

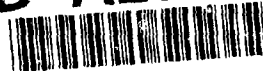
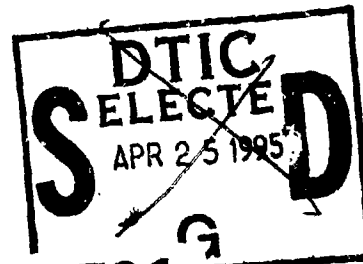
ARQ

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Winter 1995



Edward V. Byrns, Jr.,
J. Eric Corban,
Stephen A. Ingalls

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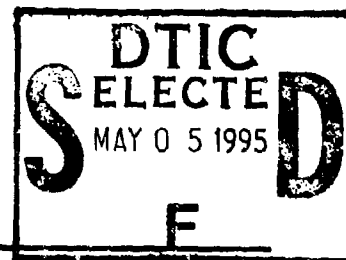
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The primary goal of the *Acquisition Review Quarterly* (*ARQ*) is to provide practicing acquisition professionals with relevant management tools and information based on recent advances in policy, management theory, and research. The *ARQ* addresses the needs of professionals across the full spectrum of defense acquisition, and is intended to serve as a mechanism for fostering and disseminating scholarly research on acquisition issues, for exchanging opinions, for communicating policy decisions, and for maintaining a high level of awareness regarding acquisition management philosophies. The *ARQ* provides insight to the acquisition professional and others in the Department of Defense (DoD), Congress, industry and academe who have significant interest in how the DoD conducts its acquisition mission. Acquisition Corps members and other readers from government, Congress, industry, and academe are encouraged to use the *ARQ* as their professional forum for discussion and exchange of policies, research, information, and opinions.

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A Novel Cost-Benefit Analysis for Evaluation of Complex Military Systems

Edward V. Byrns, Jr., J. Eric Corban, and Stephen A. Ingalls

This paper presents a systematic merit function approach for the comprehensive evaluation of competing military systems. In this paper, the merit function is defined to be the ratio of quantified system benefit to system life cycle cost. System benefit is measured by a unique utility function that quantifies the degree to which a given system configuration satisfies an identified set of customer requirements. This measure is derived from the information contained in Quality Function Deployment tables. The second portion of the merit function is a life cycle cost measure, which can be developed using any valid estimation technique. With this merit function approach, the cost effectiveness of complex systems can

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be quantified. Comparison of the quantified merit of competing systems then provides for objective and reliable decision making. This merit function approach is demonstrated by an evaluation of two attack helicopter configurations.

INTRODUCTION

According to accepted finance rules of commercial business, all investment decisions should be based upon some comparison of discounted cash inflows and discounted cash outflows (Ross, Westerfield, & Jaffe). One approach is to compute Net Present Value (NPV), which is discounted cash inflow minus discounted cash outflow. If $NPV > 0$, then the investment will generate a cash inflow which exceeds the cash outflow. A second approach to investment decision making uses Profitability Indices (PI). A PI is the ratio of discounted cash inflows to discounted cash outflows. For independent projects, the decision rule is to accept the project if $PI > 1$ and reject if $PI < 1$. In effect, a PI is a merit function comparing the project benefits—discounted cash inflows—to its costs—discounted cash outflows.

These traditional finance rules are applicable to a wide variety of investment decisions. However, these simple rules break down when applied by the Department of Defense (DoD) when considering procurement of military systems. The primary difficulty is that a military system seldom generates cash inflow. Instead, a military system generally represents a pure expense over its entire life cycle. Using traditional finance rules, NPV will always be less than zero and PI will always be less than one. Thus, using commercial finance rules, a military project will always be rejected as a poor investment! Obviously these are not acceptable decision rules for the DoD.

Several alternative rules have been proposed to evaluate military systems. The alternative rules focus on minimizing either acquisition costs or, more appropriately, Life Cycle Cost (LCC). In reality, however, Design To Cost (DSMC, 1986) rules are not universally applicable. Cost comparisons are only appropriate for systems with similar objectives and of equal complexity. Although these types of rules are effective tools for controlling system acquisitions and operations, decision rules based on cost alone are inadequate for evaluating competing alternatives. These rules generally ignore the benefit inherent in each military system.

The benefits of a military system are real although they typically cannot be quantified in dollars. A reasonable benefit measure must be developed in order to perform a reliable cost-benefit study. The military investment decision can then be based upon an objective merit function which compares the non-monetary system benefit to its monetary cost.

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The most difficult part of the proposed merit function approach is to construct an appropriate benefit function. One common approach is to define a set of technical measures (i.e., performance parameters) that can be measured or estimated for each system. A merit function is then defined as the total score for each system; the larger the score the better. However, incomplete or incorrect formulations of such merit functions have been employed in the past. For instance, failure to normalize numerical scores between differing technical measures often leads to performance parameters of relatively large magnitude that overpower the contributions of performance parameters which are relatively small, thereby unduly biasing the overall score. Cost and risk are seldom directly incorporated into the function definition. Moreover, customer requirements, which are often difficult to associate with engineering parameters, are commonly ignored. In addition, the function is most often linear, which does not allow for diminishing marginal returns on the merit measure (Harse, 1985; Schrage, Costello, & Mitlider, (1989).

This paper introduces a newly developed function to quantify the benefits of a complex engineered system. This function overcomes previous shortcomings and it incorporates direct consideration of customer requirements. Conceptual development of this measure borrows heavily from the matrix techniques of Quality Function Deployment (Sullivan, 1986). Quality Function Development (QFD) methods, developed in Japan in the 1970s, are rooted in a product development philosophy emphasizing customer-driven design. This method employs graphical quality engineering tools that map the "voice of the customer" into product and process design characteristics. A QFD method is then used to ensure the key product development objectives of quality, cost, and timeliness are retained throughout product development and manufacturing.

The second major element of the proposed merit function is a Life Cycle Cost (LCC) measure. Life Cycle Cost is simply the summation of all expenditures required from conception of a system until it is phased out of operational use. Historically, a low initial acquisition cost has not assured a low LCC. In fact, the opposite is true. This trend is explained by the fact the majority of LCC (at least for military systems) is usually in operations and support (O&S). The greatest potential opportunity for cost reduction in the Department of Defense is now recognized as control of the cost of system support. This cost element will be invisible in the selection process and so cannot be controlled unless a LCC model is used.

With system benefit and cost quantified, an overall merit function is defined as the ratio of system benefit to its LCC. Two merit functions

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are developed. The first function assumes that no existing system is available. The second function assumes the systems under consideration will replace an existing system. In this case, the merit function quantifies the incremental change in benefit and cost compared with the baseline system. For the merit functions employed in this paper, the decision rule is simply to maximize system merit.

A brief outline of this paper follows. The merit function is developed and the appropriate decision rule is presented. Next, the new benefit function is developed. Construction of the QFD Tables and calculation of the benefit function are detailed. A brief discussion of the appropriate cost functions follows. Finally, application of the merit function approach is demonstrated by an actual application to the evaluation of two attack helicopters.

THE MERIT FUNCTION

The merit function is defined as a single number which, when properly determined, reflects the ratio of benefits derived to dollars spent. For the proposed merit function, the system with greatest merit is deemed the most desirable. Let M represent overall merit, B derived benefit, and C Life Cycle Cost. The absolute merit of any given configuration then is:

$$M = B/C \quad (1)$$

This function provides the means for objective comparison of two or more complex configurations when no baseline system exists. A large system merit is preferable to a small one.

This relationship between benefit and cost is graphically represented in Figure 1. In this graph, cost is plotted on the horizontal axis and benefit on the vertical. Note that merit, Eq. (1), represents the slope of the line connecting the plotted merit value and the graph's origin. Let the point labeled 1 represent the merit of a baseline system. If a configuration were introduced for which both benefit and cost are increased proportionately, overall merit remains the same. Such a point is labeled 2 in Figure 1, and will always lie on the same line connecting point 1 and the origin. If benefit were increased, but cost remained the same, the new system's merit would be larger (the new point will fall above the shaded region in Figure 1). Conversely, if benefit remained constant while cost increased, the new system's merit would be less (the new point will lie in the shaded region of Figure 1). The defined merit function becomes particularly useful when evaluating realistic problems where both benefit and cost are sensitive to system design. When such is the

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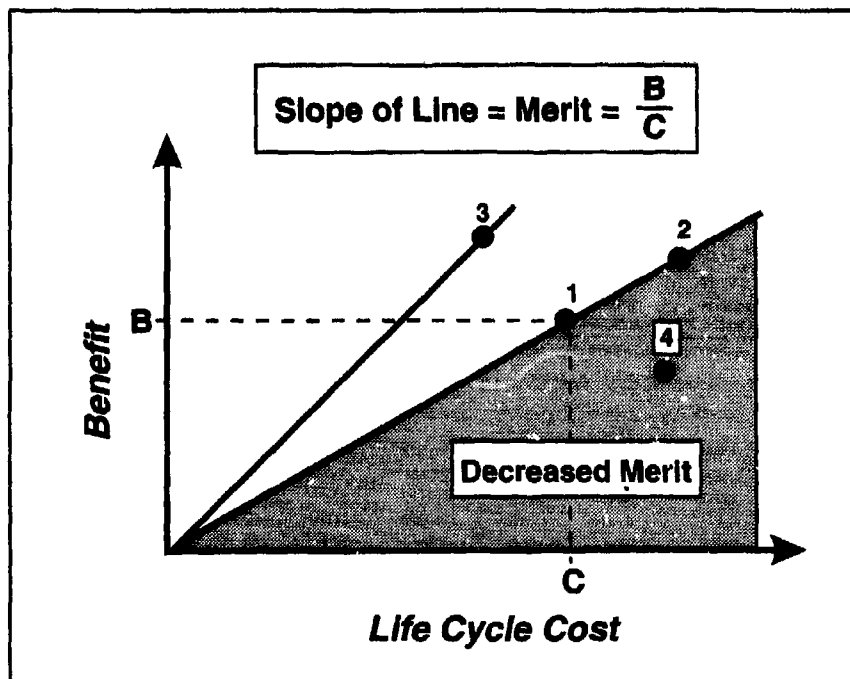


Figure 1. Graphical Representation of the Merit Function.

case, it is difficult to predict, a priori, the change in merit. The decision rule remains constant, however, and the system with largest merit is judged most desirable. Returning to Figure 1, points 1 and 2 have the same merit; point 4's merit is less than that of 1 and 2; and point 3 has the highest merit of all. Though the above circumstances are transparent, the problem remains to define a systematic procedure for quantifying both benefit and cost.

The merit function has direct economic interpretation. It is a measure of system benefit per dollar expended. A rational decision maker chooses to maximize the benefit obtained for each dollar spent, and selects the system with highest merit. Consider the inverse of the merit function, P .

$$P = 1/M = C/B \quad (2)$$

This function measures dollars spent to achieve a particular level of system benefit. The variable P represents dollar cost per unit of system merit. In other words, P is simply the price of a unit of system benefit.

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In this case, a rational decision maker selects the system with smallest price per increment of system merit, which again is the system for which merit is greatest.

QUANTIFYING BENEFIT

In this section, a method for quantifying system benefit is developed. A Benefit Function is defined to measure the degree to which a given system configuration satisfies customer requirements. To organize the data, the methodology uses a QFD Table. The Benefit Function is derived in part from the QFD Table, which relates the engineering performance of a system to specific customer requirements.

In essence, a single measure of benefit is determined (i.e., a single number) for each candidate product design. This measure, or score, represents the degree to which each candidate balances conflicting design (i.e., customer) requirements. This measure is expressed as a percentage difference from an ideal system (i.e., a system that achieves specified target values for all of the customer's stated requirements) and evaluation is biased by the customer's stated priorities.

CONSTRUCTION OF THE PLANNING TABLE

The first step in quantifying system benefit is the construction of the *Planning Table*. The general form of the planning table is depicted in Figure 2. Four lists are compiled in order to begin construction of this table. The first is a list of the customer's requirements, that is, a list of the desired characteristics of the final system stated in the customer's own words. The second list is a set of "importance weighting factors" used to prioritize each of the requirements. These factors must also be solicited from the customer. The third is a candidate set of performance/analysis parameters to be measured or predicted and compared with their corresponding target levels. These target levels are chosen to represent the ideal system and would usually reflect state-of-the-art technology. The performance/analysis parameters are to be used to evaluate candidate system designs in relation to the stated customer requirements. The fourth list needed to construct the planning table is a list of competitive systems and/or design options.

Once these four lists are compiled, the first iteration of the *Planning Table* can be constructed. There are four primary components to the table. First is the *Relationship Matrix*, labeled Table A in Figure 2. This table is used to assess and document interactions between the customer's stated requirements and the selected performance/analysis parameters. Interactions (i.e., each entry in the matrix) are typically classified as either strong, moderate, or weak. The *Relationship Matrix*, once com-

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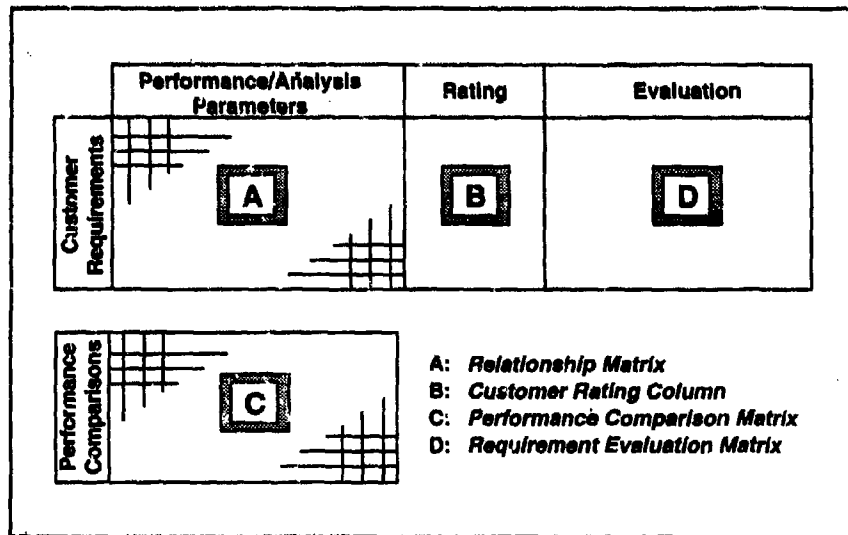


Figure 2. QFD Planning Table Used in Quantifying Benefits.

plete, is used to determine whether or not the selected performance characteristics can adequately measure satisfaction of the customer requirements. If relationships to a given customer requirement are predominantly weak, additional performance parameters are introduced to ensure compliance with the requirement can be evaluated. Similarly, the matrix entries can be used to identify a minimum set of performance parameters needed to be evaluated and tracked.

The second component of the planning table is the *Customer Rating Column*, labeled Table B in Figure 2. A list of "importance weighting factors" associated with the requirements list is solicited from the customer and used to fill out this column. These weighting factors are to be ordered so the largest numbers represent the most important requirements. The factors are later normalized so that their sum equals 1.0. This constraint ensures consistency between differing sets of weighting factors.

The next component of the *Planning Table* is the *Performance Comparison Matrix*, Table C in Figure 2. In this matrix, results of analytic or numerical predictions or experimentation are tabulated for the system under evaluation and its competitors. Target levels for each of the performance/analysis parameters are also tabulated in this matrix. With performance parameters tabulated, the systems are evaluated as to their satisfaction of the customer requirements. The results of this evaluation

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are recorded in the *Requirement Evaluation Matrix*, Table D of Figure 2. The *Planning Table* is then complete.

DERIVATION OF THE BENEFIT FUNCTION

The Benefit Function is an objective, numerical measure derived from the *Planning Table* data. This function evaluates system performance relative to the complex, and possibly conflicting, customer requirements. There are three primary components to the Benefit Function. The first component is the utility measure, which is used to compare system performance to target values in a non-dimensional format. The second component is the customer satisfaction calculation, which determines how well a system satisfies individual customer requirements. Finally, the benefit calculation combines the customer satisfaction results with the "importance weighting factors" to develop an overall score for the system. Thus, the Benefit Function measures the degree to which a system satisfies the weighted customer requirements.

The first component of the Benefit Function develops a non-dimensional utility measure from the data contained in the *Performance Comparison Matrix*. It is based upon the ratio of each performance parameter to the corresponding target level. Let the numerical entries in the performance comparison matrix be represented by the following matrix.

$$D = [d_{ij}] \quad i = 1, \dots, n+1 \quad j = 1, \dots, p \quad (3)$$

where $n+1$ represents target data plus the number of proposed systems and its competitors, and p is the number of performance parameters measured. Note that the target levels for the performance parameters are given in the first row of the data matrix. In other words, parameter targets are represented by d_{1j} , $j = 1, \dots, p$.

The utility measure is applied to the systems represented by the rows in the data matrix, D . The resulting utility matrix, U , is of the same dimension as the data matrix D in Eq. (3).

$$U = [u_{ij}] \quad (4)$$

where

$$u_{ij} = \begin{cases} \sqrt{d_{ij}/d_{1j}} & \text{if } j\text{-th target level is a desired lower limit} \\ \sqrt{d_{1j}/d_{ij}} & \text{if } j\text{-th target level is a desired upper limit} \end{cases} \quad (5)$$

If $u_{ij} < 1$, then the performance parameter does not meet the target level, and similarly, if $u_{ij} > 1$, the performance exceeds the target level. If $u_{ij} = 1$, then the j -th parameter is equal to its target level. The first

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row of the utility matrix U , is $u_{ij} = \sqrt{d_{ij}/d_{ij}} = 1$, $j = 1, \dots, p$ which represents the ideal utility of each performance parameter. Note if the j -th target level is a desired lower limit, then the j -th parameter must exceed the target for $u_{ij} > 1$. Likewise, if the j -th target level is a desired upper limit, then the j -th parameter must be less than the target for $u_{ij} > 1$.

In Eq. (5), the square root function is used to provide decreasing marginal returns to the utility measure. The incremental utility gained decreases as a performance parameter approaches and surpasses its target level. It is important that diminishing marginal return behavior is ensured so the Benefit Function is consistent with traditional economic theory. Previous studies have recognized the need for diminishing marginal return behavior, but these studies were unable to achieve this property (Harse, Schrage, et al.). Using diminishing marginal returns, the benefit of a system with all the performance parameters at or near the target levels is greater than the benefit of a system where several parameters greatly exceed their targets while others fall significantly short of the desired level.

