Competition in DoD Systems Acquisition: Past Lessons and Future Considerations

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This research was sponsored by the Office of the Secretary of Defense (OSD) Cost Assessment and Program Evaluation (CAPE) under contract N00421-03-A-0037. The views and findings presented herein do not necessarily reflect the opinions of the sponsoring organization.

Technomics
The Science of Informed Decision Making

Study Objectives

1. Compile, organize, and review past studies that address the impact of competition on weapon systems acquisition
2. Compile competitive program savings/loss estimates for a representative cross section of programs
3. Develop insights to facilitate future competition decision-making
4. Investigate a preliminary framework to enable the acquisition community to evaluate alternative competitive acquisition strategies

Defense Market Overview

Buyer

- Monopsony (single buyer)
- Customer is fragmented (Administration, Congress, Military Services)
- Multitude of stakeholders and interests (military, economic, political, social)

Seller

- Publicly held companies with fiduciary responsibilities to stakeholders
  - Limited by:
    - Relatively inelastic demand
    - Closely regulated fee structures
- High entry/exit barriers

Conditions vary greatly from competition in the commercial sector

Insights to Facilitate Future Program Decision-Making

Background and Context

- Study leverages competition study library composed of approximately 300 documents from all services
  - 40% include estimates of production savings/losses due to competition
  - 70% prepared before 1990; 90% prepared before 2000
- Significant changes have occurred since then
  - Reduction of Prime Contractors
  - Defense Industry Structure and Composition
    - Increased vertical integration as primes acquire former subcontractors
    - Increased outsourcing by primes (government has limited insight into fixed-price subcontracts)
    - Limited suppliers at lower tiers for key components
  - Following Defense Acquisition Act of 1986, government can no longer require unlimited technical data rights indiscriminately for all development efforts
  - Bid protests have declined, but still considered a major impediments

Development Lessons/Insights

- Competitive Prototyping
  - Studies dating back about 50 years do not conclude whether it had a positive or negative effect on technical, schedule, or cost risk
  - Suggest that it may reduce EMD time, but requires additional resources and time leading up to EMD start
  - Consensus that prototype contractors were more responsive to program office direction but could not be objectively measured
  - Should NOT be applied routinely. One-size-fits-all approach should be avoided

- Codevelopment
  - Resulting impact rarely documented
  - Some questions to be considered:
    - What is the likelihood that the cost of additional prototypes required to qualify two codevelopers for production will be recovered through competition?
    - Would doubling development budget of one firm have a better payoff?
    - What is the likelihood two contractors will become comfortable in cooperating and form a joint venture company, thereby, eschewing competition as has happened in some cases?

Production Lessons/Insights

- Conditions that increase the probability of competition resulting in cost savings:
  - Development must be complete with a stable product
  - Competition should be implemented as early in the production process as possible
  - A large quantity to be produced should remain in the program

- *Initial source must perceive a real threat and both sources must be able and willing to compete.*

- Achieving lower production costs
  - Reduced contractors costs
    - Moving production plant to a geographic location with lower labor rates/overhead
    - Reducing engineering and manufacturing support personnel
    - But profit has been known to be *increased*
  - Contractor bid strategies
    - Second source seeking litigation over quality of data package
    - Bidding too low and recovering through ECOs

