—and consider how TCE can help DoD acquisition practice. Our tentative answer is in four related parts.

First, even though originally intended to study the make-or-buy decision, TCE offers useful insights for Program Managers strictly involved with the "buy" option. TCE highlights problems that can, and do, arise in outsourcing relationships, and provides useful indicators regarding their severity (i.e., the expected "transactions costs"). While the main body of TCE casts light on make-or-buy (vertical integration) issues, it also provides powerful insights into the effective management of outsourcing relationships.

Second, acquisition managers are not engaged in a game against nature. Current acquisition practices emphasize (properly) the management of risk. However, managing the relationship with industrial partners (contractors) is also very important. Program Managers need to anticipate issues that pertain to governing outsourcing relationships with the same vigilance with which they anticipate risks—with a view to managing and mitigating both sets of problems.

There is an inherent conflict between DoD and its contractors. The two have different objectives. DoD wants "better, faster, cheaper." Contractors need to be profitable to survive. The key is for Program Managers to understand and anticipate the parties' divergent interests and to be prepared to deal with difficulties that might arise. Such situations are usually better addressed through anticipatory measures—such as well-crafted contracts which include appropriate incentives to align the interests of the two parties and encourage constructive behavior and provisions for governance of the relationship (especially ways to settle disputes).

Third, there is no universal solution to managing these relationships. Every outsourcing transaction involves a number of characteristics that can materially influence the nature of the relationship. TCE helps anticipate opportunistic behavior that can jeopardize the DoD-contractor partnership. While asset specificity is certainly a major cause of conflict for outsourcing relationships, there are a number of other possible causes. At minimum, Program Managers should assess contractual relationships using something like the stoplight method introduced in Appendix B to help anticipate, and prepare for, these difficulties.

Finally, DoD contracting practice would be greatly enriched by viewing defense transactions through the lens of TCE. An important insight is the opportunity to craft contracts based on the potential for opportunistic behavior, in addition to varying incentives based on shifting risk. Where there is significant scope for opportunistic behavior, contracts should pay special attention to the use of additional mechanisms to govern the outsourcing relationship. This suggests that existing guidance on contract types should be extensively revisited—an important first step in translating the theoretical insights of TCE into DoD practice.

## APPENDIX A. A TCE BARGAINING GAME MODEL

A game is developed between two parties in a transaction (i=1,2) whose combined productive efforts endogenously generate the surplus:

(1) $S = Ae_1^{\alpha_1} e_2^{\alpha_2}$; where the standard Cobb-Douglas assumptions are satisfied.

In the case of government outsourcing, the two parties could be an internal government customer and external private contractor.31 Each player can also engage in unproductive bargaining, bi. This influence and rent-seeking activity consists of measures and counter-measures designed to preserve, capture or extract a larger share of the surplus. While effort expands S for both parties in the transaction, bargaining determines the share each player realizes. The combined costs of engaging in productive and unproductive activities (to generate and capture the surplus respectively) are assumed to dilute the share of surplus enjoyed by each player.

Player 1 chooses productive effort, e1, and unproductive bargaining, b1, to maximize his utility function:

(2a) U1 = $[1/2 + (b_1^{\sigma} - b_2^{\sigma}) - (1/2)(\gamma_1 b_1^2 + \beta_1 e_1^2)]S$;

Similarly, player 2 chooses e2 and b2 to maximize her utility function:

(2b) U2 = $[1/2 + (b_2^{\sigma} - b_1^{\sigma}) - (1/2)(\gamma_2 b_2^2 + \beta_2 e_2^2)]S$.

The first two terms in brackets in (2a,b) represent the net benefit to each player derived from bargaining over his share of the surplus, S. The last term represents the quadratic costs to each player of engaging in unproductive bargaining activities and productive efforts (respectively), as a share of S.

From (1), the parameter associated with the marginal benefit of effort (for each player i=1,2) is $\alpha_i$. From (2a,b), the parameter associated with the marginal cost of effort is $\beta_i$. Meanwhile, the parameter associated with the marginal cost of bargaining is $\gamma_i$. Under the simplifying assumption the marginal benefit of bargaining is the same for both players, or $\sigma$, the first order conditions (four equations derived from maximizing 2a with respect to e1 and b1, and 2b with respect to e2 and b2) can be solved independently for the optimal bargaining activity of each player:

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[31] For instance, consider a government customer (or principal) that actively revises rules and regulations to allow more economical or flexible procurement on the part of a private contractor (or agent). This productive effort could lower the agent's input costs, thereby contributing to joint savings or a surplus. Meanwhile, suppose the agent simultaneously engages in productive investments in human capital or new processes that further contribute to the surplus. "By exerting effort the [agent] can hold down its realized costs. For example, it can, at some cost to itself, search for lower-priced raw materials…or it can manage its…inventories so that it is not left holding excessive stocks" (McAfee & McMillan, 1988, p.17). The challenge remains how any gains, savings or surpluses are shared between the principal and the agent.