After the utility matrix is computed by Eq. (4) and Eq. (5), the **customer satisfaction calculation** is performed. This calculation determines how well the system satisfies each of the customer requirements listed in the *Relationship Matrix*, Table A in Figure 2. Specifically, the satisfaction for each requirement is a summation of the system utility components weighted by the interactions between each parameter and the specific customer requirement.

To perform the customer satisfaction calculation, the symbolic *Relationship Matrix* must be translated into a numerical matrix. For each strong interaction, a value of 3 is assigned to the matrix element; 2 to each moderate interaction; 1 is assigned to each weak interaction; finally, 0 is used to indicate no interaction. The resulting numerical relationship matrix is given by

$$X = [x_{kj}] \quad k = 1, \dots, r \quad j = 1, \dots, p \quad (6)$$

where p is defined earlier, r is the number of customer requirements and

$$x_{kj} = \begin{cases} 3 & \text{for a strong interaction} \\ 2 & \text{for a moderate interaction} \\ 1 & \text{for a weak interaction} \\ 0 & \text{for no interaction} \end{cases} \quad (7)$$

With X defined in Eq. (6) and Eq. (7), the customer satisfaction

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calculation can be performed. The raw customer score is computed as

$$S = XU^T \quad (8)$$

where S is dimensioned $r \times n+1$ and the superscript T denotes the matrix transpose. Customer satisfaction is computed by

$$\hat{S} = 100\% \times S_{ki}/S_{k1} \quad i = 1, \dots, n+1 \quad (9)$$

where the first column of S , S_{k1} , $k = 1, \dots, r$, represents the satisfaction of a system which identically satisfies all parameter target levels. Thus, S_{k1} is the customer satisfaction of the target, or "ideal," system for each customer requirement. The customer satisfaction results, Eq. (9), are used to construct the *Requirement Evaluation Matrix*, Table D in Figure 2. For a given requirement k , if $\hat{S}_{ki} > 100\%$, then the i -th system exceeds the satisfaction level of the ideal system. Similarly, if $\hat{S}_{ki} < 100\%$, then the i -th system falls short of the satisfaction of the target system.

The final step of the analysis is to compute system benefit. The **benefit calculation** is a summation of customer satisfaction levels, Eq. (8), weighted by the *Customer Requirement Ratings*, Table B in Figure 2. This calculation is expressed as

$$B = R^T S \quad (10)$$

where R is the vector of "importance weighting factors" for the customer requirements. As defined in Eq. (10), the benefit vector is dimensioned $1 \times n+1$, where n is defined earlier. The first element of B , B_1 , is the benefit of the ideal system. The remaining elements of B , $B_2, \dots, B_{n+1}$, are the benefit values of the candidate configurations.

The benefit calculation results can be conveniently expressed as a percentage of the ideal system benefit.

$$\hat{B}_i = 100\% \times B_i/B_1 \quad i = 1, \dots, n+1 \quad (11)$$

Note that $\hat{B}_1 = 100\%$. Any system with $\hat{B}_i > 100\%$ exceeds the benefit of an ideal system, where the ideal system matches all target levels of performance. On the other hand, if $\hat{B}_i < 100\%$, the candidate system does not meet the ideal benefit level. If target levels are selected to represent a state-of-the-art system, then $\hat{B}_i < 100\%$ will be the typical result.

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QUANTIFYING COST

Life Cycle Cost (LCC) can be determined using a wide variety of techniques. Three common approaches are parametric analysis, determination by analogy, and the so called "bottom-up" technique. Choice is determined largely by the type of system being studied and the available database (DSMC, 1986).

Parametric analysis of LCC relies heavily on statistical cost estimating relationships. These relationships must either already be available or be developed from available data. In most cases, data representing a broad array of related systems must be obtained. Regressions are then constructed which relate system LCC to one or more characteristic parameters, such as vehicle and subsystem weights. This approach is most useful for conceptual design. However, it can be difficult to obtain an appropriate and up-to-date database with statistical relevance, and it is sometimes difficult to determine the statistical significance of publicly available cost estimating relationships.

Life cycle cost estimation by analogy is primarily used to calibrate the results of parametric analysis. With this approach, the LCC of a system is determined by analogy to available cost data on an existing and similar system. Adjustments are made to various cost elements to account for differences between the old and new systems. Analogy approaches are especially useful when an insufficient database exists to develop statistically significant cost estimating relationships.

The third LCC estimation technique to be discussed is sometimes referred to as a "bottom-up," or engineering data, approach. In general, the cost contributions of each subsystem component are estimated from knowledge of the component's design, material properties, and intended use. The primary drawback of this approach is that it can be labor-intensive and time-consuming.

Since there is a wealth of information available in the literature for LCC estimation, this subject will not be dealt with in any greater detail.

EVALUATION OF TWO ATTACK HELICOPTERS

Opportunities for improved AH-1W Attack Helicopter mission effectiveness, new mission capability, and improved survivability are currently being exploited by the United States Marine Corps (USMC). In particular, procurement of a night targeting system is underway, along with a navigation system upgrade and improvements in the electronic warfare suite. Evolution of the USMC AH-1 is expected to continue well into the next century. However, the many benefits of incorporating advanced technology will be offset by increased vehicle weight and a corresponding reduction in payload capability of the vehicle.

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**Table 1.
USMC REQUIREMENTS LIST WITH COMPOSITE WEIGHTINGS**

MARINE CORPS REQUIREMENTS	RELATIVE WEIGHTING (1.0 Highest)
Improved Reliability and Maintainability	1.00
Increased Speed	0.94
Increased Maneuverability and Agility	0.90
Harder to Kill	0.87
Reduced Vibrations and Loads	0.86
Carry More	0.79
Reduced Operations and Support Costs	0.70
Harder to Detect	0.50
Operate Over the Horizon	0.49
Easier to Fly	0.49
Increased Endurance	0.39

The AH-1W manufacturer, Bell Helicopter Textron, Inc. (BHTI), in recognition of the trend toward decreasing payload capability and degraded performance, initiated an independent research and development (IR&D) program to first evaluate, and then demonstrate, the feasibility of applying available BHTI four-bladed, bearingless main rotor technology, in combination with an uprated drive system, to achieve significant improvements in AH-1W vehicle performance and payload capability. The technology demonstrator developed by BHTI is referred to as the 4BW. The evaluation of the cost effectiveness of adopting the 4BW in place of the AH-1W is an example of a complex military management decision. This problem provides an excellent opportunity for the application of the developed cost-benefit methodology. For simplicity, risk is not included in the presentation of this example. A detailed cost-benefit analysis of the two systems was documented by Corban et al. in 1991.

A survey of knowledgeable military and civilian personnel was conducted and resulted in the USMC requirements listed in Table 1. The relative weightings were obtained by averaging the weights provided by the surveyed personnel. The performance measures listed in Table 2 were used

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Table 2
SELECTED PERFORMANCE MEASURES FOR BENEFIT ASSESSMENT

Performance Measure	Target Value
(1) Isolated Rotor Figure of Merit at Operating Blade Loading (hover, Navy hot day conditions, battle station weights, escort/anti-armor ordnance load)	0.85
(2) Hover Ceiling (battle station weights, escort/anti-armor ordnance load, 2082 hp transmission limit (AH-1W), 2825 h, W))	15,000 ft
(3) Maximum Rate of Climb (sea level standard, battle station weights, escort/anti-armor ordnance load)	4,000 ft/min
(4) Service Ceiling (standard day, battle station weights, escort/anti-armor ordnance load)	25,000 ft
(5) Maximum Vertical Rate of Climb (VROC) (Navy hot day conditions, battle station weights, escort/anti-armor ordnance load)	1,500 ft/min
(6) Dash Speed (Navy hot day conditions, battle station weights, escort/anti-armor ordnance load, intermediate rated power)	180 knots
(7) Cruise Speed (Navy hot day conditions, battle station weights, escort/anti-armor ordnance load, max continuous power)	160 knots
(8) Radius Ordinance Factor	4,000 lb-nm per 100
(9) Station Ordinance Factor	5,000 lb-hrs
(10) Maneuverability/Agility Assessment (Note overall score is the sum of tabulated scores at take-off and battle station weights)	1.0
(11) Structures (determined as the percentage difference from limits of the allowable maneuvering loads envelope)	1.0
(12) Vibrations/Dynamic Loads (qualitative assessment)	1.0
(13) Acoustic Signature (qualitative score based on first-order main rotor signature estimates)	1.0
(14) Impact on Vulnerability (qualitative assessment)	1.0
(15) Handling Qualities (qualitative assessment)	1.0

to quantify the performance of the two candidate helicopters. This list was influenced by standard engineering practice, the identified requirements, and the engineering tools available for use in the assessment. Target values were established by a combination of military specifications, current AH-1W performance, and state-of-the-art rotorcraft technology. Those measures were subjectively evaluated based on available data, whereas the remaining were evaluated quantitatively using computer analysis tools.

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Interactions: S - Strong M - Medium W - Weak N - None		Marine Corps Requirements																
Normalized Weightings		①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	⑪	⑫	⑬	⑭	⑮		
Improved Reliability & Maintainability		N	N	N	N	N	N	N	N	N	N	N	S	N	N	N	1.00	
Increased Speed		M	W	W	W	W	S	W	W	W	M	M	S	S	N	W	0.94	
Increased Maneuverability & Agility		W	M	S	M	S	S	W	W	W	S	S	M	M	S	S	0.90	
Harder to Kill		N	N	N	N	N	M	N	W	W	S	S	N	N	S	W	0.87	
Reduced Vibrations & Loads		N	N	N	N	N	M	N	N	W	S	S	M	N	S	W	0.86	
Carry More		S	S	S	S	S	M	M	S	S	W	M	N	N	M	N	0.79	
Reduced Operations & Support Costs		N	N	N	N	N	N	N	M	M	N	M	S	N	M	M	0.70	
Harder to Detect		N	N	M	N	M	M	N	N	W	S	N	N	S	N	M	0.50	
Operate Over the Horizon		W	W	W	W	W	W	W	S	S	W	N	N	N	N	N	0.49	
Easier to Fly		N	N	N	N	N	N	N	N	N	M	N	M	N	N	N	0.49	
Increased Endurance		M	W	W	W	W	W	W	M	S	W	N	N	N	N	N	0.39	
Target Values		0.85	15,000	4,000	25,000	1,500	180	160	4,000	5,000	1.8	1.0	1.8	1.8	1.8	1.8		
Configuration A - AH-1W		.701	10,250	1,188	21,562	495	157	155	524	633	.593	.984	.1	.25	.5	.75		
Configuration B - 48W		.743	12,250	2,797	24,937	1,453	171	166	861	1,076	.823	.866	.8	.75	.5	.85		

Figure 3. Planning Table for AH-1W Example.

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Overall Benefit Score		100%	94.8%	93.8%
Handling Qualities	15	1.0	0.998	0.922
Vulnerability	14	1.0	0.767	0.767
Acoustic Signature	13	1.0	0.399	0.896
Vibrations & Dynamic Loads	12	1.0	0.316	0.894
Structural Design	11	1.0	0.963	0.716
Maneuverability & Agility	10	1.0	0.764	0.507
Station Ordnance Factor	9	1.0	0.127	0.464
Radius Ordnance Factor	8	1.0	0.382	0.464
Cruise Speed	7	1.0	0.894	1.000
Dash Speed	6	1.0	0.334	0.975
Vertical Rate of Climb	5	1.0	0.557	0.964
Service Ceiling	4	1.0	0.929	0.899
Maximum Rate of Climb	3	1.0	0.726	0.822
Hover Ceiling	2	1.0	0.827	0.904
Rotor Figure of Merit	1	1.0	0.908	0.905
Target Values				
Configuration A - AH-1W				
Configuration B - 48W				

Figure 4. Utility Matrix and Benefit Score for AH-1W Example.

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The customer requirements and performance parameters are assembled into a Planning Table as depicted Figure 3. The performance parameters of Table 2 are distributed horizontally across the top of the matrix. The prioritized requirements list of Table 1 is distributed vertically along the left-hand side of the upper matrix. These requirements are listed in order of importance, starting from the top, as indicated by weightings entered in the second column. Interactions between individual requirements and performance measures 1-15 are then subjectively characterized as either strong (S), medium (M), weak (W), or relatively nonexistent (N), and entered into the Relationship Matrix. Next, the candidate helicopter configurations are listed vertically in the first column of the Performance Comparison Matrix, also of Figure 3. Last, the numerical results and target values assigned to each of the fifteen performance measures are entered in the lower matrix.

With the Planning Table complete, the algorithm defined by Eq. (11) and Eq. (12) is used to construct the Utility Matrix shown in Figure 4. Next, the interaction classifications (strong, medium, weak, or nonexistent) are translated into numerical values using Eq. (13). They serve to prevent a good score for one requirement from influencing an unrelated requirement's total score. For example, the score for acoustic signature should not improve benefit attributed to a configuration that is "easier to fly" (the second-to-last requirement), since the two requirements share little relationship. The outcome of the customer satisfaction calculation, Eq. (15) and Eq. (16), is presented graphically in Figure 5. This graph represents the Requirement Evaluation Matrix: Table D, Figure 2. Note that the 4BW helicopter configuration proves superior to the AH-1W in satisfying each individual customer requirement.

Finally, the Benefit Measures for the two systems are then calculated using Eq. (17) and Eq. (18). Note in this calculation the normalized weightings have been scaled so that the sum is one. This overall score is measured relative to an ideal system which achieves all target values (i.e. the ideal system scores 100%). These overall scores are presented on the right-hand side of Figure 4. Based on this assessment, the 4BW exhibits an 18.8% improvement in benefit over the AH-1W. That is, the 4BW achieves 83.6% of the overall target level, while the AH-1W achieves only 64.8%.

Preliminary LCC estimates are generated from a generic AH-1 cost model that includes the cost elements depicted in Figure 6. Two different operating scenarios, readiness and contingency, are considered, and estimates formed for each. Readiness level assumes no combat over the aircraft life. The contingency level assumes various combat engagements over the life of the system.

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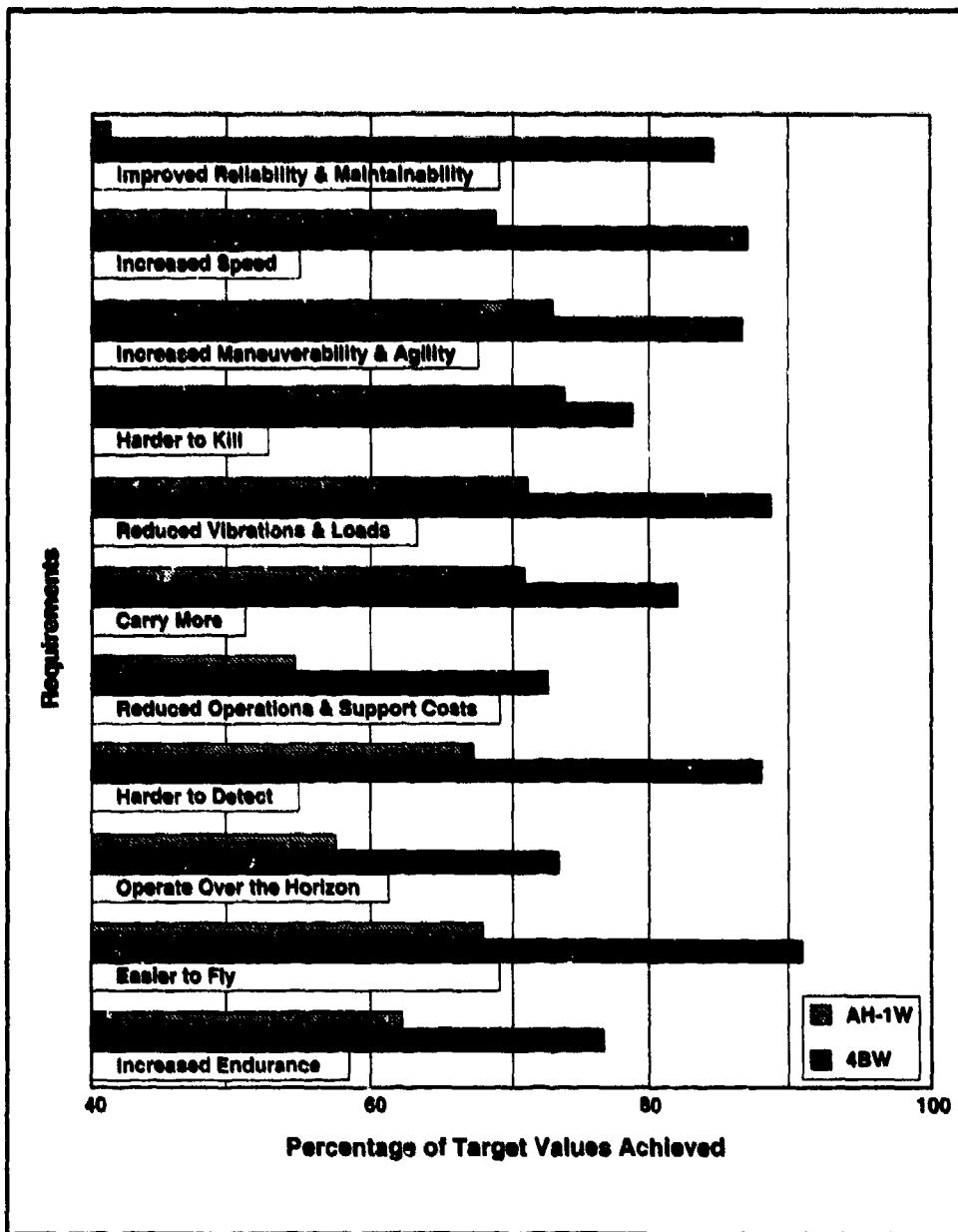


Figure 5. Percentage of Target Values Achieved.

Rough-order-of-magnitude estimates of LCC for the AH-1W and 4BW helicopters are presented in Table 3 in 1990 billions of dollars for both the readiness and contingency scenarios. These estimates represent a lower bound on LCC. Cost estimates for all categories of Figure 6 were not available. Acquisition of the 4BW requires approximately 200 million dollars of additional expenditure over the life of the system.