Past Production Competition Estimates

Program	Range of Estimated Savings (+)/Loss (-) from Studies		Sample of Some Deficiencies of the Estimates
	Low	High	
AN/ALQ-165 Airborne Self-Protection Jammer (ASPJ)	8.3%	17.8%	Program employed co-development strategy; ASPJ never produced; estimates based on conjecture
CG-47 Class Aegis Cruiser	-51.0%	19.6%	Only one study showed added cost, but program office felt government cost exceeded savings; estimates do not apply to entire program
Cruise Missile (Tomahawk Missile)	3.0%	20.7%	No competition for ALCM; cruise missile engine second source non competitive; estimates for Tomahawk airframe & guidance only
DDG-51 Arleigh Burke Class Aegis Destroyer	-13.9%		No sole source period in program for baselining; loss shown based on very preliminary data; continuous upgrades to hull & combat system during life of program make units incomparable
Evolved Expendable Launch Vehicle (EELV)	*		Program on-going; experienced cost growth because of failure of expected commercial market to occur
Javelin (AAWS-M) Medium Anti-Armor Weapon	*		Program employed co-development strategy; firms formed a joint venture & did not compete during production
Joint Primary Air Training System (JPATS) T-6A Texan II	*		RFP allowed 9 competing prototypes; major mods required for presumably "off-the-shelf" options
Multifunctional Information Distribution System-Low Volume Terminal (MIDS-LVT)	*		Program ongoing; program office claimed cost reduction of 50% over first 8 lots
MK-46 Torpedo	-43.6%	-11.8%	Competition resulted in a loss; however, second source won final two winner-take-all lots
MK-48 Torpedo			
Mod 1	23.7% (Warhead) 11.6% (Elec. Ass.) 61.2 %(Exploder) 61.8% (Test Set)	54% (Warhead) 55% (Elec. Ass.) 80% (Exploder) 79% (Test Set)	Second source won all competitions; no sole source learning curve for exploder & test set; high estimates discredited
ADCAP	-0.2%	16.3%	Competitors bid aggressively; estimates do not include winner-take-all buyout

***Note: No estimates of savings/loss due to competition were included in the studies in the library.**

Past Production Competition Estimates

Program	Range of Estimated Savings (+)/Loss (-) from Studies		Sample of Some Deficiencies of the Estimates
	Low	High	
AIM-54C Missile	-18.5%	11.0%	Most studies do not include all production buys; there were only two competitive buys -- split buy in FY89 & winner-take-all in FY90
Sidewinder AIM-9 Missile			
AIM-9B	-6.7%	20.7.%	Estimates based on only one sole source lot; initial source learning curve did not change during competition
AIM-9D/G	-71.3% (G&C)	0.7% (G&C)	Second source dominated competitions & both sources raised prices as a result; data does not include Chapparal & FMS units produced concurrently
AIM-9L	-3.8%	24.0%	Savings estimate assumed sole source would increase profit margin during life of program
AIM-9M	-35.4%	12.7%	Savings resulted from high sole source profit which declined during life of competition
AIM-9R	-38.2%	12.9%	Exclude first lot from cost improvement curve
Sparrow AIM-7 Missile			
AIM-7F	-31.4% (G&C)	57% (G&C)	Savings based upon assumption about which lot was first completed; consensus that competition increased production cost; profits increased significantly
AIM-7M	-28.6% (G&C)	29% (G&C)	Based on recurring unit price savings
SSN 688 Class Attack Submarine	*		Savings based on comparison of initial contract prices to budget; Initial contract prices, based on aggressive bids, grew significantly as a result of claims against the government
Standard Missile			
MR RIM-66A	-4.2%	59.2%	Systems were never produced by a second source; no data available to support savings estimate
ER RIM-67A	34.0%		
SM-2	15% (GC&A) 18.1% (Rocket Motor)	35% (GC&A) 32% (Rocket Motor)	Program experienced purchase of initial source & ultimate merger of both sources into joint venture Do not include entire procurement

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Limitations of Past Production Competition Estimates

- Source data incomplete (i.e., only a few years or only subsystems of a system included)
- Costs attributable to competition omitted (e.g., second source start-up costs, government costs, claims/litigation, O&S costs)
- Questionable estimating methodologies applied (e.g., assumed learning curve shift and rotation)
- Generally reflect pre-1990s industrial base