(3a) $b_1^* = (\sigma / \gamma_1)^{1/(2-\sigma)}$,

and

(3b) $b_2^* = (\sigma / \gamma_2)^{1/(2-\sigma)}$.

Substituting (3a,b) into the first order conditions yields the optimal effort contributed by each player:

(4a) $e_1^* = \{2\alpha_1 / (\beta_1(2+\alpha_1)[1/2 + (b_1^* - b_2^*) - (\gamma_1/2)(b_1^*)^2]\}^{1/2}$,

and

(4b) $e_2^* = \{2\alpha_2 / (\beta_2(2+\alpha_2)[1/2 + (b_2^* - b_1^*) - (\gamma_2/2)(b_2^*)^2]\}^{1/2}$.

This combined effort generates the surplus (substituting (4a,b) into (1)):

(1') $S^* = A(e_1^*)^{\sigma_1}(e_2^*)^{\sigma_2}$.

Finally, substituting (3a,b), (4a,b) and (1') into (2a,b) yields the utility each player achieves as a result of the joint decisions of the two parties to the transaction: (2a') $U_1^*$, and (2b') $U_2^*$.

A reasonable simplifying assumption is that the marginal cost of bargaining is the same for both parties in the transaction, or that $\gamma_1 = \gamma_2 = \gamma$. From (3a,b), this implies symmetric bargaining (or influence) activity by each player at the optimum, or $b_1^* = b_2^* = b^*$. The comparative static results from the model appear in Table A1 below.[32]

**TABLE A1. Comparative Static Results**

| | | $e_1$ | $e_2$ | $b$ | $S$ |
|---|---|---|---|---|---|
| **Productive Effort Parameters** | $\alpha_1$ | + | 0 | 0 | + |
| | $\alpha_2$ | 0 | + | 0 | + |
| | $\beta_1$ | - | 0 | 0 | - |
| | $\beta_2$ | 0 | - | 0 | - |
| **Unproductive Bargaining Parameters** | $\sigma$ | - | - | + | - |
| | $\gamma$ | + | + | - | + |

[32] Relaxing the simplifying assumptions that the marginal benefit and costs of bargaining are the same for both players, the simulations reveal much the same results as those reported here for the complete analytical solution.

In general, the less complex and uncertain a transaction, the lower the degree of asset specificity, and the greater the frequency, then the lower $\beta$ and $\sigma$, and the higher $\gamma$. From Table 3, at the optimum, reducing $\beta$ increases productive effort, ei, and the surplus, or gains from exchange, S. Also from Table 3, reducing $\sigma$ and increasing $\gamma$ lowers unproductive bargaining, b, and boosts productive efforts, ei, and, consequently, the surplus, S. The higher the combined effort (e) and joint surplus (S), the greater the potential returns from outsourcing.33

## APPENDIX B. AN OUTSOURCING RISK ASSESSMENT METHOD

A thesis by Powell proposes a method for defense managers to assess the risks associated with a proposed outsourcing action.34 Basically, aspects of the new relationship are related with a stoplight scheme. For example, if there is a high degree of asset specificity involved, there would be a red light in that category, and a higher degree of risk is indicated. Powell intended the light scheme to increase visibility of areas where management attention is important, and where managers ought to focus their risk-reduction efforts.

That application is certainly valid, but there's another wrinkle. The study of Transaction Cost Economics indicates that risk-reduction measures (even if highly effective) are not risk-elimination panaceas. Accordingly, one can expect an overall outsourcing action with a large number of assessed red and yellow lights will be more costly and risky during its execution, even with due diligence in risk reduction.

What follows is a variation of Powell's stoplight scheme.35

a. Asset Specificity.

RED. Source becomes specialized, with no close substitutes or competitors readily available. Example: only qualified supplier for a specific, highly-specialized task—such as suppliers of spare parts for aging weapon systems. High barriers to entry.

GREEN. Routine (non-specialized) goods or tasks; competitors or close substitutes readily available. Example: purchase of standard commercial items, such as paper clips and other office supplies. Low barriers to entry.

b. Complexity.

RED. A large-scale task covering a large geographic area. Complexity of task severely limits qualified bidders. Example: large-scale, complex IT support; such as NMCI.

GREEN. A simple, routine task or standard product. A large number of qualified bidders. Example: office supplies and dental services. (Even though dentistry is a complex

[33] The lower sigma (the marginal benefit of unproductive bargaining) and the higher gamma (the marginal cost of unproductive bargaining) for any particular activity, the lower the transaction costs of outsourcing.