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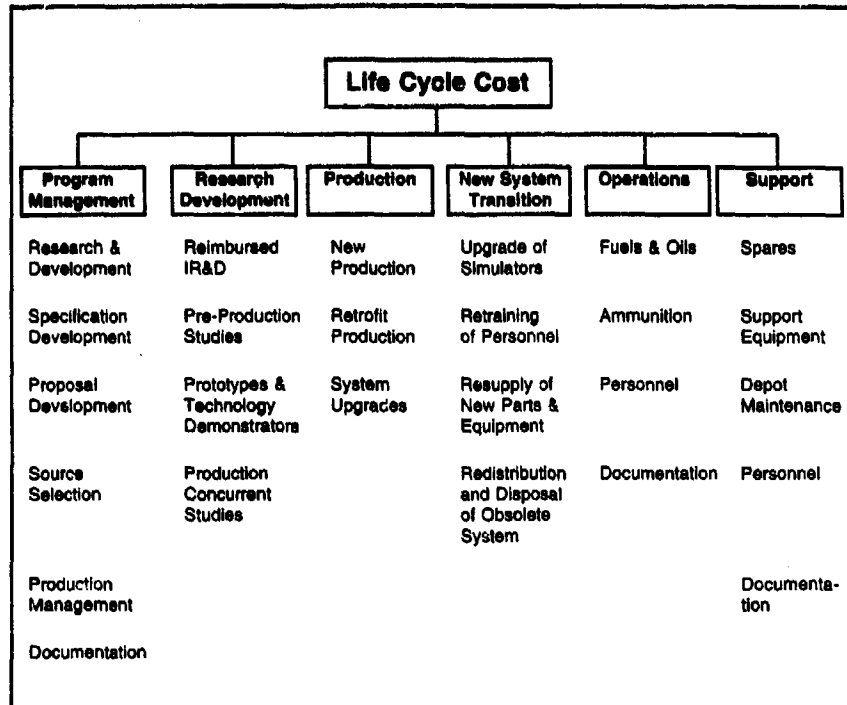


Figure 6. Cost Categories for all AH-1 LCC Model.

The calculation of comparative AH-1W and 4BW merit is presented in Table 3. These calculations are based on preliminary assessment of proposed four-bladed main rotor system benefit and lower bound estimates for AH-1W and 4BW life cycle cost (the 4BW is assumed to provide 5% reduction in maintenance and spares costs). Based on this preliminary assessment, the 4BW's benefit outweighs fleet conversion cost in both readiness and contingency scenarios. The 4BW's merit exceeds that of the AH-1W by 17% in the readiness scenario, and 20% in contingency. Procurement of the 4BW thus yields a 20% higher level of mission effectiveness (in the contingency scenario) per dollar spent. This preliminary positive result justifies a recommendation for further engineering development of the 4BW and more comprehensive evaluation of its potential value to the Marine Corps.

SUMMARY

This paper presents a merit function approach for cost-benefit analysis of high tech systems, which relies on a comprehensive measure of sys-

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**Table 3
CALCULATION OF AH-1W AND 4BW MERIT BASED ON PRELIMINARY
PERFORMANCE AND COST ESTIMATES**

Helicopter Configurations	Preliminary Benefit Score	Life Cycle Cost Estimated Floor in 1990 - \$ Billion		MERIT	
		Readiness Level	Contingency Level	Readiness Level	Contingency Level
Configuration A - AH-1W	84.8	1.764	2.295	36.74	28.24
Configuration B - 4BW	83.6	1.940	2.466	43.09 17% increase	33.90 20% increase

tem utility. The benefit function is derived in part from Quality Function Deployment Tables, which allow for the measurement of both monetary and non-monetary attributes. The cost component of the merit function is system life cycle cost. Application of the methodology was demonstrated by an evaluation of two competing attack helicopter configurations. This decision example demonstrates the practical application of this methodology to the evaluation of a complex system employing advanced technology.

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Technology Diffusion in Large Organizations Using Customer Perception Analysis Methods

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The diffusion of new information technology (IT) into large organizations is a strategically important and very difficult activity. In-depth understandings of application requirements, customer perceptions, and the technology itself are essential in order to estimate the impact and probability of successful adoption and integration of the technology into the organization. Incomplete knowledge of application requirements and customer perceptions is frequently cited as a major risk in the defense acquisition process. In this paper, we demonstrate the application of a multiattribute attitude model for understanding how a new technology

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is perceived vis-a-vis competing technologies. Further, since members of the organization impacted by the technology are not necessarily homogeneous in terms of how the technology is viewed, perceptions and attitudes are compared across segments of individuals within the organization. We apply our new models in a case study on the large-scale introduction of CD-ROM publications in tactical Army units. Implications of the case study for successful IT introduction and diffusion in large organizations are examined.

INTRODUCTION

As any manager responsible for the introduction of new technology into a firm recognizes, the true problem is not finding information technology (IT) products that will enhance the quality of the organization's products/services and improve the productivity of the workforce. Rather, with the decision made to introduce some new technology into the organization, the difficulty is how to go about convincing the employees to use the new technology and then training them to use it effectively. This problem looms larger in those instances where the old technology will be permitted to survive side by side with the new one.

Such is the case in which the U.S. Army now finds itself. In an attempt to reduce the massive volume of paper publications, the Army has embarked on a program to use CD-ROM technology as a means of distributing many of their 65,000 different publications and forms. During fiscal year 1990, the Army's publication distribution centers at Baltimore and St. Louis shipped 14,000 tons of paper and microfiche to active Army, Army Reserve, and National Guard units at a cost of over \$6 million. However, despite the Army's compelling organizational need to use CD-ROM technology, the U.S. Army Printing and Publications Command (USAPPC) has achieved only very limited success in introducing this technology into the front-line tactical units.

Given this background, the purpose of the study presented in this paper is to investigate how CD-ROM technology is viewed by various officer groups in the Army and whether officers from different branches view the technology differently. Examining how commissioned officers perceive the new technology is critical since they serve as the drivers of new product acceptability. If the officers fail to encourage using a new product, then individuals under their command will certainly not adopt it and will continue to rely upon alternative products.

Understanding how innovations are perceived represents a core concept in the consumer diffusion paradigm (Rogers 1983; Gatignon and Robertson 1985, 1989, 1991). Further, it serves as the focus of attention in information systems research on technology adoption and diffusion (Leonard-Barton and Deschamps, 1988; Bayer and Melone, 1989; Davis,

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1989; Davis et al., 1989; Brancheau and Wetherbe, 1990; Moore and Benbasat, 1991). Developing an effective campaign to encourage trial and adoption of a new product without knowing how potential users view it is difficult, if not virtually impossible.

The purpose of this study, then, is twofold. First, in order to understand user perceptions of the CD-ROM technology, we use a *multi-attribute attitude* approach to measuring attitudes toward the new technology and existing competing technologies (paper and microfiche). This approach is one that is often used in studies related to consumer behavior in marketing. In addition to being easy to apply, it is quite useful in diagnosing why one product is viewed more favorably than others. Second, we examine whether Army officers should be treated as a homogeneous group or if they should be segmented by branch of service. If perceptions and attitudes differ among segments, then different communication strategies must be employed so that the product can be diffused more rapidly. If differences do not exist among the segments, a single strategy is all that is necessary throughout the entire organization. This process of subgroup identification is referred to as *segmentation analysis*.

The basic theories for multiattribute attitude models and segmentation analysis are presented in Section 2. Section 3 describes our case study research methods. An extensive survey of Army officers furnished us with data on their perceived use of CD-ROM for Army publications. The results of our data analyses are shown in Section 4. The paper concludes with a discussion of the implications of using customer perception models to support IT introduction and infusion in large organizations.

The implications of this research to defense acquisition managers are important. Acquisition managers can readily employ the customer perception analysis methods in this paper to decrease risk in several phases of the product acquisition life cycle. During concept exploration and definition, the analysis of alternative products is supported by multiattribute attitude models. Management decision making during the phases of production/deployment and operations/support is supported by the customer attitude models and the discovery of significant customer segments. The effective use of customer perception analysis methods provides essential information to decrease risk during acquisition.

CUSTOMER PERCEPTION MODELS

Multiattribute Attitude Models

As the name implies, the multiattribute attitude model assumes that products have many attributes which may be evaluated differentially by consumers. Overall attitude is a function of how the product is per-

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ceived across the relevant product attributes or characteristics, weighted by the attribute's importance. The model used in this study can be expressed algebraically as:

$$Attitude_n = \sum_{i=1}^k b_{in} x_{ij}$$

where: n = product type
 b_i = the j th person's belief about attribute i of product n
 x_{ij} = the j th person's belief about the overall importance of attribute i

This formulation of the multiattribute attitude model is the one most commonly used in consumer perception studies (Lutz and Bettman, 1977). It has been employed across a variety of product categories ranging from prescribing the behavior of physicians to retail store image and new product development (Holbrook and Havlena, 1989). By operationalizing attitudes as a function of beliefs about the product, or information technology as is the case here, we are able to identify which beliefs are most critical in understanding whether a product is liked or disliked. In short, this model provides important diagnostic capabilities for managers interested in modifying attitudes about new products.*

The multiattribute framework is also useful in showing how an innovation is perceived in comparison with competing products. From a strategic perspective, it is critical to measure how a particular object is viewed as well as to understand its perceived relative strengths and weaknesses with competing products. For example, in our study, CD-ROM has two primary competing products, microfiche and hard copy in the form of paper. Again, the focus of this study is not on how the three products are perceived by the Army officers, given that the decision to use CD-ROM has already been made at some higher level of Army command. Rather, the focus is to assess officer perceptions in their roles as potential users of CD-ROM and organizational change agents.

Market Segmentation Models

Businesses have long recognized the importance of market segmenta-

* One assumption underlying this model is that beliefs impact attitudes which then impact behavior. Because using computers and IT is a high involvement decision making process, we expect that attitudes are likely to impact behavior directly (MacKenzie and Sprend, 1992) and that the (belief ==> attitude ==> behavior) paradigm is appropriate for this study.

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tion when it comes to marketing new as well as existing products. The fundamental assumption underlying market segmentation is that consumers are not homogeneous in terms of their preferences for products. Preferences differ because product attributes may not be equally relevant or because consumer groups view the products differently. To the extent that significant and meaningful differences exist among easily identified groups, then different strategies and tactics may be deemed necessary for each segment that is targeted (Kotler, 1988).

There are a number of plausible bases upon which to segment the CD-ROM market in the U.S. Army. One could use experience with computers, age, or education, to name a few general segmentation variables that have been used in consumer research. The goal in segmentation analysis is to select that basis which produces subgroups that are easily identifiable and reachable through a viable communications strategy. One natural basis for segmenting the Army that was deemed reasonable for the current study is the basic mission of individual tactical units.

The three divisions of mission-specific units in the Army are *combat*, *combat support*, and *combat service support*. Combat units (e.g., infantry, armor, artillery) are characterized as highly maneuverable units with as little support overhead as possible. Combat support units (e.g., chemical, engineers, military intelligence, signal, military police) provide essential services to combat units. As such, combat support units generally have a greater logistical burden than combat units. Combat service support units (e.g., quartermaster, ordnance, adjutant general, chaplain, finance, judge advocate general, medical service, transportation) provide even greater levels of administrative and logistical services to both combat and combat support units. As a result, the logistical overhead in combat service support units is high and they are relatively less mobile on the battlefield.

Differences in preferences and beliefs among these three naturally occurring segments would be expected to arise because the three Army branch categories differ widely in the nature of their tactical missions (e.g., an armor unit's mission is very different from that of a quartermaster unit). Beyond differences in relative mobility on the battlefield, the three categories differ in the amount of field training conducted. Combat units generally spend a greater amount of time training under field conditions than combat support and combat service support organizations. The amount of administrative paperwork involved in the day-to-day mission also varies by category, with the heaviest burden found among combat service support units. Additionally, combat units are notoriously "anti-bureaucratic" in their approach to administrative

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requirements, with a much smaller percentage of personnel within the organization devoted to administrative duties compared with the other branch categories.

The advantage of segmenting based on tactical mission is that, if significant differences are found, then appropriate messages to individuals can be easily targeted so as to help speed the diffusion process.

RESEARCH METHODS

Survey Participants

The participants in this study were Army commissioned officers located at five military sites. Officers, rather than noncommissioned officers and junior enlisted soldiers, were selected because of their critical role in the diffusion process of any innovation in the military. Commissioned officers represent the top and middle levels of management that must be the first to buy into IT innovations for diffusion to be successful. The five survey sites were the Army War College, Command and General Staff College, Combined Arms and Services Staff School, the Field Artillery Officer's Advanced Course, and First Army Headquarters at Fort Meade, Md.

Surveys were sent and results were returned during the first half of 1992. Of the 1000 surveys distributed to the survey sites, 748 were returned (i.e., 74.8% return rate). The high response rate was undoubtedly the result of the interest and support of the chain of command at each survey site and the school environment at four of the five sites which allowed local follow-up by survey coordinators to ensure completion of the surveys. All but two surveys were deemed usable in the final analysis. The two excluded had large numbers of missing values.

Survey respondents included first lieutenants (2.28%), captains (59.52%), majors (26.68%), lieutenant colonels (6.70%), and colonels (4.83%). Except for the percentage of lieutenant respondents, the sample is representative of the Army's pyramidal rank structure. Further, the survey population represents 23 different year groups, 21 branches of the Army, and 32 job specialties (known in the Army as functional areas).

Questionnaire Development

A crucial step in using the multiattribute attitude model is the identification of a set of beliefs to include in the questionnaire. In order to try to ensure that the attributes included in the survey are relevant to the potential adopters, we conducted a focus group with 12 members of the Army at Fort Meade.

Focus groups are frequently used in marketing research to develop surveys, to gain insight into how individuals think or behave, to generate new ideas for products, and to gather other, qualitative information

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about a target market (Calder, 1977). The focus group for this study included two senior noncommissioned officers, four captains, and six majors. Nine branches of the Army were represented: Adjutant General, Combat Engineer, Field Artillery, Military Intelligence, Military Police, Medical Service, Signal, Transportation, and Quartermaster. The group members were from the First Army Readiness Group, whose mission is to provide Active Army support and expertise to Army National Guard and Army Reserve units. As such, the group represented a wealth of experience in tactical Army units.

The focus group session started with a brief introduction to CD-ROM technology, with every effort made to present an objective, unbiased view of the product. Next, group members were asked to independently write down what they thought the attributes of a successful publishing medium should be in a field environment. To avoid group dysfunctional tendencies caused by differences in rank and personalities among group members, the nominal group technique (Huber, 1980) was used during this idea-gathering phase as opposed to directed discussion or brainstorming techniques.

Ten attributes were identified as the most salient or critical by the participants of the focus group. The ten were:

- Ease of Use;
- Portability of the Medium;
- Portability of the Hardware;
- Maintenance;
- Durability;
- Timeliness;
- Weight;
- Storage;
- Completeness;
- Updatability.

The attributes are self-explanatory. The participants felt that it was important to separate portability issues of the text medium and the hardware required to interpret the medium. Thus, while the CD-ROM itself may be perceived positively on medium portability, the requirements for a CD-ROM reader (i.e., hardware portability) may be perceived as a negative.

Questionnaire Design and Pre-Testing

In order to operationalize the attitude model as presented in Section 2, 30 belief questions were included in the questionnaire, ten attributes for each of the three media, ten importance questions, one for each attribute, and three attitude scales. The media types were randomly ordered for each belief question to minimize any effects of order bias. Samples of each are provided below.

To measure attitude (Attitude_{ni}) respondents were asked:

Please indicate your overall attitude towards the two types of publishing media currently used in a field environment, and, in the case of CD-ROM, indicate your overall attitude towards its possible employment in the field:

a. Paper |-----|-----|-----|-----|-----|-----|-----|
Poor **Neutral** **Excellent**

b. Microfiche |-----|-----|-----|-----|-----|-----|-----|
Poor **Neutral** **Excellent**

c. CD-ROM |-----|-----|-----|-----|-----|-----|-----|
Poor **Neutral** **Excellent**

To measure beliefs (b_{in}) a semantic differential scale (bi-polar) was used (Urban and Hauser, 1980). For example, in the case of *ease of use*, participants were asked to rate each of the media as follows:

For each of the distribution media listed (paper, microfiche, and computer-based CD-ROM), please indicate the degree to which each product possesses the following characteristics:

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Ease-of-Use

a. Paper	----- ----- ----- ----- ----- -----
	Poor Neutral Excellent
b. Microfiche	----- ----- ----- ----- ----- -----
	Poor Neutral Excellent
c. CD-ROM	----- ----- ----- ----- ----- -----
	Poor Neutral Excellent

Importance on the ease of use attribute was asked in the following manner:

How important are each of the following attributes in selecting a distribution medium for the field?

Ease-of-Use	----- ----- ----- ----- ----- -----
	Very Important Neutral Not Important

The survey was pre-tested with twelve officers, including two lieutenant colonels, one major, and nine captains. During pre-testing, individuals were asked to complete the survey on their own to ensure that the survey did not take more than 15 minutes to fill out. Upon completion, each individual participated in a debriefing session. Each survey question was scrutinized to determine whether it was clearly worded and interpreted consistently across respondents and in a manner intended by the research.

RESULTS AND DISCUSSION

Three different sets of analyses are conducted in order to gain a full understanding of how individuals perceive the CD-ROM technology for Army publications. First, we study the customer perception of the new technology without regard to segments (i.e., Army branch subgroups). It is critical that individuals responsible for effecting change understand how potential users perceive each competing technology prior to communication strategy development. Then we use multiple regression analysis to find out which beliefs on product attributes are most important in predicting attitudes towards CD-ROM. Finally, the segmentation analysis is presented.