Past estimates are flawed & should not be used as analogies for future programs

Framework for Evaluating Competition as an Acquisition Strategy

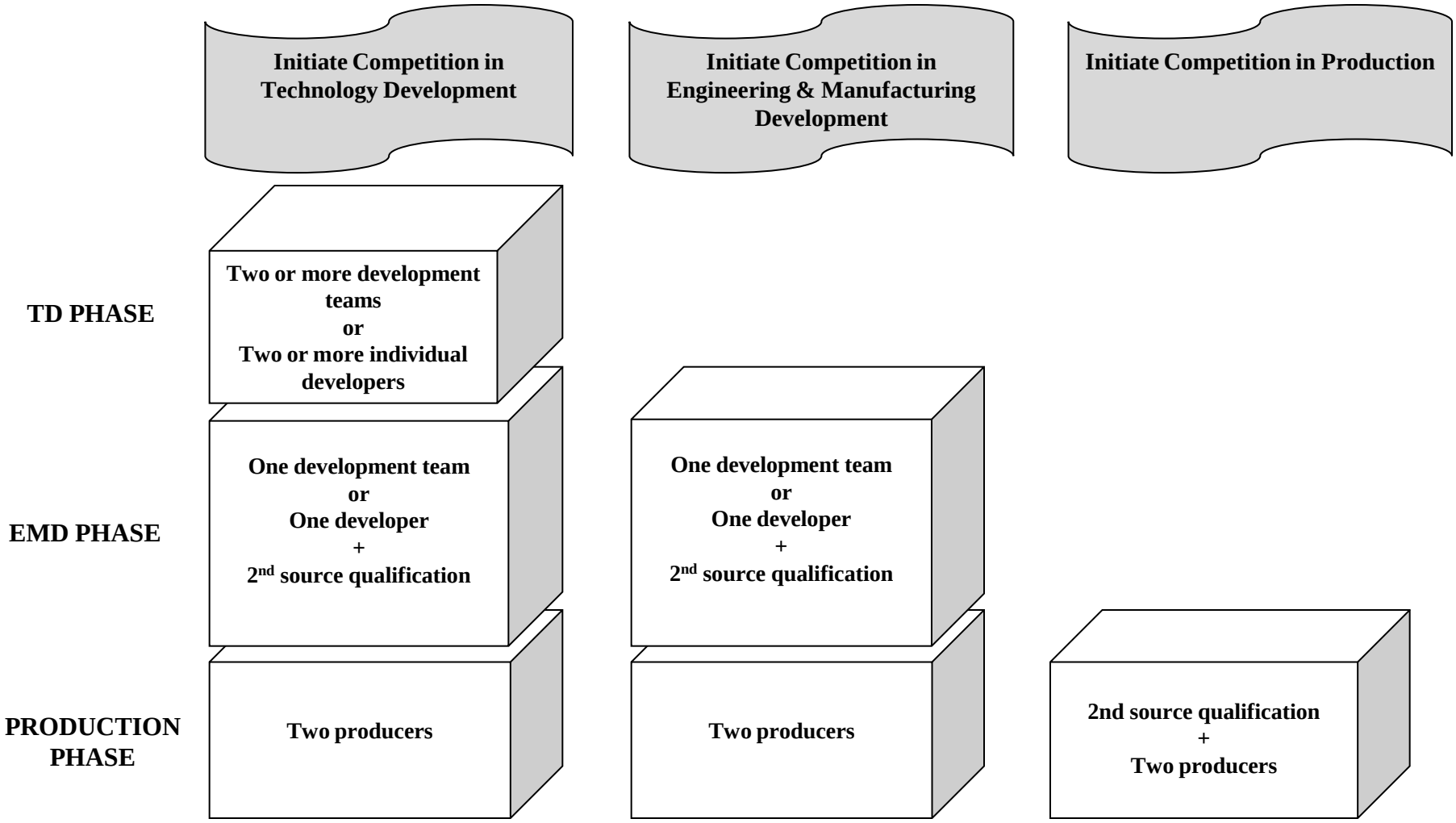
Framework for Evaluating Competition

- Why?
  - Technical risk reduction
    - Arguably the most important objective
    - Deliver best technical solutions & quality systems faster
    - Control costs
  - Industrial base maintenance
    - More firms = greater design & build capability
    - Deliver best technical solutions & quality systems faster
    - Control costs
  - Price reduction
  - Law and Policy
- When?
  - Technology Development (i.e., MS A)
  - Engineering & Manufacturing Development (i.e., MS B)
  - Production (i.e., MS C)

Latest Competition Legislation/Guidance

- PL 111-23, *Weapon Systems Acquisition Reform Act of 2009*
  - Requires acquisition strategies to include measures to ensure competition or option for competition throughout program life cycle at prime/subcontract level
  - Suggests potential measures to address this requirement (i.e., competitive prototyping, dual-sourcing, acquisition of complete TDPs, etc.)
  - Requires competitive prototyping for MDAPs prior to Milestone B approval unless waived by MDA
- USD AT&L Directive-Type Memo 09-027, *Implementation of the Weapon Systems Acquisition Reform Act of 2009*
  - Implements & institutionalizes PL 111-23
- DoDI 5000.02
  - Requires competitive prototyping at the system or key subsystem level during the TD phase.
- OMB Memo M-09-25, *Improving Government Acquisition*
  - Requires that contracts non-competitively awarded/solicitations with one bid, cost-reimbursement contracts, and T&M/LH contracts must be reduced by 10% in FY2010 (combined share of $)