[34] Powell, 2002.

[35] Franck, 2004.

activity requiring considerable skill and training, dental services are available throughout the general economy; that is, substitutes for contractor services are readily available.)

c. Length of Relationship.[36]

RED. A long-term relationship, which strains ability to foresee problems during original contract negotiations. Complexity and asset specificity exacerbate this problem. Example: IT support, such as NMCI.

GREEN. Outsourcing is a one-time transaction, or can be structured as a series of one-time transactions. Example: purchase of office supplies.

d. Frequency.

RED. Specialized, complex task or service from which there is significant learning-by-doing. Incumbent contractor has significant competitive advantage over potential competitors. Example: contract maintenance for specialized aircraft, such as E-4s.

GREEN. Routine, standard task, service or product, in which a number of firms have significant expertise. Example: copy machine repair.

e. Time Sensitivity. (added)

RED. Quick performance of task or delivery of product is essential for satisfactory performance. Example: repair of combat aircraft, or warship subsystems.

GREEN. Quick delivery of products or accomplishment of task is not essential for satisfactory performance. Satisfactory performance can include some delays. Example: copy machine repairs.

f. Operational Significance. (added)

RED. Unsatisfactory performance significantly degrades operational capability or compromises safety. Example: repair of combat aircraft or warship subsystems.

GREEN. Unsatisfactory performance involves, at most, administrative inconvenience and longer time to accomplish routine tasks. No compromise of operational readiness or safety. Examples: delays in copy machine repairs and temporary lack of office supplies.

## APPENDIX C. RULES FOR CONTRACT TYPES

| **Comparison of Major Contract Types (Fixed Price)** | | | | | |
|---|---|---|---|---|---|
| | Firm Fixed-price (FFP) | Fixed-price Economic Price Adjustment | Fixed-price Incentive Firm | Fixed-price Award-fee | Fixed-price Prospective |

[36] In a sense, the relationship lasts as long as the period specified in the contract, which means length of relationship issues can certainly be addressed in contracts. However, contracts must be agreed to by both parties, and the minimum length agreeable to both is determined in good part by the *nature* of the relationship itself.

| | | (FPEPA) | (FPIF) | (FPAF) | Redetermination (FPRP) |
|---|---|---|---|---|---|
| Principal Risk to be Mitigated | None. Thus, the contractor assumes all cost risk. | Unstable market prices for labor or material over the life of the contract. | Moderately uncertain<br><br>contract labor or material requirements. | Risk that the user will not be fully satisfied because of judgmental acceptance criteria. | Costs of performance after the first year because they cannot be estimated with confidence. |
| Use When… | The requirement is well-defined.<br><br>Contractors are experienced in meeting it.<br><br>Market conditions are stable.<br><br>Financial risks are otherwise insignificant. | The market prices at risk are severable and significant. The risk stems from industry-wide contingencies beyond the contractor's control. The dollars at risk outweigh the administrative burdens of an FPEPA. | A ceiling price can be established that covers the most probable risks inherent in the nature of the work. The proposed profit sharing formula would motivate the contractor to control costs and meet other objectives. | Judgmental standards can be fairly applied by an Award-fee panel. The potential fee is large enough to both:<br><br>Provide a meaningful incentive and justify related administrative burdens. | The Government needs a firm commitment from the contractor to deliver the supplies or services during subsequent years. The dollars at risk outweigh the administrative burdens of an FPRP. |
| Elements | A firm fixed-price for each line item or one or more groupings of line items. | A fixed-price, ceiling on upward adjustment, and a formula for adjusting the price up or down based on:<br><br>Established prices.<br><br>Actual labor or material costs.<br><br>Labor or material indices. | A ceiling price<br><br>Target cost<br><br>Target profit<br><br>Delivery, quality, and/or other performance targets (optional)<br><br>Profit sharing formula. | A firm fixed-price.<br><br>Standards for evaluating performance.<br><br>Procedures for calculating a fee based on performance against the standards. | Fixed-price for the first period.<br><br>Proposed subsequent periods (at least 12 months apart).<br><br>Timetable for pricing the next period(s). |
| Contractor is Obliged to: | Provide an acceptable deliverable at the time, place and price specified in the contract. | Provide an acceptable deliverable at the time and place specified in the contract at the adjusted price. | Provide an acceptable deliverable at the time and place specified in the contract at or below the ceiling price. | Perform at the time, place, and the price fixed in the contract. | Provide acceptable deliverables at the time and place specified in the contract at the price established for each period. |
| Contractor Incentive *(other than maximizing goodwill)* [1] | Generally realizes an additional dollar of profit for every dollar that costs are reduced. | Generally realizes an additional dollar of profit for every dollar that costs are reduced. | Realizes a higher profit by completing the work below the ceiling price and/or by meeting objective performance targets. | Generally realizes an additional dollar of profit for every dollar that costs are reduced; earns an additional fee for satisfying the performance standards. | For the period of performance, realizes an additional dollar of profit for every dollar that costs are reduced. |
| Typical Application | Commercial supplies and services. | Long-term contracts for commercial supplies during a period of high inflation | Production of a major system based on a prototype | Performance-based service contracts. | Long-term production of spare parts for a major system. |
| Principal Limitations in FAR | Generally NOT | Must be justified. | Must be justified. Must be negotiated. | Must be negotiated. | MUST be negotiated. |