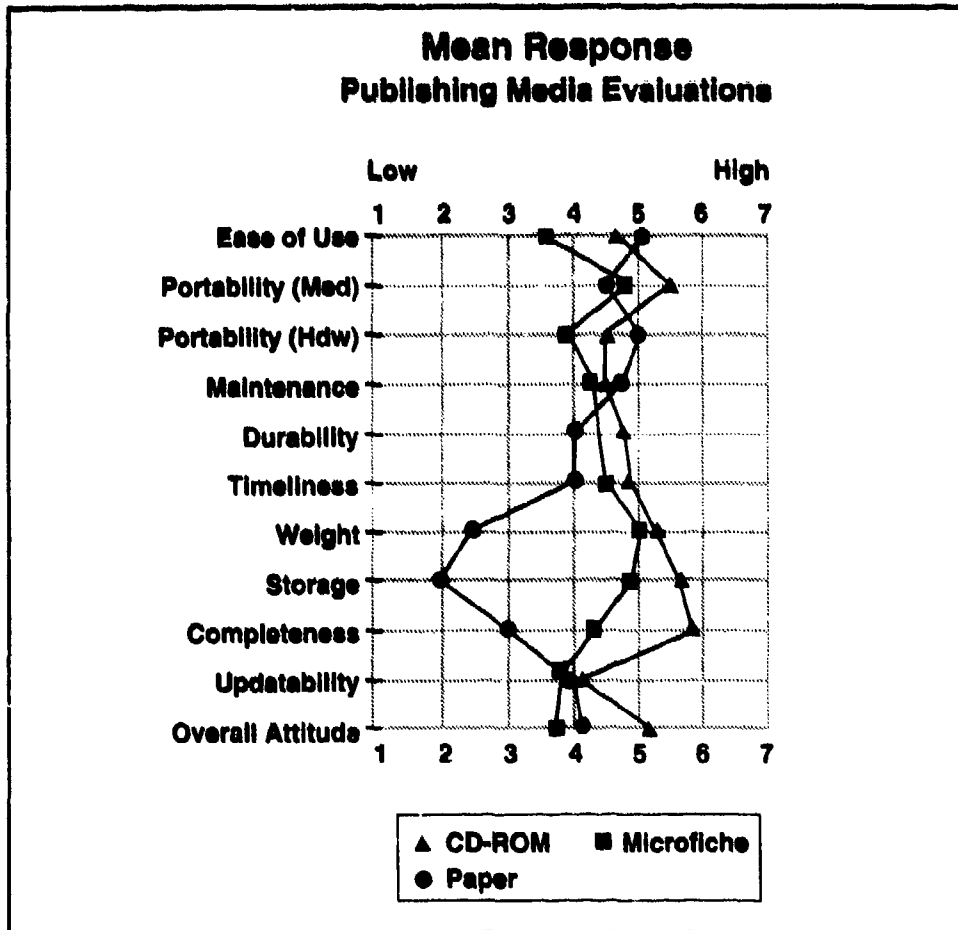


Figure 1. Mean attitude response for publication alternatives: CD-ROM, paper and microfiche.

Overall Perception of the Three Media

Figure 1 shows how each of the publishing media, CD-ROM, paper, and microfiche, is perceived by the 748 survey respondents along the ten attributes identified as most relevant in the focus group portion of the study. In order to ascertain if these differences are significant, a repeated measures analysis of variance (ANOVA) design is used for each of the attributes and overall attitude. A repeated measure design is required since multiple measures are solicited from each respondent on the same attribute across the three technologies. The repeated measures design removes the variance caused, not by perceived differences among technologies, which is exactly what we wish to measure, but by changes in an individual's response towards a particular attribute when

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Table 1.
PUBLISHING MEDIA EVALUATIONS

Attribute	Media Mean by Type			Univariate F(ndf,ddf)*	Signifi- cance of F
	CD-ROM	Fiche	Paper		
Ease of Use	4.89	3.53	5.09	F(2,736) 227.12	<.001
Portability of the Medium	5.49	4.85	4.57	F(2,738) 68.39	<.001
Portability of Hardware	4.52	3.90	5.04	F(2,727) 105.80	<.001
Maintenance	4.47	4.32	4.73	F(2,734) 14.94	<.001
Durability	4.79	4.35	4.02	F(2,731) 36.71	<.001
Timeliness	4.86	4.50	3.98	F(2,730) 58.06	<.001
Weight	5.25	5.05	2.40	F(2,732) 583.93	<.001
Storage	5.64	4.89	1.90	F(2,732) 1237.90	<.001
Completeness	5.86	4.33	2.94	F(2,729) 660.38	<.001
Updatability	4.09	3.79	3.97	F(2,727) 8.53	<.001
Overall Attitude	5.14	3.70	4.12	F(2,737) 219.16	<.001

* ndf stands for numerator d.f.; ddf stands for denominator d.f.

measured at different times. In effect, when calculating the F statistic for each attribute, this source of "error" or variation in responses is removed from the denominator of the F-ratio.

The results from the ANOVAs are presented in Table 1. Significant differences ($p < .001$) are found for all of the attributes and attitudes

across the three products. CD-ROM is perceived as significantly better on durability, timeliness, weight, storage, completeness, updatability, and portability of the medium. Other media are rated more positively, however, on the ease of use, portability of hardware, and maintenance attributes. Despite the apparent inconvenience associated with paper in terms of weight, storage requirements, and completeness, paper publications are viewed as easiest to use and maintain. Microfiche seems to have some of the attributes of both other media and rates between them in all cases except for portability, maintenance, and updatability. Microfiche also has the lowest overall mean attitude rating; in other words, it is the least preferred medium.

Regression Results of the Attitude Model

By using multiple regression analysis with attitude as the dependent variable and each of the ten belief importance components as individual predictor variables, we can ascertain which of the attributes are most important in explaining overall attitude. This helps information managers identify those elements that should receive priority in the communication strategy to encourage and speed the diffusion process.

The results of the regression analysis are provided in Table 2. The overall model is highly significant ($F = 40.17$, $d.f. = 10,695$, $p < .001$) with an R^2 of .37. It is quite typical for models such as this one to explain 35-40% of the variance in attitude.

Of the ten attributes, six are significantly related to attitude. Highlighted in bold in the table, these include: ease of use, portability (media), portability (hardware), maintenance, storage, completeness, and updatability. Following the attitude model, the manager should focus on these attributes in terms of communication, training, or product development plans as they have the greatest potential impact on attitudes.

It is interesting to note that ease of use and portability of hardware are significant predictors of which the CD-ROM media rated poorly in Table 1. These attributes may be critical ones, therefore, in the development of communication, training, or product development plans. Concerns over ease of use and hardware portability may be alleviated by hands-on demonstrations of portable computer systems incorporating CD-ROM technology.

Storage, completeness, and updatability rate highly for CD-ROM and, because they are significant predictors of attitude, should be emphasized in any communication strategy. This should be done not only to point out the strengths of CD-ROM over competing media, but also because of the potential upward improvement in perception still possible along these attributes. Note that none of the perceptions towards

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Table 2.
REGRESSION RESULTS FOR PREDICTING ATTITUDE TOWARD CD-ROM

Variable Predictor	Standardized Regression Coefficient	Standard Error	t-ratio	p-value
Constant	2.2328	0.1646	13.57	0.000
Ease of Use	0.025549	0.004873	5.24	0.000
Portability (Medium)	0.019541	0.005150	3.79	0.000
Portability (Hardware)	0.014740	0.003569	4.13	0.000
Maintenance	-0.003266	0.005095	-0.64	0.522
Durability	0.010232	0.005458	1.87	0.061
Timeliness	0.004604	0.005294	0.87	0.385
Weight	-0.006245	0.005115	-1.22	0.223
Storage	0.012316	0.005389	2.29	0.023
Completeness	0.011022	0.005192	2.12	0.034
Updatability	0.007930	0.003259	2.43	0.015

CD-ROM among the ten attributes has a mean score exceeding 5.86, which does indicate that improvement in perceptions, as well as overall attitude, is very feasible.

Segmentation Results

Thus far we have shown that the two publishing products currently used in Army tactical units are, in fact, perceived differently from CD-ROM. We have also established that the multiattribute attitude model is a useful one in understanding what attributes are most relevant in explaining attitude towards CD-ROM.

The next logical step is to ascertain if different units within the Army may be used as a means of segmentation to further facilitate the development of a diffusion strategy to encourage adoption and use of the new technology. Again, if we can segment the user population into groups that differ from each other in terms of beliefs then educational and training efforts can be tailored so as to maximize the likelihood of CD-ROM use and adoption throughout the Army. For the reasons presented earlier, the survey participants were segmented by combat, combat support, and combat service support branch categories.

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A remaining condition for a segmentation basis to be a useful one is for the various segments to differ significantly on important variables related to the product under investigation. In this study, two sets of variables are compared across segments. First, we ascertain if the product-related variables which follow directly from the multiattribute attitude model differ by subgroup. The second category of variables we examine are user-related variables. Here we focus on where individuals within the Army believe the CD-ROM should be deployed. If Army IT managers believe that the system should be deployed at one level of the organization and potential users believe that it should be deployed at another, then problems may occur that may influence overall acceptability of the technology.

Without understanding both product-related and user-related perceptions, the successful diffusion of CD-ROM and other IT products is not possible. The issue is not whether the Army can put a CD-ROM on every desktop (the Army could, of course, simply mandate the presence of CD-ROM, but this most certainly would not guarantee diffusion). The issue is whether or not people will use the technology. To get people to use the technology, effective marketing of CD-ROM is required. Yet effective marketing without adequate customer or user-related information is itself impossible.

Product-Related Variables

Multivariate analysis of variance (MANOVA) is used to test for differences in attitudes and beliefs about CD-ROM and competing products across combat role segments. MANOVA is similar to ANOVA except that it permits the simultaneous examination of several interrelated variables (in this case vectors of attitudes and beliefs).

The MANOVA for differences in attitude toward the three media across segments is provided in Table 3 below. The MANOVA ($F = 2.69$, d.f. = 4, 1464), significant at the .05 level, supports the expectation that differences exist among the three segments. An examination of the univariate ANOVAs indicate, however, that these differences are only marginally significant ($p < .10$).

Since our primary interest lies with CD-ROM, we next investigate the beliefs about CD-ROM only, by segment, along the ten product attributes. An overall MANOVA for the ten attributes by segment yields a significant MANOVA F-statistic ($F = 2.03$, d.f. = 18, 1386) with $p < .005$. The univariate results are given in Table 4 above.

Significant differences among branch categories, as indicated by the ANOVA results in the table, are encountered for ease of use, portability of hardware, durability, weight, and updatability attributes. Recall that

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Table 3.
SEGMENTATION ANALYSIS BY COMBAT ROLE (COMBAT (CBT),
COMBAT SUPPORT (CS), COMBAT SERVICE SUPPORT (CSS) -
ATTITUDE TOWARDS PUBLISHING MEDIA

Publishing Medium	Mean By Combat Role			Univariate F(2, 734)	Signifi- cance of F
	CBT	CS	CSS		
CD-ROM	5.04	5.16	5.32	2.71	.067
Microfiche	3.73	3.62	3.74	0.42	.658
Paper	4.23	4.13	3.90	2.73	.066

Table 4.
SEGMENTATION ANALYSIS BY COMBAT ROLE (COMBAT (CBT),
COMBAT SUPPORT (CS), COMBAT SERVICE SUPPORT (CSS)) -
BELIEFS MEASURES FOR CD-ROM

CD-ROM Attribute	Mean By Combat Role			Univariate F(2, 701)	Signifi- cance of F
	CBT	CS	CSS		
Ease of Use	4.54	4.80	4.84	3.82	.022
Portability of the Medium	5.40	5.56	5.56	0.98	.377
Portability of Hardware	4.36	4.55	4.75	3.79	.023
Maintenance	4.34	4.52	4.62	2.26	.104
Durability	4.64	4.92	4.90	3.92	.020
Timeliness	4.89	4.76	4.93	1.47	.232
Weight	5.10	5.41	5.34	5.10	.006
Storage	5.53	5.75	5.69	2.05	.129
Completeness	5.79	6.00	5.81	2.60	.075
Updatability	4.16	3.72	4.40	6.35	.002

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ease of use, portability of hardware, and updatability are also significant overall predictors of attitude towards CD-ROM in the beliefs importance model. With the exception of the updatability attribute, the combat unit category perceives the CD-ROM most negatively across those attributes where significant differences exist.

Of equal interest in our investigation of beliefs about CD-ROM among the branch segments is whether or not significant differences exist for the *importance* of each attribute among the branch categories. The result of an overall MANOVA F value ($F = 1.40$, d.f. = 20, 1432) is not significant ($p > .10$). With an insignificant MANOVA F, interpreting univariate ANOVAs is not very useful. In this case, only one significant difference is found for the completeness attribute, an occurrence that could well be expected to happen by chance alone.

These results provide considerable information to the IT manager who is responsive to customer requirements and preferences. First, we can say that attitudes toward CD-ROM appear to be more positive across all three branch subgroups than attitudes for the competing technologies. However, clear differences in attitude do not exist within media across segments. Second, in general, the combat role segment views the CD-ROM less favorably than the other branch segments along several beliefs with relatively few differences among the remaining two segments. Finally, but no less important, there are no significant differences among the segments regarding the importance of the attributes associated with a successful publishing medium in a field environment.

User-Related Variables

In our study, analysis of user-related variables allows IT managers to answer questions concerning where in the organization potential users believe CD-ROM should be used, who will be the actual hands-on users, and who are the likely beneficiaries from CD-ROM technology in tactical Army units. We begin with the results of the question which asked how useful CD-ROM would be at the following echelons: platoon (a small unit of about 60 people), company (between 80 and 300 people depending on unit type), battalion (about 600 people), brigade (about 2500 people), and division and higher (units having over 6000 people). The nature of the tactical mission changes at each echelon with platoons carrying out near-term operations under the close scrutiny and direction of company and often battalion level commanders and staffs. While at brigade level and higher, a proportionally greater share of resources is devoted to long-term operations and planning. The implications of this echelon structure contribute to the *a priori* assumption that CD-ROM might be viewed as more effective or appropriate at certain organiza-

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tional levels than others. The results found in our survey are shown in Table 5 below.

Table 5.
SEGMENTATION ANALYSIS BY COMBAT ROLE (COMBAT (CBT),
COMBAT SUPPORT (CS), COMBAT SERVICE SUPPORT (CSS)) -
BELIEFS ON DEPLOYMENT LEVELS

Organization Level	Mean By Combat Role			Univariate F(2, 732)	Signifi- cance of F
	CBT	CS	CSS		
Platoon	2.77	3.28	3.74	18.02	.001
Company	4.28	4.78	5.07	14.49	.001
Battalion	5.74	5.92	5.74	2.14	.118
Brigade	6.24	6.23	6.09	3.89	.021
Division and higher	6.51	6.43	6.17	8.38	.001

Beliefs about deployment level differed dramatically among the three segments, as indicated by a significant MANOVA F ($F = 8.24$, d.f. = 8, 1456, $p < .01$). Significant differences exist among the subgroups for all echelons except battalion level; below this organizational level the combat arms subgroup is least favorable towards CD-ROM deployment. Above battalion level, the combat arms segment is the most favorable towards CD-ROM. The implications are clear. The IT manager contemplating the fielding of CD-ROM at platoon level would be well advised to concentrate instead on echelons above battalion level to achieve rapid adoption across all three segments, while possibly adjusting the nature and intensity of the educational and training efforts for each branch segment. The ensuing information on users and beneficiaries can assist to further define the marketing strategy. Further, as the upper echelons use the technology, positive word-of-mouth communication should occur thereby speeding the diffusion process.

Table 6 depicts the results of the question which asked, "How likely are persons in the following positions to be actual hand-on users or operators of a CD-ROM system in the field?" A response of 1 indicates not likely, a score of 7 means highly likely. A response of 4 indicates the respondent was not sure or had no opinion. Using a question such as

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Table 6.
SEGMENTATION ANALYSIS BY COMBAT ROLE (COMBAT (CBT),
COMBAT SUPPORT (CS), COMBAT SERVICE SUPPORT (CSS)) -
HANDS-ON USERS

Publishing Medium	Mean By Combat Role			Univariate	Signifi- cance of
	CBT	CS	CSS	F(2, 734)	F
Commander	2.99	2.99	3.24	1.22	.295
Staff Officer	5.78	5.68	5.81	0.66	.519
Staff NCO	5.67	5.81	5.81	1.22	.296
Special Staff	5.01	4.27	4.86	3.66	.026
Company Commander	3.97	4.47	4.43	7.43	<.001
Company Officer	4.21	4.74	4.84	10.46	<.001
Senior NCO	3.47	4.12	4.19	13.45	<.001
Junior NCO	3.27	4.08	4.33	21.91	<.001
Junior Enlisted	2.97	3.85	3.99	18.85	<.001

this is somewhat analogous to the behavioral intention question often used in consumer research (e.g., Morwitz and Schmittlein, 1992) except that respondents are asked to forecast use by persons/groups other than just themselves.

Before examining the results of the MANOVA used to test differences among the segments, it is interesting to note a few patterns. First, the CD-ROM medium is viewed as more likely to be used by staff personnel, in general, than line individuals. Second, the potential use of CD-ROM appears to be greatest among middle managers, with commanders, line NCOs, and enlisted personnel potentially using CD-ROM less than company officers and staff NCOs.

When differences are analyzed using the MANOVA, the three segments appear to differ significantly ($F = 3.79$, $d.f. = 16, 1352$, $p < .001$) on who is likely to use the system in the field. From the company commander down to the junior enlisted people, combat role personnel are perceived to be less likely to use the system than the other segments, a

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finding not too surprising given their tasks. Special staff in combat roles, however, are more likely to use CD-ROM. It is interesting to note that for the two job positions seen as most *likely* to be actual CD-ROM operators (staff officers and NCOs), there are no significant differences among the branch categories. The same holds true for the duty position viewed as most *unlikely* to be a hands-on user—the commander at battalion level or above.

CONCLUSIONS

The research results of this study indicate that 1) a multiattribute attitude framework is an effective means for evaluating the attitudes held towards a IT innovation such as the CD-ROM; and 2) large, complex organizations, such as the U.S. Army, cannot be considered as a homogeneous entity when it comes to generating support for IT product introduction and diffusion. Both of these findings have important implications for the IT manager responsible for change.

In the Army/CD-ROM case, for example, there appear to be several primary attributes that must be emphasized during introduction and training in order to achieve successful organizational diffusion of the new product. Perceptions of ease of use, portability, and updatability themes are found to be critical in adoption decisions. Effective solutions for dealing with these issues must be addressed during the product introduction, training, and communication programs.

The segmentation portion of the study clearly indicates that a single communication strategy might not be effective. The Army's greatest problem is likely to be gaining acceptability of CD-ROM from units in the combat branch subgroup. First, targeting more attitudinally positive subgroups, such as the combat service or combat service support branches, first will help generate such needed familiarization and positive word of mouth. Further, rather than attempt to introduce the product across all possible user groups, a roll-out introduction focusing more on the staff personnel might be useful. These individuals may be more likely to use and adopt the technology than commanders and NCOs.