Understanding Your Options



Evaluation of Your Options

Cost Analysis	Industrial Base Analysis	Technical Analysis	Program Analysis
• Non-recurring start-up • Recurring production • Recurring government management • Logistics support	• Industrial capability health • Industry financial health	• Level/type of technology • Availability of sources • Status of TDP • Potential for technological innovation • Plans for future development • Proprietary data	• Program funding • Program development schedule & risk • Production lead times • Degree of subcontracting • Lower tiers • Contracting & legal issues • Program management complexity

General Cost Analysis Approach

- **Simple procedure that negates need to predict initial/second source behavior**
- Step 1
  - Most important step
  - Estimate the additional costs to establish/manage a second source and support two potentially different items in the field.
- Step 2
  - Estimate total recurring production costs based on the important assumption that the initial source produces the entire required production
  - Then estimate total recurring production costs based on the assumption that the total production quantity will be split in some way between two sources.
  - The difference between the single and dual source estimates is the recurring production impact of competition. This difference may or may not represent recurring production cost savings.
- Step 3
  - If step 2 indicates savings which offset the additional costs computed in step 1, then it is reasonable to conclude that the analysis indicates bottom-line competition savings.
  - If step 2 indicates no savings or savings that do not offset the additional costs computed in step 1, then it is reasonable to conclude that the analysis indicates bottom-line competition losses.
  - The analyst can revisit step 2 and conduct sensitivity analysis to determine specific methodology/assumption changes that result in recurring production cost savings that offset the additional costs.

Non-Recurring Start-Up Costs

- R&D
  - Second source effort to translate & utilize design specs
    - Reverse engineering of select components
    - Redesign of components/subsystems that developers claim as proprietary
  - Technology transfer technique will directly impact second source level of effort
    - Form, fit & function may require substantial development effort
    - TDP may require reverse engineering
- Technology transfer
  - Initial source preparation & Government qualification of TDP
    (Note: faulty TDPs have resulted in second source claims against the Government)
  - Initial source technical assistance to second source
- Qualification
  - Contractor qualification hardware
  - Government T&E
- Capital equipment, test equipment & tooling
  - Contractor special tooling & test equipment
- Government & contractor management
  - Administration associated with solicitation, evaluation & award of second source contracts
- Facilities

Recurring Production Costs

- Large body of work that addresses 'accepted' analytical techniques for evaluating recurring production cost considerations
- In general, these techniques consider and compare two scenarios
  - Sole source: 100% production by initial source (i.e., what cost would be in the absence of competition)
  - Dual source: x% production by initial source + y% production by second source (i.e., what cost would be as a result of dual source competition)
- Impact of competition on recurring production cost is influenced by the initial & second sources' willingness & ability to compete, but firm behavior is difficult, if not impossible to predict credibly
- There are additional recurring Government costs associated with two vice one source, e.g.,
  - SE/PM
  - GFE testing (when breakout is used as a means to establish competition)
  - Royalties (when licensing is used as a means to establish competition)

Competition at the Enterprise Level

Hypothesis:

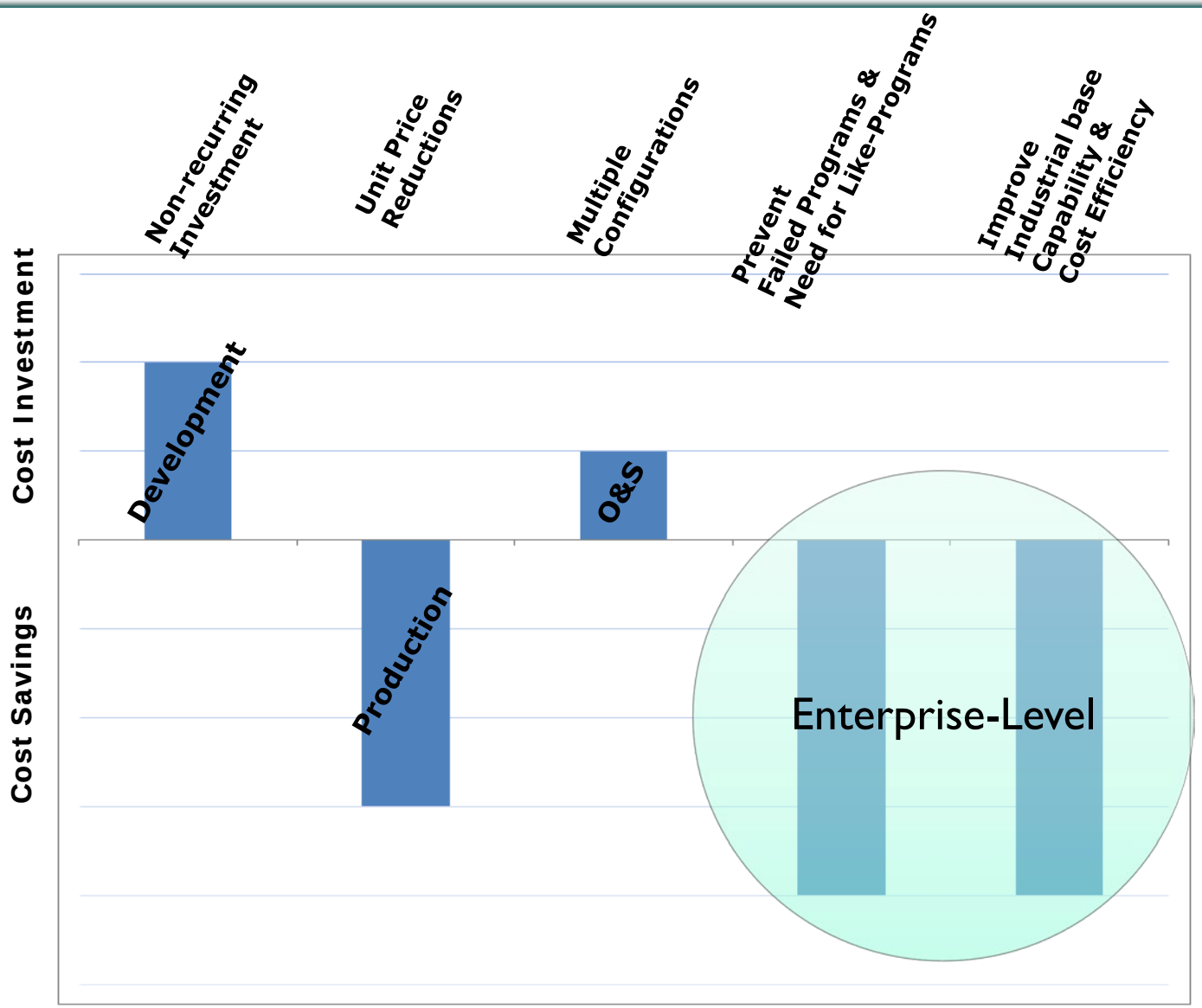
Early & maximum involvement of the Industrial Base in acquisition programs has enterprise-level technical and cost benefits that may far exceed program-specific competition objectives.

Competition Cost Impacts

- Development
  - More developers require additional investment and costs
- Production
  - Competition can mitigate monopolistic behavior and control/reduce unit costs
- O&S
  - Allowing for multiple configurations will result in additional non-recurring and recurring costs
- Enterprise Level Cost Benefits
  - Increases probability of program success and reduces costs of future programs
  - Reduces requirements and associated costs for similar threat addressing programs within portfolio (i.e., development of broader/cross-cutting solutions)
  - Improves overall Industrial Base productivity and cost efficiency performance on future programs
    - Increases the overall performance value per production dollar within the Industrial Base

The following slide represents a notional representation of these ideas

Competition Cost Impacts



Summary of Major Findings

1. No definitive evidence that competition has consistently reduced technical, schedule, or cost risks for major weapon systems acquisition programs
2. Past estimates of competitive weapon systems program savings/losses are not appropriate for application to future weapon system programs
3. Credible estimation of the nonrecurring costs to establish & recurring costs to maintain competition is paramount to making the 'right' decision
4. O&S cost implications must be considered if systems are not identical
5. One-size-fits-all competition policies and acquisition strategies have not and will not work for all programs
6. Prospective competitors must be willing and able to compete