| | | | | | |
|---|---|---|---|---|---|
| Parts 16, 32, 35, and 52 | appropriate for R&D. | | Contractor must have an adequate accounting system. Cost data must support targets. | | Contractor must have an adequate accounting system that supports the pricing periods. Prompt redeterminations. |
| Variants | Firm Fixed-price Level of Effort. | | Successive Targets | | Retroactive Redetermination |

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## Comparison of Major Contract Types (Cost Reimbursable)

| | Cost-Plus Incentive-Fee (CPIF) | Cost-Plus Award-Fee (CPAF) | Cost-Plus Fixed-Fee (CPFF) | Cost or Cost- Sharing (C or CS) | Time & Materials (T&M) |
|---|---|---|---|---|---|
| **Principal Risk to be Mitigated** | Highly uncertain and speculative labor hours, labor mix, and/or material requirements (and other things) necessary to perform the contract. The Government assumes the risks inherent in the contract -benefiting if the actual cost is lower than the expected cost-losing if the work cannot be completed within the expected cost of performance. | | | | |
| **Use When…** | An objective relationship can be established between the fee and such measures of performance as actual costs, delivery dates, performance benchmarks, and the like. | Objective incentive targets are not feasible for critical aspects of performance. Judgmental standards can be fairly applied.[1] Potential fee would provide a meaningful incentive. | Relating fee to performance (e.g., to actual costs) would be unworkable or of marginal utility. | The contractor expects substantial compensating benefits for absorbing part of the costs and/or foregoing fee or<br>the vendor is a non-profit entity. | No other type of contract is suitable (e.g., because costs are too low to justify an audit of the contractor's indirect expenses). |
| **Elements** | Target cost<br>Performance targets (optional)<br>A minimum, maximum, and target fee<br>A formula for adjusting fee based on actual costs and/or performance. | Target cost<br>Standards for evaluating performance,<br>A base and maximum fee<br>Procedures for adjusting fee, based on performance against the standards. | Target cost<br>Fixed fee | Target cost<br>If CS, an agreement on the Government's share of the cost.<br>No fee | A ceiling price<br>A per-hour labor rate that also covers overhead and profit<br>Provisions for reimbursing direct material costs |

| | | | | | |
|---|---|---|---|---|---|
| **Contractor is Obliged to:** | Make a good faith effort to meet the Government's needs within the estimated cost in the Schedule. | | | | Make a good faith effort to meet the Government's needs within the ceiling price. |
| Contractor Incentive (other than maximizing goodwill)[1] | Realizes a higher fee by completing the work at a lower cost and/or by meeting other objective performance targets. | Realizes a higher fee by meeting judgmental performance standards. | Realizes a higher rate of return (i.e., fee divided by total cost) as total cost decreases. | If CS, shares in the cost of providing a deliverable of mutual benefit. | |
| **Typical Application** | Research and development of the prototype for a major system. | Large scale research study. | Research study. | Joint research with educational institutions. | Emergency repairs to heating plants and aircraft engines. |
| **Principal Limitations in FAR Parts 16, 32, 35, and 52** | The contractor must have an adequate accounting system. The Government must exercise surveillance during performance to ensure use of efficient methods and cost controls. Must be negotiated. Must be justified. Statutory and regulatory limits on the fees that may be negotiated. Must include the applicable Limitation of Cost clause at FAR 52.232-20 through 23. | | | | Labor rates must be negotiated. MUST be justified. The Government MUST exercise appropriate surveillance to ensure efficient performance. |
| **Variants** | | | Completion or Term. | | Labor Hour (LH) |

[1] Goodwill is the value of the name, reputation, location, and intangible assets of the firm

Adapted from Contract Pricing Reference Guides (Vol. 4). Advanced issues in contract pricing matching contract type to contract risk. Retrieved from http://www.acq.osd.mil/dpap/contractpricing/vol4chap1.htm

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Title 10 United States Code, § 167. Unified combatant command for special operations forces.

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