Continuous monitoring of the IT product within the organization is an important duty of the IT manager. In the case of the deployment of CD-ROM publications within the Army, satisfaction measurements will become necessary in conjunction with a re-analysis of segmentation. Other possible segmentations, including those based on the number of paper and microfiche publications taken to field, may prove more critical than the branch category segments.

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Contracting Readiness: *Timely Support for Military Operations*

Rita Lappin Wells

This article addresses "contracting readiness." The term is used to indicate the ability of the acquisition system to provide contracting support in a timely fashion to U.S. forces involved in a military operation, national emergency, or humanitarian relief effort.

INTRODUCTION

From the moment American forces first arrived in Saudi Arabia during Operation Desert Shield/Storm, their survival was dependent on contracted support. Their first bottle of water, transportation to their base camp, tents [as shelter] from the harsh environment, refuse control for garbage, ice to preserve rations, showers and latrines were all provided through contracted support. Without contracted support to provide only the supplies and services listed above, our combat effectiveness would have been degraded because of deteriorated troop health. As important as providing the supplies and services, was the timeliness [with which] they were provided. (Johnson. 1991)

Department of Defense Changes

As the Department of Defense (DoD) changes following the end of the Cold War, policy makers must carefully consider DoD's ability—its readi-

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ness—to respond to future national emergency and wartime demands. The changes taking place in the DoD which began in the late 1980s and are continuing in the 1990's involve more than just dramatic cuts in the DoD budget and reductions in the number of active duty forces and civilian employees. Roles and missions of the military services and defense agencies are being redefined. Increasingly, the military is being called upon to assist in domestic response to national emergencies as well as in worldwide humanitarian and peacekeeping efforts. As the national security strategy focuses on responses to regional conflicts, U.S. military personnel and equipment may be called upon to perform in widely varying environments ranging from the desert to arctic conditions.

The most important change reflected in this new strategy is that we no longer are focused on the threat of a Soviet led, European wide conflict leading to global war. . . . The new strategy shifts its focus to regional threats and the related requirements for forward presence and crisis response. . . . The regional contingencies we might face are many and varied. . . . One trait most of them share, however, is that they will arise on very short notice and therefore require a highly responsive military capability. (Cheney, 1991)

Less Money, Fewer Suppliers

Budget authority for defense is decreasing significantly, and a much smaller proportion of the defense budget is allocated to defense procurement. As the budget authority for defense procurement is decreasing, the industrial base supporting defense needs is shrinking. Although the largest dollar decreases reflect cuts in major weapon acquisition, the inventory of support equipment is also being affected.

A secret Army study has warned of a looming shortage in the unglamorous essentials of modern war—such as fuel tanks, chemical-weapons detectors, medevac helicopters and mine-clearing equipment—that it says could undermine the Army's ability to deploy and sustain combat forces in an extended crisis. (Lancaster, 1993)

There is greater uncertainty about the conditions under which U.S. military forces will operate in the future. There is a smaller inventory of support equipment. There are fewer suppliers. There are fewer military personnel and civilians who have experience in supporting wartime needs.

Importance of Contracting Readiness

In short, the military actions of the future—whether humanitarian, peacekeeping or wartime—will be heavily dependent on the readiness of the contracting system to be responsive to support needs. Today, as members of the administrative and legislative branches of government seek to reform the acquisition system, they need to place a priority on ensuring “contracting readiness.” The first step towards contracting readiness is recognizing that there is a difference between peacetime contracting and national emergency or wartime contracting.

In peacetime, supplying the troops with quality goods and services in a timely manner, while complying with seemingly unrelated laws and regulations, presents DoD acquisition professionals with many unique, but tolerable, challenges. During times of national emergency, when the results of the acquisition process are reflected directly on the battlefield, delays incident to unrelated laws and regulations are not tolerable. They are not tolerable to acquisition professionals or to their primary customers—the soldiers, seamen, airmen, and marines who have been placed in harm’s way. These delays should not be tolerable to any member of American society, even those intended to be the primary beneficiary of the law or regulation. (Morrison, 1993)

The second step toward contracting readiness is to recognize its importance and to be proactive in planning for acquisition processes that will provide timely contracting support in future conflicts or national emergencies. This starts by examining the lessons of the past and incorporating these lessons into acquisition reform initiatives.

Research Objectives

The objectives of this study were to:

- (a) review contracting actions required to rapidly respond to urgent needs of U.S. troops during recent times of war or national emergency including humanitarian assistance, peacekeeping, and disaster relief; and
- (b) make recommendations as to what acquisition reform initiatives are required to ensure that the contracting systems can rapidly respond to wartime and national emergency requirements of U.S. troops.

The methodology used in this study consisted of a comprehensive review of literature as well as interviews with people with wartime contracting experience. The analysis focused on what worked, what did not work, and what changes are recommended. The scope of this research was limited to Department of Defense (DoD) contracting actions both in the Continental United States (CONUS) and the overseas theater of operations.

Definitions

Contingency. An emergency involving military forces caused by natural disasters, terrorists, subversives, or by required military operations. Because of the uncertainty of the situation, contingencies require plans, rapid response, and special procedures to ensure the safety and readiness of personnel, installations, and equipment. (AFR 70-7, June 1992, p. 10)

Contingency Contracting. Contracting performed in support of a peacetime contingency at an overseas location pursuant to the policies and procedures of the Federal Acquisition Regulation. (JCS Pub 1-02, 1989, p. 86)

Gulf War. As used in this study, the term "Gulf War" refers to the period of time from August 2, 1990 when Iraqi forces invaded Kuwait to February 27, 1991 when a cease fire was declared. The term "Operation Desert Shield" refers to the period between August 7, 1990 when President Bush ordered U.S. forces to Saudi Arabia and January 17, 1991 when the coalition air campaign commenced. The term "Operation Desert Storm" refers to the period between January 17 and February 27, 1991. (Watson, 1991)

National Emergency. Condition declared by the President or by Congress which authorizes certain emergency actions to be undertaken in the national interest. Actions to be taken may range up to total mobilization. (AFR 78-10, Apr 1984, p. 9)

REVIEW OF LITERATURE SOURCES

Literature reviewed for this study consisted of journal articles, books, government regulations, scholarly papers, and unpublished "lessons learned." A wealth of information was found regarding experiences of contingency contracting officers in the theater of operations during the gulf war. Less material was found on experiences during other military operations or on the experiences of contracting organizations located within CONUS which actively supported U.S. forces during the Gulf War. The literature review was supplemented by interviews with individuals personally involved in meeting wartime contracting needs. Ano-

nymity was promised to the interviewees and so names and organizations will not be divulged for the majority of those interviewed. Contracting within CONUS will be discussed in this section before a discussion of contingency contracting.

CONUS CONTRACTING

Direct communication between CONUS and theater of operations

During the Gulf War, CONUS contracting organizations played a significant role in supporting the soldier, sailor, airman and marine in the theater of operations. As a result of modern advances in telecommunications, there were direct phone and fax links between military personnel in the Gulf area and contracting offices in the CONUS. The resultant sense of urgency was described in *DLA Dimensions* by Kim Kalai, a supply technician at the Defense Personnel Support Center in Philadelphia:

"You could sense a lot more tension from the people calling in," said Kalai. "Most of the time, we tried to calm them down and assure them that we know it's urgent and that we're going to do all we can to get them what they need." . . . "We hear the urgency in their voices and we see the necessity of the items. We know the impact we have on these customers," said Kalai. "We're not just reading the newspaper headlines; we hear it straight from the people who need these supplies. When they call and say, 'Hey, we're leaving tomorrow and we need such and such,' that urgency gives you a sense of commitment and integrity." (DLA, 1990)

The extent of CONUS contracting. The General Accounting Office (GAO) conducted a study which looked specifically at the unit prices paid for Gulf War procurements by selected CONUS organizations. This GAO study is interesting for two reasons: first, it gives an idea of the dollar magnitude of CONUS procurements during the war, and second, it shows the effectiveness of CONUS contracting organizations in preventing wartime price gouging. The GAO study, *Comparing Peacetime and Wartime Unit Price Change Patterns* (GAO, June 1992), examined the prices paid for Gulf War procurements at six CONUS contracting organizations: Defense Personnel Support Center, Philadelphia, PA; U.S. Army Aviation Systems Command, St. Louis, MO; U.S. Army Troop Support Command, St. Louis, MO; U.S. Army Tank Automotive Command, Warren, MI; U.S. Army Armament, Munitions, and Chemical Command, Rock Island, IL; and the U.S. Air Force San Antonio Air Logistics Center, San Antonio, TX.

Billions of dollars spent in CONUS for Gulf War procurements

The six CONUS contracting organizations studied by the GAO spent \$4.6 billion in Gulf War procurements. This does not include the dollar value of Gulf War procurements by dozens of other CONUS contracting organizations involved in the procurement of spare parts, ammunition, telecommunications equipment, maps, guidance systems, munitions, transportation services and supplies, medical equipment, weapons, maintenance and repair, and troop support items (Killen and Wilson, 1992). In CONUS, contracting organizations bought supplies and services specifically for use in the theater of operations as well as for training and replenishment for deployed items.

The GAO found that 60% of the unit prices paid were within the range of peacetime prices and about 11% were *lower* than peacetime prices. Of the remaining 29% of the purchases where the unit prices were higher than peacetime prices, the majority were the result of costs associated with accelerating the delivery of urgently needed items. Other reasons cited for the higher prices were negotiated changes to forward pricing rate agreements, changing market conditions, and drawing or engineering changes (GAO, June 1992).

Role of CONUS contracting not recognized in legislative relief

During the war there was strong support in Congress for providing legislative relief for contingency contracting officers. What was not recognized in legislative relief was that the CONUS contracting offices played a major role in supporting urgent needs of U.S. military personnel in the theater of operations.

Purchases could be made by either contingency contracting officers in the Gulf or by CONUS contracting officers. In interviews supporting this study, contracting personnel often told of phone calls between the Gulf and CONUS contracting offices in which urgent requirements were identified and a decision made as to whether the procurement would be made by the CONUS contracting officer or the contingency contracting officer. Several variables affected the decision as to where an item would be bought: locations of sources, transportation requirements, prices, (GAO, 1991). Another factor that influenced the decision was the small purchase threshold.

During the war, relief was given to raise the small purchase threshold from \$25,000 to \$100,000, *but only for items bought overseas*. A statutory change was made later by Section 805 of the FY-92 DoD Authorization Act which raised the small purchase threshold to \$100,000 for "any contract to be awarded and performed, or purchase to be made, outside the United States in support of a contingency operation."

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Because the relief did not apply to CONUS contracting offices, contingency contracting officers could use small purchase procedures (and save the time required for formal contracts) when CONUS contracting officers could not. Interviewees told of instances when contingency contracting officers bought items priced between \$25,000 and \$100,000 from suppliers in the Gulf who, in turn, bought the items from sources in CONUS. This involved a middleman—the Gulf area supplier—and the middleman's profit. Although this method was not preferred by any U.S. personnel, it was the quickest way to obtain urgently needed supplies. This cumbersome process would have been unnecessary if the same legislative relief granted to the contingency contracting officer in the area of operation had also been granted to CONUS contracting officers buying supplies for the Gulf area.

Experiences of CONUS contracting personnel

Killen and Wilson (1992) conducted the largest and most comprehensive study of the role of CONUS contracting organizations during the Gulf War. Their research included contracting organizations from all military services and major defense agencies. They gathered data from individuals at each organizational level through the use of focus groups, personal interviews, and a formal Delphi survey. Results of their research provide insight into the major role played by CONUS contracting organizations.

One of the strongest messages contained in the research by Killen and Wilson is that CONUS contracting personnel rallied strongly to the challenge of supporting the war.

How did the people . . . work within the regulations and yet react so quickly to ODS [Operation Desert Shield] requirements? They worked hard and they worked long, long hours. The parking lots were as full on Saturdays and Sundays as they were the rest of the week. It was not unusual for people to start work as early as 4:00 AM and work until late at night. They worked holidays—even Christmas Day. Child care often was a problem on week-ends for working parents. Sometimes they had to bring their children with them. . . . "Everyone had a sense of purpose, of being needed." Above all, they were dedicated to getting results. Cooperation among organizations was at an all time high. (Wells, Wilson, Killen, and Pappas, 1992)

Just as the GAO report found little difference between wartime and peacetime unit price ranges, Killen and Wilson's research documented

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the extent to which CONUS contracting organizations operated within the existing legislation and regulations. Competition rates and awards to small business were maintained at high levels; file documentation was complete.

Killen and Wilson found that at the onset, there was initial confusion at all levels in the CONUS contracting community about what to do and how to do it. Contracting officers throughout the DoD had to search through the entire Federal Acquisition Regulation (FAR) and Defense Federal Acquisition Regulation Supplement (DFARS) to find widely dispersed guidance.

This initial confusion resulted from a lack of training and an absence of consolidated guidance on wartime contracting. Mandatory contracting courses did not specifically address wartime contracting. Few CONUS contracting personnel in field organizations had ever participated in wartime exercises.

The organization of the FAR and DFARS is by individual, specific topics, not by processes or systems. The few regulations addressing wartime contracting were specifically for contingency contracting—not CONUS contracting. This was all exacerbated by the fact that there is no uniform language for contracting exemptions. Each contracting requirement—whether regulatory or statutory—had been written with differently worded exemptions.

Planning, by definition, is a continuous process; yet, by virtue of the evidence provided in this study, it is clear that planning for contracting in an emergency environment is sporadic or nonexistent. If this situation remains uncorrected, the Department of Defense acquisition community may find itself unprepared and unable to fulfill its obligation of procuring the necessary supplies and services to successfully prosecute a war. (Britt and Miles, 1985)

Statutory, regulatory and policy impediments

Killen and Wilson (1992) asked respondents what statutory or regulatory waivers would have enabled their organizations to work more effectively in meeting Gulf War contracting needs. Specific responses included modification or waiver of:

- small purchase threshold;
- Service Contract Act – wage determinations;

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- synopsis publication and response time;
- Competition in Contracting Act (CICA);
- Undefinitized Contractual Action (UCA) approval level and expenditure limit; and
- requirement for a small business subcontracting plan.

Many of the items mentioned above were particularly troublesome when the CONUS contracting organizations tried to purchase commercial items. One respondent noted:

Try getting a subcontracting plan from a firm that rarely does business with us—and the vehicles were built 6 to 8 weeks earlier. It's a totally meaningless exercise. You're not going to change the way the item was built. (And if it is commercial, do you want to impose those requirements? Is it still the commercial item if it's changed in order to comply with subcontracting goals?) (Killen and Wilson, 1992)

Because of the high volume and short suspense time, many CONUS contracting organizations purchased commercial items for immediate shipment to the Gulf area. As one respondent in the Killen and Wilson study noted, "There was an operational need that was not met by current assets and no time to develop MIL-STD equipment to meet the need" (p. 143). Results were mixed. In some cases the commercial equipment worked fine, but in others, the commercial items were just not rugged enough for the military application.

Wars start with spares

One of the greatest challenges of the Gulf War was supplying needed spares. In an attempt to reduce costly inventory, many defense organizations had gone to virtually a Just-In-Time (JIT) inventory system. Compounding the problem was the fact that many of the most critically needed items were not expected to be problems. During the Cold War, many of the wartime readiness plans and military exercises focused on wartime scenarios in Europe. In the desert environment, the equipment faced different environmental challenges that caused unexpected shortages in some spares. For example, the air filters in the M-1 tanks became a critical item—what some referred to as a "war stopper"—because they were quickly clogged by the fine desert sand.

At TACOM, a special team was put together during the Gulf War to develop a Critical Items List (CIL) for each weapon system managed by TACOM (Wells, Wilson, Killen, and Pappas, 1992). Critical items were identified for each weapon system which—like the M-1 air filters—could stop the weapon system from functioning properly. The special TACOM team then could adopt a proactive approach of checking inventory levels, contractual instruments, and production status. Action could be taken before spares problems became acute. Members of this team have recommended:

... that this CIL be established in the future for all weapon systems. The critical items could vary with environmental and climatic factors. For example, certain parts would be critical in a desert environment that would not be essential in a jungle or arctic environment. The IMT has also recommended that critical items on these lists be monitored during peacetime with periodic briefings by weapon system. This would add visibility to potential supply problems, enhance supply availability, and improve mission capable rates. (Wells, Wilson, Killen, and Pappas, 1992)

A similar recommendation was to develop lists of commercial equivalent items that could be acquired for immediate use in lieu of specific critical spares. The commercial items might not be appropriate for inclusion in the peacetime inventory because of shelf life problems such as corrosion, but would be sufficient for immediate use in a conflict.

Empowerment – Not!

When Killen and Wilson asked about statutory and regulatory impediments, they heard from several respondents that higher organizational levels would not permit them to use the exemptions which existed in laws and regulations. In other words, the impediments were not the laws and regulations; the impediments were the people (intermediate and headquarters staff) who would not permit exemptions to be used.

This was particularly true with regard to approval to use letter contracts to save time and a class Justification and Approval (J&A) to save duplicate paperwork. A J&A is required under CICA each time a contracting organization anticipates procuring by other than full and open competition. A class J&A would permit one document to cover all procurements for a “class” of items—in this case procurements for the Gulf War. Without a class J&A, an individual J&A would have to be accomplished for each procurement action at an enormous increase in paperwork, review, coordination—and time.

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One organization requested authority from its higher headquarters during the first week of Desert Shield to use a class J&A for procurements which could be clearly identified in support of the Gulf War; this is unquestionably permitted by CICA. Personnel at the higher headquarters returned the request without action two weeks later. A respondent in that organization noted:

We did a J&A for every file. We followed all the board rules, all the cost accounting rules, all the social program rules. . . But if the outcome had been different, and we all ended up in front of a senate subcommittee explaining, can you imagine the disgust, if lives had been lost, because of the delays due to the time associated with filling out that paperwork. (Killen and Wilson, 1992)

This example was reflected in the experiences of several other CONUS contracting organizations when dealing with higher headquarters. Many reported a lack of any sense of urgency by people in staff positions at higher headquarters. Below are representative comments received by Killen and Wilson from different organizations:

During ODS we would get calls from headquarters and when we offered to return the call on a Saturday, their answer was typically, "No, it can wait until Monday." There was never any sense of urgency at headquarters. And they certainly weren't working Saturdays. Nor were they trying to make things easier!

And, from another organization:

There was no contracting leadership in Washington. Nothing we could see or feel that meant we would probably have to do all the work of writing a waiver and supporting it, without any likelihood they (headquarters, service department, and DoD contracting) would push it through. If you're working as many hours as we were and talking directly to Saudi, the attention was on serving the folks in the area of operations, whose lives were at stake—not on being responsive to people who had let us down.

Not all respondents indicated this kind of experience with higher headquarters staff. Most notably, contracting personnel at the Defense Logistics Agency (DLA) buying activities, the Defense Mapping Agency,

and the Naval Air Command praised the staff personnel at higher headquarters for their support.

CONUS Contracting Summary

1. The CONUS contracting role in supporting the Gulf War was significant, both in terms of dollars spent and in terms of providing urgently needed support to U.S. military in the theater of operations.
2. Advances in telecommunications made it possible for CONUS contracting personnel to have direct phone links with U.S. military personnel in the area of operations.
3. The CONUS contracting organizations needed legislative relief as much as contingency contracting officers in the theater of operations. This is particularly important in the areas of the small purchase threshold, small business sub-contracting plan requirements, and socio-economic provisions.
4. To prevent lengthy research time, uniform wordings for exemptions should be applied to statutory and regulatory contracting requirements. This should be done in a manner similar to the wording now used for "small purchase threshold" instead of identifying specific dollar thresholds.
5. Mandatory contracting courses should highlight how CONUS contracting personnel should respond in the time of national emergency or war. Simulations would be particularly effective.
6. Military exercises should include CONUS contracting personnel in a capacity in which they are most likely to interact with military forces.
7. During peacetime, critical item lists should be developed for weapon systems *tailored to different geographic and environmental conditions*. Procurement strategies should be developed for these critical items. These should be matched with lists of commercial equivalent items.
8. In a time of military conflict or national emergency, higher headquarters staff must empower the CONUS contracting professionals to do their jobs, and at the very least, not become impediments.

CONTINGENCY CONTRACTING

Compared to the dearth of literature on CONUS contracting, a wealth of information exists for contingency contracting. There are recurrent themes in lessons learned from contingency contracting going as far back as the Vietnam War. Lessons learned from each conflict address problems related to actions permitted short of declaration of a national emergency as well as problems related to language, cultural differences, training, disbursements, market surveys, consolidated contingency contracting guidance, record keeping, and regulatory impediments.

Actions permitted short of declaration of a national emergency

The Defense Resource Act (DRA) (P.L. 85-804 as amended by P.L. 93-155) gives authority to perform extraordinary contractual actions. The DRA is summarized in FAR 50.101(a):

The Act empowers the President to authorize agencies exercising functions in connection with the national defense to enter into, amend, and modify contracts, without regard to other provisions of law related to making, performing, amending, or modifying contracts, whenever the President considers that such action would facilitate the national defense.

There are express limitations in the DRA; for example, it is not an authority for "Providing for other than full and open competition for award of contracts for supplies or services (FAR 50.203(a)(3))." However, the major drawback is that it has not been implemented in recent low-intensity conflicts. As Mason (1988) noted, "The Defense Resources Act . . . relies too heavily on declaration of war prior to deployment. There is a lack of information regarding contingency contracting without declaration of a national emergency."

Thus, contingency contracting officers must be prepared to operate without the statutory relief that could be granted under the DRA if a national emergency had been declared.

Language. Bell (1990) described his personal experiences as a contingency contracting officer accompanying his units into Honduras. Language was a major problem. There had been no foreign language training for new contracting officers. The FAR states that the English language meaning of contract terms translated into another language is the correct meaning; however, a contracting officer without language training is never sure that the foreign supplier really under-

stands the transaction. Almas, Estes, Shero, and Jordan (1992) described a similar situation in the Gulf.

Most people with whom we did business had a limited command of written English. They signed contracts because we told them they must. The majority never read what they signed nor did they fully comprehend what they had read even if they did sign. One of the elements of a binding contract is competent parties. If a competent party must be capable of comprehending the written contract, then we are not sure we had any legally binding contracts.

Compounding the language problem was the difficulty in contracting for translators because of the restrictions on contracting for personal services (Bartlett, 1994).

Cultural differences. Not only is language a barrier in most contingency contracting situations, but cultural differences cause numerous complications. Koster (1991) noted:

More emphasis needs to be placed on the courtesies, customs, traditions, and security threats that can be expected in the country within which the contracting organization is deploying. This is important for contracting organizations because they must operate among the general population. To require an individual to procure from local businesses in a foreign country without the proper orientation, can severely degrade the contracting effort. The insensitivities of Americans to foreign cultures can result in vendors not doing business with the offender. Additionally, not understanding the possible terrorist threats or the dark parts of the town could place the contracting officer in an unnecessary life threatening situation.

Lack of training. A recurring theme throughout all the lessons learned was the lack of training to prepare contingency contracting officers for their specific duties. Although there are several mandatory training courses for contracting people, none of them provide specific training for contingency contracting officers.

Lack of comprehensive guidance. In 1985, Britt and Miles conducted an extensive research project in which they identified 126 provisions from stat-

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utes, regulations, or directives which might impede the contracting process in the event of a national emergency/full mobilization. They noted:

An in-depth review of the literature of the last ten years revealed that no comprehensive national emergency guidance has been developed for the contracting community. A comprehensive document is needed which clearly delineates the laws, directive, and regulations useful or deleterious to contracting functions in a national emergency environment.

The research report by Britt and Miles, *Contracting Under Conditions of National Emergency/Full Mobilization*, contains detailed information that could have been used as a foundation for consolidating guidance for contingency contracting. The Army Procurement Research Office published the *Contingency Contracting Smart Book* (August 1987) and the Air Force Logistics Management Center (AFLMC) published the *Wartime Contingency Contracting Handbook* (1986). However, neither became official documents.

CONTINGENCY CONTRACTING INITIATIVES

The good news is that several contingency contracting initiatives have been implemented within the DoD since the end of the Gulf War. These show promise of making improvements in the acquisition process which should facilitate contingency contracting during future conflicts.

U.S. Army

As this research paper was being completed in Spring 1994, the U.S. Army published contingency and field contracting procedures as a supplement to the Army Federal Acquisition Regulation Supplement (AFARS). This document was based on a comprehensive collection of information compiled under the direction of COL Charles D. Bartlett, USA, the Principal Assistant Responsible for Contracting (PARC) and Commander, ARCENT Contracting Command. This collection of information included lessons learned from all Army units involved in the Gulf War as well as fact sheets on contingency contracting during Operation Just Cause (Panama), Granada and Vietnam.

Based upon these lessons learned, Colonel Bartlett (1994) offered observations and recommendations in regard to contingency contracting. Several of these observations and recommendations with broad application across DoD contingency contracting are paraphrased below:

- *Small purchase threshold.* Raise the small purchase threshold from \$25,000 to \$100,000 for any contract "to be awarded and performed,

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or purchase to be made in support of any contingency declared by Secretary of Defense."

- **Personal services contracts.** Provide a deviation to allow contracts for laborers, translators, and consultants required in the theater of operations.
- **Market surveys.** Identification of sources by on-site surveys would have alleviated time and turmoil in search for adequate suppliers.
- **Automated Data Processing Equipment (ADPE).** Laptop computers with large hard drive storage capacity and contracting software should be developed to accompany the incoming contracting activity.
- **Personnel.** The following personnel arrangements were recommended in support of contingency contracting:
 - A significant number of key positions in the contingency contracting organization could be filled by preselected, specially qualified reserve NCOs and officers called Individual Mobilization Augmentees (IMAs).
 - Finance and accounting and disbursement capability must be co-located with the contracting activity.
 - Resource management and fund certification must be co-located with the contracting activity.
 - Legal advice must be available to the contingency contracting officer from the start.
 - Civilians should be included in the contingency contracting operations. "Civilians were utilized in the Operation Desert Shield/Storm performing admirably."
 - NCOs should be included in the procurement field so they can accomplish the education requirements for appointment as contracting officers.
 - The Acquisition Corps should include Installation and Contingency contracting people.

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- ***Proposed legislative relief.*** A Crisis Action Package (CAP) would be submitted to Congress upon declaration of an emergency which would, for the DoD:
 - Suspend the requirement to prepare a J&A when the procurement is urgent and the U.S. would be seriously injured.
 - Raise the small purchase ceiling to \$100,000.
 - Raise the threshold for requiring certified cost and pricing data to \$500,000 and permit waivers by the Head of the Contracting Activity (HCA).
 - Suspend requirement for referral of determination of non-responsibility of a small business to the Small Business Administration (SBA).
 - Suspend the requirements for and approving of subcontracting plans for each contract to large business over \$500,000.
 - Suspend the requirement for small business goaling and reporting.
 - Align threshold for affirmative action to employ the handicapped, disabled veterans, and Vietnam veterans with the small purchase threshold.
- ***Proposed Regulatory Relief.*** The following emergency revisions would become a part of the FAR and DFARS:
 - Raise the Blanket Purchase Agreement (BPA) ceiling to match the revised small purchase threshold.
 - Waive the Buy American Act, Equal Employment Act, and Balance of Payments requirements.

U.S. Air Force

Based upon lessons learned during the Gulf War, the Air Force completely revised Air Force Regulation (AFR) 70-7 (1992), initiated a Contingency Contracting Officer course, updated a contingency contracting handbook (Robinson, 1991, 1992), and developed software with predrafted Statements of Work (SOWs) (AFLMC, April 1992). The Air Force actions represent a comprehensive improvement to prior contingency contracting guidance.

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The revised AFR 70-7, "Contingency Operational Contracting Support Program" (June 1992), clearly sets forth the statutory and regulatory authority for contingency contracting as well as for exceptions and waivers permitted under certain conditions. Local contingency operational contracting support plans and deployment/mobility kits are discussed. Organizational responsibilities are identified; training and planning are discussed. The regulation is supplemented by a practical, hands-on Air Force Management Center (AFLMC) publication, *Wartime Contingency Contracting Handbook Update* (Robinson, 1992).

Defense Contract Management Command (DCMC) Initiatives.

The DCMC is part of the Defense Logistics Agency (DLA) and has responsibility for post-award defense contract management both domestic and international. Naval reservist CAPT Steve Morgan described a recent DCMC initiative involving deployable contract management teams comprised of Tri-Service reservists assigned to DCMC. Each team consists of 17 reserve officers representing all three military services (Air Force and Army IMA's and Navy reservists) as well as three civilian volunteers from DCMC International. Many reservists are involved in international business in their civilian careers; several have fluency in other languages.

The teams train together and would deploy together in the event of an overseas contingency. They would not make purchases, but would be involved in all other aspects of contract management possibly to include source selection, transportation within theater, and disbursement.

At this time there are three teams, but the plans are to increase the number of teams and to have each team dedicated to specific geographical areas. For example, the team in Dallas would be dedicated to Central and South America; the team in San Francisco would be dedicated to the Pacific area.

When U.S. troops left Somalia in the Spring 1994, the U.S. military contracts were novated to NATO forces. A DCMC reservist team stayed in Somalia to administer the contracts—not for the U.S., but for NATO.

RECOMMENDATIONS

The contracting system will be challenged to provide critically needed support during future military action. Planning needs to be done now. Based on the results of this research, the following recommendations are offered:

Executive agent. An executive agent for contracting readiness should be appointed. The executive agent would perform the role of advocate for contracting readiness within the DoD. In this capacity, the executive agent would:

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- articulate a set of core values for contracting readiness (see below);
- be the focal point within DoD for reviewing lessons learned, observations, and recommendations;
- develop a coordinated action plan for implementation of contracting readiness reforms across DoD;
- become the proponent for contracting readiness training—for both CONUS and contingency contracting personnel.

Core values for contracting readiness reform. A set of core values for contracting readiness must be clearly articulated throughout the DoD and within Congress. These core values would then become the foundation on which any reform efforts are based. The core values are:

- The objective of contracting readiness is to support the soldiers, sailors, airmen and marines who are going in harm's way. U.S. lives are at risk.
- The contracting system must respond differently during contingencies than during peacetime, whether the contingencies are national emergencies or low-intensity conflicts.
- CONUS contracting actions are vital to support during contingencies.
- Mandatory contracting training must address wartime support; contracting personnel must be included in war gaming exercises and simulations.
- As DoD resources decrease, we must continue to develop innovative ways to strengthen contracting readiness. For example, innovative groups like the DCMC reserve deployable teams may take on expanded roles in performing market surveys, coordinating critical items lists for different environmental conditions, and helping contingency contracting officers with language and cultural problems.

SUMMARY

In summary, the information is available on which to base meaningful contracting readiness reform. Lessons learned have been documented after each conflict. In-depth research has been completed. The problem is that action has been slow, non-existent, or subordinated to other pri-

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orities. We know what to do; we just do not put a priority on doing it! During the Cold War, there were higher priorities for the DoD. With the end of the Cold War, the current global unrest, and a national strategy that focuses on preparation for regional conflicts, contracting readiness can no longer be considered a subordinate issue.

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Leaders, Fiascoes and Conspiracies: *Dysfunctional Processes in Groups*

Donald A. Petkus

The great thing is to get the true picture, whatever it is.
Winston Churchill

Leaders who try to build cohesive teams face a dangerous dilemma. Cohesion may have an adverse aspect. Teams may exhibit dysfunctional behaviors and processes that reduce the likelihood of successful outcomes. The author explores the groupthink theory of Irving L. Janis and the unconscious conspiracy described by Warren G. Bennis. Other writers will be examined in relation to Janis and Bennis. Some emphasis will be placed on managerial, military, and political contexts for leadership and group processes. The concept of social cohesion will be explored. Prescriptions for coping with the phenomena will be described. Acquisition managers, especially managers of large programs, should find a kinship with several thoughts and processes put forth in this article.

INTRODUCTION

Leaders cannot function without groups. Warren G. Bennis (1976 and 1989, *passim*) writes of an "executive constellation"—a group of key assistants in an executive team, task force, or committee—to operate the office of the leader. Leaders can use group decision mak-

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Leaders, Fiascoes, and Conspiracies: *Dysfunctional Processes in Groups*

ing process to achieve consensus and commitment to a course of action. Leaders also use groups to avoid the bias of a single point of view or gaps in information and technical skills. As Irving L. Janis (1982) notes, "The usual way of trying to counteract the limitations of individuals' mental functioning, however, is to relegate important decisions to groups."

Most readers can cite some anecdotal evidence or humorous account of poor decisions made by committees or similar groups. In a seeming paradox, an organization composed of extremely bright individuals can make bad decisions and policies when acting as a group. It appears that in some strange way, groups can operate with less competence than any of its members exhibit on their own. Working groups and committees may often decide not to decide. The groups work in loops that never result in a meaningful output such as recommendations or reports. Defective decision making is particularly dangerous today when new threats in the organizational environment are real, but not clearly defined.

The implications for acquisition management are profound. The acquisition process is a group effort that consumes time and money as inputs. The quality of the end product is important to the nation in terms defense and economic survival. In the age of action teams and TQM, leaders are still accountable for decisions made. James P. Stevenson (1993) cites specifically the groupthink phenomenon in connection with problems in military aircraft acquisitions. What Stevenson sees happening in aircraft acquisition applies to other acquisitions. For leaders to capitalize effectively on the teams available to them, they must constantly monitor the quality of group processes, particularly in decision making and reality testing.

In 1886, Friedrich Nietzsche wrote that "Madness is rare in individuals—but in groups, parties, nations, and ages it is the rule" (W. Kaufman (1966), translator).

This article focuses on the works of Irving L. Janis and Warren G. Bennis. It explores the relationship of groups and accomplishing the goals espoused by their leaders. Janis used the term "fiasco" to describe group process failures in decision-making. Case studies of fiascoes examined by Janis include the Bay of Pigs and Watergate. Bennis uses the idea of an "unconscious conspiracy" to describe how subordinates hinder rather than facilitate their leader's performance.

GROUPTHINK DEFINED

Janis (1982) acknowledges the Orwellian flavor of the term groupthink in the following definition:

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I use the term "groupthink" as a quick and easy way to refer to a mode of thinking that people engage in when deeply involved in a cohesive in-group, when the members' strivings for unanimity override their motivation to realistically appraise alternate courses of action. "Groupthink" is a term of the same order as the words in the newspeak vocabulary George Orwell presents in his dismaying *1984*—a vocabulary with terms such as "doublethink" and "crimethink." By putting groupthink with those Orwellian words, I realize that groupthink takes on an invidious connotation. The invidiousness is intentional: Groupthink refers to a deterioration of mental efficiency, reality testing, and moral judgment that results from in-group pressures.

In addition to the definition above, some other negative aspects of cohesive in-groups discussed above appear as groupthink phenomena, i.e.:

- Non-conforming members become isolated;
- Minority views receive little if any attention ;
- Outgroups become stereotyped and dehumanized; and
- Polarized collective judgments: conservatism or adventurism.

The process of groupthink represented in Table 1 is based on a concept first presented in Janis and Mann (1977). This concept was later elaborated on and presented by Janis in 1982. Table 1 implies a temporal sequence moving from I to IV. II is the groupthink tendency as well as the concurrence seeking tendency.

THE UNCONSCIOUS CONSPIRACY

Bennis's definition of the unconscious conspiracy is shaped by his experiences as president of the University of Cincinnati. As he saw it, the presidency was an opportunity for his transition from a theoretician of leadership to a practitioner. On entering his new office, Bennis began to conclude that the university was unmanageable or he was unable to manage. In an epiphany of terror and discovery Bennis (1976) concluded, "I had become the victim of a vast, amorphous, unwitting, unconscious conspiracy to prevent me from doing anything whatever to change the university's status quo."

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Table 1
GROUPTHINK MODEL

			
I	II	III	IV
Antecedent Conditions 1. High Cohesiveness 2. Insulation of Group 3. No Methodical Procedures for Search and Appraisal 4. Directive Leadership 5. High Stress + Low Hope of Finding a Solution Other Than That Favored by Leader or Other Influential Persons	Concurrence Seeking Tendency	Symptoms of Groupthink 1. Illusion of Invulnerability 2. Collective Rationalization 3. Belief in Group's Inherent Morality 4. Stereotypes of Out-Groups 5. Direct Pressure on Dissenters 6. Self-Censorship 7. Illusion of Unanimity 8. Self-Appointed Mind Guards	Symptoms of Defective Decision Making 1. Incomplete Survey of Alternatives 2. Incomplete Survey of Objectives 3. Failure to Examine 4. Poor Information Search 5. Selective Bias in Processing Information at Hand 6. Failure to Re-Appraise Alternatives 7. Failure to Work Out Contingency Plans
'DECISION MAKING: A Psychological Analysis of Conflict, Choice, and Commitment by Irving L. Janis and Leon Munn. Copyright © 1977 by The Free Press, a division of Simon & Schuster. Adapted with permission of the publisher.			

When Bennis sought to pursue academic issues and strategic planning, he found himself beset with trivia in his in-basket. Alumni wanted football tickets. Employees complained about parking. A teacher complained about the heat in his classroom, driving Bennis to write: "I suppose he expected me to grab a wrench and fix it." Because of the trivia confronting them, leaders may find no time to do the things they want and need to do as leaders. Bennis uses the term "wet babies" to describe trivial, time consuming problems passed on to leaders by subordinates.

The *Doppelganger* is a cardinal feature of the unconscious conspiracy. The concept is congruent with the issues of group process in doublethink. The *Doppelganger* is a twin or ghostly double of the leader. Bennis uses the term to describe the recruiting and promotion of candidates who most resemble those already in power.

Rosabeth Moss Kantor is well versed in the Bennis notion of the *Doppelganger*. Kantor (1985) summarizes the perniciousness of the *Doppelganger* effect:

For example, leaders may create closed inner circles consisting of "doppelgangers," people just like themselves, who are their

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principle sources of organizational information and tell them only what they want to know. The reasons for the distortions are varied: key aides want to relieve the leader of burdens, they think just like the leader, they want to protect their own positions of power, or the familiar "kill the messenger" syndrome make people close to top executives reluctant to be the bearers of bad news.

Such a situation has a dangerous potential when the leader is deficient in some areas of expertise critical to the policy issues being decided. Bennis (1989) uses President Reagan as an example of what can happen:

Reagan's problems were compounded by the fact that he relied heavily on his aides. He's not much of a reader, and according to the late chief of the CIA William Casey, he doesn't like to work very hard, and so, more than any of his predecessors, he counted on his staff supplying him with everything he needed to know. His staff failed in this regard—judging by the president's numerous press conference lapses, along with the Iran-Contra scandal.

The one thing a president—whether of the United States, a corporation, or a university—needs above all is the truth, all of it, all of the time, and it is the one thing a president is least likely to get from his assistants, if they are cut from the same cloth.

The *Doppelganger* effect is so pronounced in some organizations that subordinates resemble their superiors in not only their value systems, but their dress and even physically. Informal or informal dress codes for agencies made people identifiable as to which agency employed them, (e.g., the FBI look). Some organizations are populated by people who physically resemble each other. The result may combine the worst features of yes men and in-breeding.

SUBORDINATE LEADERSHIP AND DECISION MAKING

Operating in a staff role, the group becomes a quasi-decisionmaker by selecting the information and options presented to the leader. The group's input and menu of options often shapes the decision making of the leader, perhaps for the worse. Like many other military leaders of the Third Reich, Field Marshall Gerd von Rundstedt had misgivings appar-

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ently about Operation Barbarossa, the disastrous invasion of the USSR. He failed to present his reservations, forcefully, if at all, to the Fuhrer. According to Janis's analysis of secondary sources, President Kennedy's closest advisers suppressed their misgivings about the Bay of Pigs invasion because of the apparent enthusiasm of Kennedy himself and two high status members of the group. It is apparent that for leaders to have realistic options and assessments presented by staff members, freedom of dissent must be institutionalized. Members must be able to express their reservations without fear of punishment or loss of status. The group's role as information gatekeeper can be positive or negative, but is always critical.

Mark A. Abramson and John W. Scanlon argue that the absence of subordinate leadership, (i.e., managing one's boss), renders organizations and bosses less effective. The notion of effective "followership" has been perhaps underrated. As Abramson and Scanlon (1991) point out:

When subordinate leadership is missing in a government organization, the agency's top manager usually looks ineffective or inept. The boss's strengths are ignored and weaknesses magnified. Unfortunately, this public perception also means that the agency mission is suffering. Subordinates must help their bosses succeed.

Followers can provide true subordinate leadership to help the chief executive and the organization succeed. In terms of the unconscious conspiracy, followers can free their bosses from being bogged down in trivia by taking the initiative to keep "wet babies" off the boss's desk. It is an old principle worth re-emphasizing that subordinates should deal with the trivial, so the leaders can deal with the significant. It is important for the subordinate to know how much information his or her boss wants or has time to deal with. A well indoctrinated subordinate leader can distinguish the trivial from the significant.

DEFINITION AND MODELS OF COHESION

Cohesion may accompany faulty decision making and staff support in some cases, but cohesiveness in teams and groups is usually considered desirable. Military leaders in particular seek to establish cohesiveness in their teams and groups to enhance survivability and success in combat. Ben Shalit's studies of the psychology of the military, particularly in Israel and Sweden, provide us with two models of cohesion.

Cohesiveness in a group implies that the individuals in the group share common values and goals. When individuals feel themselves to be part of a cohesive group, they feel the need to protect the group and work for its goals. The degree of cohesiveness in a group can be deter-

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mined by the degree of communication and dependence of the members, including the leader. To consider himself part of a group, an individual needs to perceive himself as linked to at least one other member whom he communicates with and depends on. Unless such links are formed, the individual will not be integrated into a group. In extreme forms, if links do not exist, a true group does not exist. Instead, one may have an almost random collection of unconnected individuals, ostensibly operating under some vague charter. If the links are weak, the group is not cohesive enough to stand up to stress and will dissolve into its constituent members, each with a separate agendas. As Shalit (1988) puts it:

When the soldier feels himself to be part of a cohesive group, there will be pressure on him to behave according to the needs of the group. When he sees himself as an individual, his behavior will primarily depend on what he feels to be best for his own survival or his own emotional needs. This may be the cause of collapse of the fighting ability of individuals in a unit after a certain proportion of the unit has been destroyed. . . . it is clear that there comes a point when the group does not function as a group, and its effectiveness is destroyed—although individuals in it could, technically, proceed to fight.

Figure 1 represents two models of cohesiveness described by Shalit (1988). In both A and B, leaders are represented by rectangles and followers by circles.

Notice that A represents an older, strictly hierarchial and rigid organizational configuration, not significantly different from the stratified, pyramidal corporate structure. This is a relatively simple model of cohesiveness in that each follower is linked to the follower above him or her and the senior follower is linked to the leader. Like a string of beads, the effect on the group of breaking a link depends upon where the breakage occurs. In the example of an infantry platoon based on the A style model, the lieutenant communicates through his sergeant to the enlisted. The death of the junior private at the bottom of the chain of command would have little effect on the cohesiveness of the rest of the platoon. The loss of the sergeant would severely affect cohesion by severing the link between the lieutenant and the enlisted personnel.

This model is extremely simplified. It does not consider the quick reconstitution possible because of seniority-based succession. In the extremely hierarchial model, the loss of the leader may result in decapitation. Highly centralized command and control structures, characteristic of totalitarian cultures, often do not provide for succession to leader-

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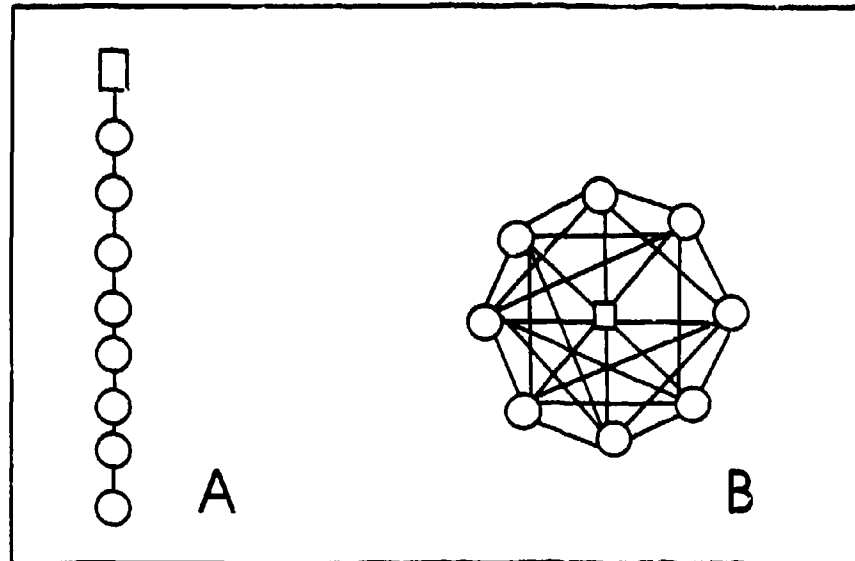


Figure 1. Ben Shalit, *The Psychology of Conflict and Combat* (Praeger Publishers, an imprint of Greenwood Publishing Group, Inc., Westport, CT, 1988) Copyright © 1988 by Ben Shalit. Reprinted with permission.

ship. The death of the hypothetical lieutenant will mean the group will lose its vision, goal, and key information. The group will then either dissolve a collection of individuals each with a personal agenda for survival or, mutually agree to maintain cohesion in pursuing survival.

If A may be likened to a chain, B is a star-like structure. Each member of the group is linked directly to the leader and each member has multiple links of communication and dependency with others. The B model group is inherently more cohesive because of the multiplicity of its internal linkages. It is also more likely to survive as a group even with the loss of several members. In theory, the B model group is so cohesive it could survive as group with only two members and continue to pursue its original missions including group maintenance/survival and task achievement. Rational leaders would pursue the B model in order to facilitate achieving the group purpose and the development of subordinate leadership.

TREATMENT OF DISSIDENTS IN GROUPS

A group that is strongly integrated along the lines of Shalit's B model may sense a threat to its internal homeostasis when a member takes on the character of a dissident, a loose cannon, or the unauthorized devil's

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advocate. A group's internal critics who challenge the group's unity, values, and *esprit de corps* become perceived as threats. Janis (1982) cites research by Stanley Schacter that the group at first attempts to bring the dissident back in line with group norms and values. It does this by increasing communication with the dissident by the majority view members. The majority view members reduce communication with the dissident if he or she does not recant. The dissident who does not recant finds himself or herself increasingly isolated. The group has either smothered the dissident, much in the way an oyster forms a pearl over an irritant or now considers him an outlaw, or at least beyond the pale. In any event, the dissident's input is not sought and has little impact on the group's decision making. The self-appointed "mindguard" described in Janis (1982, *passim*) functions in the role of anti-body isolating the dissident. For the leader of such a group, the range of options available for consideration constricts because the dissident goes unheard.

Jerry B. Harvey (1988) disagrees with Janis. Harvey claims that tyranny of the group is perceived, not real. The real problem, according to Harvey, is failure to manage agreement. The group may take a course that none of the members subscribes to, but no individual wishes to disturb the perceived wants of others. While Harvey's insights into morality and ethics in organizations are interesting and valuable, the arguments against tyranny of the group are not persuasive.

DYSFUNCTIONAL ASPECTS OF COHESION

On an intuitive level, it may be difficult to envision negative aspects of a cohesive team that shares values, goals, and can survive the loss of some members and continue to function. Excessive homogeneity and disproportionate commitment to the party line can adversely affect the group process. Some groups may become so cohesive on a social level that the members concentrate on social interaction rather than the tasks before them. Such groups may seek (consciously or unconsciously) to avoid completing their tasks so that the group may continue and thus go on meeting their social needs.

Perhaps on a more sinister level, Janis (1982) notes two tendencies in cohesive groups that definitely impact on the decision making process:

- Groups develop stereotyped images of out-groups with whom they compete; out-groups are dehumanized.
- Collective judgments become polarized—either extremely conservative or riskier courses of action than individual members would normally elect themselves.

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The dysfunctional aspects of life in cohesive groups has been noted by other researchers. In his chapter "Destructive effects of groups on individuals," Walter C. Swap (Swap *et al.*, 1984) describes several negative effects seen in groups:

- Social loafing, or a tendency for individuals to work less when responsibility is diffused in a group.
- Deindividuation, or the loss of individual ethical restraints in an individual, acting as part of a mob or other group.
- Pressures toward group consensus, or toeing the party line.
- Isolation of the group from its environment.
- Inappropriate group norms.
- Groupthink, as formally defined by Janis.

JANIS'S PRESCRIPTIONS

In Chapter 11, Janis (1982) summarizes nine prescriptions for preventing groupthink. With tailoring for specific circumstances, these prescriptions could reasonably be used to treat organizations already infected with groupthink. Janis considers the enormous difficulty in the transition between describing and diagnosing a pathology, or "pollution" as he terms it, and developing practical solutions and treatments.

Janis is practical enough to consider the enormous expenditure of administrative resources that would be necessary to implement these changes. Depending on the stakes involved, some changes may not be cost effective. Janis also recognizes that these prescriptions may have adverse side effects. While the leader may encourage the group members to challenge his or her thinking, the resulting debate may prove prolonged and destructive of group discipline. Janis considers ethical impacts of some changes. Is there a value in improving the decision making process if the group's purpose is evil?

To summarize, Janis's nine prescriptions for preventing groupthink are:

1. The leader of the group must assign each member the role of critical evaluator. The leader must reinforce his or her acceptance of criticism, so that members will actually voice their concerns and doubts.

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2. When assigning a policy making mission to a group, the organization's upper hierarchy must not state preferences, assumptions, and expectations at the outset.
3. Routinely set up several independent groups operating under different leaders to work on the same problem or question.
4. When policy alternatives are being evaluated for feasibility and effectiveness, the group should divide into subgroups, meeting separately under different chairpersons. Later, the group should reunite to hammer out differences.
5. Each member should go back to trusted associates in his or her own unit and report on the group's deliberations. The members should then report the reactions to the deliberations.
6. Qualified experts or qualified colleagues should be invited to sit in on meetings and challenge the views and assumptions of the core group members.
7. At each meeting dedicating to evaluating alternatives, at least one member should be assigned the role of devil's advocate.
8. When the issues involve relations with rival organizations or countries, considerable time must be dedicated to reading warning signs from the rivals and evaluating alternate scenarios of their intentions.
9. After arriving at a preliminary consensus of the best package of alternatives, the group should hold a "second chance" meeting in order to voice most vigorously any remaining doubts and rethink before making a definite choice.

BENNIS'S PRESCRIPTIONS

Bennis (1989) offers his readers five rules to be followed by presidents or other leaders to counteract the *Doppelganger* effect. They are paraphrased below:

1. Rotate assistants every two years to ensure more humility, openness, and less arrogance.
2. Ensure that at least some assistants have contact with constituents to understand obligations and limits of power.

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3. Reject the *Doppelganger*. Recruit staff with as much diversity as possible.
4. Read the paper daily. Avoid relying solely on staff summaries.
5. Do not rely solely on intimates for information.

**COMPARISON OF GROUPTHINK
AND THE UNCONSCIOUS CONSPIRACY**

Groupthink and the unconscious conspiracy share many parallels and connections. Three areas that suggest themselves are the treatment of dissent, moral numbing and the effect of stress on organizations.

In Bennis's discussion of dissent and the drive for conformity within organizations, one finds an analysis comparable to groupthink. As Bennis notes (1976):

Ironically, this pervasive emphasis on harmony does not serve organizations particularly well. Unanimity leads rather quickly to stagnation, which, in turn, invites change by nonevolutionary means. . . . Most organizations would rather risk obsolescence than make room for the non-conformists in their midst.

Janis posits stereotyping of outgroups and a sense of moral rightness as characterizing groupthink. Bennis describes a blunting of the moral sense in the unconscious conspiracy that is comparable to groupthink. Bennis describes what happens in segmented organizations, where one's activity in one's own group does not seem to make one responsible for what the organization as a whole does. This situation can be compared to the policy or decision making groups in Janis's model. They can become divorced from the moral implications of the greater corporate structure by viewing themselves as merely technical planners.

As Bennis writes:

In this segmented environment, any one individual can develop tunnel vision, concentrating on the task at hand, completing this task with a sense of accomplishment, however sinister the collective result of all these individual jobs well done. This segmented structure characteristic of all large organizations encourages indifference and evasion of responsibility. A benefit of membership in such an organization is insurance against the smelling of burning flesh. Speer, for example, still

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does not seem particularly troubled by the horrors of slave labor in his wartime munitions plants even when making his unique public confession.

Janis¹ indicates that high stress, such as that encountered by the Watergate group, coupled with low hope of a better solution than that proposed by influential leaders in the group, fostered groupthink tendencies. Psychologists have recognized that boredom and trivialization of work can produce stress, much as overwork would. In Bennis's account of the unconscious conspiracy, trivialization of the leader's work produced stress in the university president's life. It would be quite easy to imagine a meld of the high stress, low hope, and trivial routine driving an executive constellation into the worst of groupthink and the unconscious conspiracy.

THE PERILS OF TECHNOCRACY

The acquisition corps and many federal agencies are populated by engineers, scientists, and other technocrats. Most technocratic leaders may focus almost exclusively on the technical fix and neglect interpersonal realities. John H. Johns et al. (1984) write of the effect of technology on group cohesion:

Sophisticated equipment requires highly trained operators whose attention is necessarily oriented toward the equipment rather than toward other people in the group. Leaders, too, are required to be technically oriented. Much time is required to learn technical skills, and leaders often become more "thing oriented" than "people oriented." Although this situation does not necessitate the neglect of interpersonal relations, the evidence is that it does so to an extensive degree.

Owen C. Gaden (1986) reported on studies of engineers and scientists placed into management that suggested that technical expertise did not guarantee programmatic success. Scientists and engineers tend to excel at quantification and hardware rather than in interpersonal relationships. Successful dealing with people counts for more in successful leadership than successful engineering. The results of placing engineers and scientists in middle management posi-

¹ Some references to Janis (1982) are adapted text. Irving L. Janis. *Groupthink*. Second Edition. Copyright © 1982 by Houghton Mifflin Company. Adapted with permission.

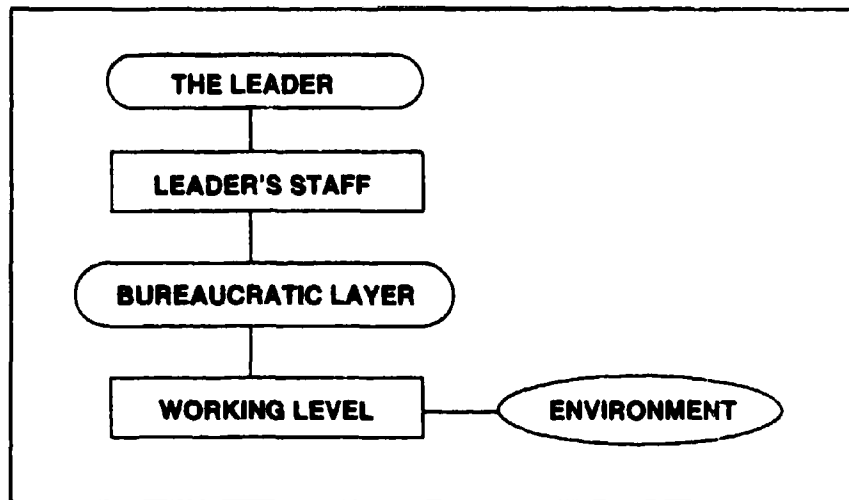


Figure 2. Information Flow in Stratified Organizations

tions where they support higher placed technocrats with the same credentials may prove problematic.

People skills are the most important component of program management. The number of acquisitions that are technically sound, but over budget and over schedule is striking. The moral for technocrats is to be aware of the danger of recruiting the *Doppelganger*.

INFORMATION FLOW WITHIN ORGANIZATIONS

Being aware of the information flow within his or her organization is of prime importance to leaders. Bennis's dictum for leaders to read the newspaper daily as a partial remedy to the unconscious conspiracy is especially important to the leaders of stratified bureaucracies in large organizations. Often the leader and his staff consider themselves too busy to do the equivalent of reading the newspaper or even reading their mail.

Figure 2 represents a model of information flow suggested by Thomas B. Allen's account of a discussion with Lincoln P. Bloomfield (Allen, 1987). Bloomfield, a former naval officer, led and coordinated several wargame and political-military simulations with cabinet members and high ranking military officers as participants.

In Bloomfield's view, the working level personnel interface with the organization's environment. The working level sees the outside and tries to move recommendation up to the executive staff and the leader. These attempts are frequently blocked by resistance from the bureaucratic layer

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or layers between the working level and the executive staff. Information and recommendations do not move easily. As Bloomfield said:

It does not very often penetrate that world . . . of the President, the national security adviser, the Secretary of State, the NSC staff, the senior staff, and the President's immediate decisionmaking family, the Meeses, the Bakers. And they generally know less about foreign affairs than the President.

Bloomfield's views are consistent with Kantor's (1985) account of isolation at the top and Bennis's dictum that leaders need to read the newspaper daily.

CONCLUSIONS/RECOMMENDATIONS

- Constantly monitor the quality of group processes.
- Leaders are responsible for group output, including decision making.
- Isolation from reality takes many forms. All are dangerous.
- Subordinate leadership is essential for success.
- Indoctrinate/empower your team to not pass "wet babies."
- Re-examine group cohesion. Often it can be unproductive socializing or stifling of alternate views.
- Technocrats are especially vulnerable to groupthink and *Doppelganger* phenomena.
- Read/reread Janis and Bennis. Use their insights to diagnose and treat dysfunctional groups as needed.

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Project Kaizen Looks at Congressional Oversight of Defense Acquisition Programs

William F. Scott, et al.

This article is a product of a Section C, Program Management Course 94-1 project to review congressional oversight of Department of Defense (DoD) acquisition programs with the aim of continuous improvement. The section divided into three teams with charters to analyze pending legislation in both houses of Congress concerning acquisition reform to determine potential impacts on DoD; to examine recurring formal oversight documentation required by Congress; and to examine one-time reports required by law and committee language. This article summarizes some of the findings and conclusions. A list of participating students appears at the end.

BACKGROUND

Legislative oversight of the Military Departments is a responsibility firmly rooted in the Constitution, Article I, Section 8. From the few simple words, "To make rules for the Government and regulation of the land and naval forces," has grown a host of provisions which describe oversight responsibilities of the Congress and the General Accounting Office (GAO). The practices employed to exercise congressional oversight, as tedious as they may be for program managers, serve a vital function—that of providing information to Members of Congress and their staffs to enable better understanding of the operational needs and acquisition priorities of the Services' leadership.

The Congress often requires the Department of Defense to prepare reports to satisfy a variety of needs, not all of which are readily appar-

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ent. Members use the mechanisms of Questions for the Record (QFRs) and requests for special reports to reach political compromise and avoid legislative delays. The broad desire of a committee to "do something" on an issue spurs action to require a report be undertaken to flesh out the issues and to isolate possible solutions. Reports are also requested as a forcing function to compel the services to reach consensus among themselves and with the Office of the Secretary of Defense (OSD) on specific issues. Members oftentimes believe that DoD has not made sufficient progress or has been nonresponsive to a QFR or earlier committee language and, therefore, demand a report be prepared. In other cases, information from DoD has been inconsistent or more general than desired. Reports also serve to highlight congressional special interest items and to respond to constituent concerns or interests.

PROJECT KAIZEN METHODOLOGY

A group of senior acquisition professionals, military officers and equivalent grade civilians, undertook a 6-week special project while attending the Defense Systems Management College (DSMC) Program Management Course 94-1. We named the project Kaizen. The word *kaizen* is derived from a Japanese expression referring to the concept of continuous improvement. The focus of this project was specifically to examine Congressional oversight of defense acquisition programs—in particular, the reports process—to establish a current database and to identify areas for potential improvement. The broad purpose of this work was to find ways to improve the quality of information while also looking for more efficient ways to communicate.

The team examined regularly recurring reports or those required by DoD Instruction 5000.2, Defense Acquisition Management Policies and Procedures, and special reports prepared in response to questions or congressional language. The techniques chosen for this work were individual interviews, survey development, data collection (interviews, survey, sample report research), database development, analysis, team assessment, findings and conclusions.

We explored the following hypotheses:

1. Reporting requirements are increasing.
2. Comparison of report format, content and frequency may yield potential efficiencies for DoD.
3. A comprehensive DoD report tracking system would improve the process.

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4. Lack of timeliness in reporting is a principal issue.

Bearing in mind the limited time available for this work, Project Kaizen established a target population, composed of both legislative and defense organizations, to develop issues that could be the focus of more careful scrutiny by future working groups. The team interviewed staff professionals of the House Armed Services Committee (HASC), the Senate Armed Services Committee (SASC), the Defense Subcommittee staffs of the House Appropriations Committee (HAC) and the Senate Appropriations Committee (SAC), the Congressional Budget Office (CBO), the Defense Performance Review Office, the Office of the Secretary of Defense (OSD) (Legislative Affairs), the OSD Comptroller, the Office of the Undersecretary of Defense (Acquisition and Technology), the Office of the Deputy Undersecretary of Defense (Acquisition Reform), the Washington Headquarters Service (WHS), and the DoD Inspector General. Clearly, many more players participate in the oversight process. Still, substantive discussions were held with a fair representation of the primary stakeholders.

The team experienced excellent cooperation from all organizations. Numerous stand-alone databases were obtained in hard and soft copy. Actual reports from an Acquisition Category I (ACAT I) program over a full fiscal year were used to create a database containing each report, data element, and its value. This automated database provided the ability to sort and compare the data. The databases were extensively reviewed. Correlating the data between sources yielded results that can be used to streamline and enhance the utility of future reporting.

The results serve to illuminate the degree of inconsistency and duplication of effort. As expected, the data was inconsistent because of significant program changes between submittal dates of the various reports. For example, subsequent to submittal of the Selected Acquisition Report (SAR), the production quantities were decreased and the unit cost was updated to provide the most accurate estimate for submission of the President's budget. While some reports can be eliminated and while it is certain that combining some reports into fewer submittals would reduce inconsistency, the need to provide Congress with the latest and most accurate information would still have to be accommodated.

FINDINGS

Report requirements continue to increase. Trends in report requirements indicate no lessening of the need for information. According to a report from the Secretary of Defense to the President dated January 1990, DoD reports to Congress grew 224% from 1980 to 1988, far faster

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than any other government agency and nearly three times the average growth of other agencies. Acquisition issues comprise approximately 45% of the reports requested by Congress.

No comprehensive report tracking system exists either within Congress or in the DoD. The lack of a comprehensive tracking system results in duplicative requests for information and needless expenditure of DoD resources to repeatedly respond. A DoD tracking system existed in the mid-80s which served the need well, but this directory is no longer provided. Interestingly, some in DoD believe that the tracking function is performed by the DoD Comptroller (DoD(C)). In fact, the DoD(C) only monitors submission of most non-recurring reports, while the Washington Headquarters Service monitors submission of some recurring reports. Neither office provides routine status reports to Congress on tracking of actions assigned. Therefore no organization is tracking the entire body of requests from Congress (QFRs, recurring reports, and one-time reports that apply to both budget and technical issues).

Timeliness of reports is a major issue. Congressional staffers are of the opinion that the DoD response circuit is unnecessarily complex. If a problem with a due date surfaces, the staff and Members would like to know informally, well before the suspense date rather than receive a formal letter on or very near the deadline. Staffers suggested that, particularly for one-time reports, the requester should be able to work directly with the DoD action officer to ensure a useful product is obtained.

Recurring reports are useful. The sampled population had no recommendations for change in either format or content. The most valuable acquisition reports are the SAR, Research and Development Descriptive Summaries (RDDS), Congressional Data Sheets (CDS), and budget back-up books. Research, Development, Test and Evaluation (RDT&E) budget exhibits are intensely scrutinized by the Services, OSD(C) staff, and the professional staffs of the four congressional defense committees. Although RDT&E funding is small compared to other appropriations, it is the cornerstone for each program. The format for this recurring report changes almost annually, requiring more detail at each revision. The latest formats were profoundly different from prior years. As a spinoff of Project Kaizen, an RDT&E Budget Exhibits Handbook has been prepared which provides step-by-step instructions on the preparation, analysis, and scrub of these exhibits. Based on the team assessment, opportunity exists to streamline the recurring reports.

The congressional staffers surveyed are generally satisfied with the reports, even though quality varies. Some reports do not answer the question asked. In other cases, reports are not appropriate for the intended audience. Two specific reports—the Industrial Base Strategy and

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Critical Technology Plan—are perceived by the staff to be urgently needed and are sometimes delinquent. Both represent long-term investment strategies and critical planning that will define a process for smart spending of scarce resources. The surveyed staffers indicate that Members see these plans, once agreed upon by DoD and Congress, as being the necessary management tools for long-term investment, which would reduce the tendency to “earmark” funds for special interest research and development.

CONCLUSIONS

All four hypotheses explored by Project Kaizen were confirmed. Reporting requirements continue to increase. Potential efficiencies can be gained by changing some aspects of the communication process with Congress. A comprehensive DoD report tracking system would certainly improve the information flow. And finally, timeliness of the reports is a principal concern.

RECOMMENDATIONS

The DoD should:

- Develop a comprehensive tracking system and establish a single point of contact (POC) to coordinate all congressional reporting requirements. This POC should have sufficient authority to commit resources and influence the delivery of required products. The POC would deconflict/rationalize tasks to streamline and consolidate requests to avoid duplication or overlaps. Furthermore, the POC would work with congressional staffers on setting priorities and negotiating deadlines, if necessary, on outstanding requests.
- Submit reports to Congress electronically. Currently staffers neither retain all reports provided nor have time during critical committee activity to search for information previously provided. Use of an electronic database with index and key word search capability would greatly enhance access, encourage retrieval of existing information, and conceivably reduce the need for special requests. Commercially available management information systems provide sufficient levels of program indenture to enable rapid retrieval of technical, financial, and programmatic information. A pilot program, sponsored under the provisions of the National Performance Review (NPR), could equip the legislative liaison offices with a uniform digital information management system able to receive information electronically. This would support: (1) more rapid transfer

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of information between DoD and Congress; (2) mass distribution of information to appropriate committees/subcommittees; and (3) automated search and retrieval of information already provided to answer queries from Congress, without the need for a special report.

- Facilitate more open dialogue between the requester and the DoD action agent preparing the response. Direct communication would help ensure that the right information in the right format is provided to Congress the first time. On the other hand, action officers involved in liaison with staffers must clearly understand the limits of their charter—that is, to reach clear understanding of the requirement and not to articulate a Service position on specific subjects under review.
- Know your customer. Regardless of the level of detail provided, some will view the report as too technical and others as not specific enough. Consider providing reports with varying levels of detail such as a summary statement supplemented by a detailed report.
- Establish a process action team (PAT) whose goal is reducing the number of regularly recurring reports to Congress. Project Kaizen readily determined that the Unit Cost Report and the Exception Unit Cost Report should be eliminated since all critical information is contained in the SAR and Exception SAR. We also concluded that the Defense Acquisition Executive Summary (DAES), while not submitted to Congress, could be used as the principal program database and could replace other recurring reports submitted to Congress (such as the SAR and APB).
- Establish an Integrated Product/Process Team (IPPT) to complete and publish the RDT&E Budget Exhibits Handbook. This Handbook, drafted as a spinoff of Project Kaizen, is currently under review at DSMC. In addition to aiding program managers in preparing RDT&E budget exhibits, the guide provides hints on common errors, omissions, and questions often asked by analysts in reviewing the documents. An IPPT is needed to complete the document, publish, distribute and maintain the handbook.
- Place priority on completing two reports of special interest to Congress: the Industrial Base Study and the Critical Technologies Plan. Both were perceived to be overdue to Congress and, therefore, require urgent attention by DoD. In the absence of a DoD plan or

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strategy, the risk is that Congress will take action which may have undesirable consequences for national defense.

SUMMARY

Congressional oversight, while serving the vital function of keeping Congress informed of the operational needs and acquisition priorities of the military departments, creates a significant burden on program managers. At the same time, the Constitution clearly mandates that Congress has the fundamental responsibility "... to provide for the common defense ... to raise and support armies ... to provide and maintain a Navy ... to make rules for the Government and regulations of the land and naval forces." The exercise of that responsibility has resulted in a burgeoning list of recurring and one-time reports on acquisition programs.

Opportunities exist for streamlining both the process and content of reports to Congress. The NPR and the Secretary of Defense have recently empowered us to challenge the old ways and to pilot demonstration projects in reengineering government functions. In today's manpower and funding constrained environment, we must turn our energy to finding better ways of communicating vital acquisition information to Congress.

Colonel Scott, USMC, led the team which participated in Project Kaizen and contributed to this article. Team members were: Vicky R. Armbruster; Mark R. Bebar; James R. Carlson; James Colombo, Sr.; Richard E. Edelman; Scott E. Farnsworth; Craig A. Farr; CAPT Robert N. Freedman, USN; Douglas C. Gage; CAPT Michael T. Gehl, USN; Thomas C. Golart; Thomas H. Holzer; Dr. Virginia Kobler; David R. LaRochelle; Col Robert N. Leavitt, USMC; Sue A. Lumpkins; CAPT John T. Manvel, Jr., USN; Billy S. Miller; James A. Nooney; Peter D. Patrick; Jeffrey T. Pearl; Col James R. Penick, USAF; CAPT John H. Priesel, USN; Joseph M. Rivamonte; William E. Roberson, Jr.; CAPT Dennis L. Ryan, III, USN; Philip H. Spector; Col Billy K. Stewart, USAF; CAPT Peter B. Strickland, USN; and Mark C. Tuten.

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Readers Speak

Comments on DAB Review Guide for Program Offices Article

I have just finished reading Vol. 1, No. 2 of the *Acquisition Review Quarterly (ARQ)*; like your first issue, it is a tremendous contribution to the field. I do have comments on the article entitled *Coming Up Golden: Defense Acquisition Board Review Guide for Program Offices*. I understand Colonel Greenberg's and Ms. Palley's article was written based on their experiences with the Joint STARS program, which was the first Air Force program to fall under the latest DoD Instruction 5000.2 revision. Overall, I found the article to be excellent. However, the authors' purpose was to "... provide suggestions for future programs DAB reviews." Based on our ongoing experience with the DAB review process, I have a different view concerning three of the authors' generic assertions.

First, the authors state the Defense Acquisition Board (DAB) review cannot be accomplished within the specified schedule because "... several processes, notably the independent cost estimate, take longer than six months." Our perspective is that in developing the independent estimate we request the program office to clarify portions of their program which may be poorly defined or totally undefined. In the give and take of explaining the program, the program office gains insight into the types of questions and requirements that can be levied going to the DAB and may request more time to define, estimate, and prepare their program. Admittedly, there have been occasions where the independent team has requested slips when clarification or data were not forthcoming, but the requests have never been granted.

Second, the authors assert "Though the CARD [Cost Analysis Requirements Description] will never be sufficient to perform an estimate" The CARD is the basis by which we seek understanding and clarification of a program. It must reflect the program baseline in detail or it will be inadequate to perform a full life-cycle cost estimate. If the CARD is not sufficient to perform an estimate, then it is not useful to its principal customers—the independent estimating teams within the services and OSD. There are clear guidelines in DOD 5000.4M and the AF supplement

Readers Speak

as to the minimum CARD requirements needed to describe the program baseline. Any additional information beyond that reduces problems in reconciling estimates. The CARD process is new and we've learned a lot since Joint STARS. With few exceptions, recent CARDS have been sufficient to estimate large portions of the program without any further baseline clarification, and have been completed without putting the DAB schedule in jeopardy.

Finally, the authors state "... the ICE will without fail increase your required line" They further imply that the ICE created a \$900 million disconnect. The rephasing effort was required to fix an existing condition; the ICE represented about a third of the total increase. While it is true the independent estimate for Joint STARS was indeed higher than the program's budget, there are many other cases, most notably the recent Titan IV DAB review, in which the independent estimate was well below the program's current budget. Put simply, the independent estimating team's job is to estimate and advise on the most probable cost of the program. The degree of risk OSD and the Air Force are ultimately willing to accept will determine the impact on the budget.

Thank you for allowing me to voice my concerns. Keep up the good work on your excellent publication. We look forward to contributing to it in the near future.

GORDON D. KAGE II, Col, USAF
Commander
Air Force Cost Analysis Agency

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