STRATEGIC SOURCING: DON'T LOSE SIGHT OF THE FOREST

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ABSTRACT

In recent years, the United States (U.S.) government has attempted to utilize strategic sourcing to reduce acquisition and operating expenses. However, currently accepted best practices for implementing strategic sourcing of services and commodities developed in the private sector fail to account for the diverse and unique set of strategic objectives present in the public sector. Value-Focused Thinking (VFT) was used to develop a value hierarchy to help a U.S. government agency assess opportunities for the strategic sourcing program. This hierarchy represents the full range of program objectives, and was used to develop a value function useful for systematically evaluating service and commodity requirements for strategic sourcing potential.

INTRODUCTION

As economies have become more integrated and interdependent, organizations are increasingly adopting the concept of strategic sourcing to reduce costs and increase efficiencies. The procurement function has subsequently evolved from a tactical role to a more strategic role [3, 10, 12, 17] in which decision-makers align the purchasing function's goals with the organization's strategic goals. Applicable to all types of organizations, strategic sourcing focuses on creating value-added supply relationships [17], which has helped some companies save 20% in procurement costs [5]. A key contributor to these cost savings is the concept of leveraging, which is often referred to as buying power [6, 15]. However, focusing solely on buying power does not represent a systems perspective and could be a long-term detriment to the organization [17]. There is a similar concern that the United States (U.S.) government is developing a singular focus on buying power: "Strategic sourcing is just another example of our efforts to best leverage the government's buying power" [13]. Furthermore, an Air Force contracting leader stated that "despite the huge buying power our Air Force dollars should have, we are missing opportunities to leverage our dollars" [11].

To help prevent losing sight of the forest for the trees, the objective of this research was to develop a decision model to incorporate strategic dimensions into the decision-making process by examining the opportunity assessment activities of one of the commodity councils in the U.S. Air Force. Unfortunately though, there is little information in the literature regarding decision models related to strategic sourcing. The Data Envelopment Analysis approach has been used to develop a decision model related to the selection of suppliers [18] and other published methodologies, like Kraljic's method, have been used to find the best solution for a strategic sourcing opportunity. However, no methodology has been developed to address the opportunity assessment phase in strategic sourcing.

BACKGROUND

The strategic approach to purchasing began in the early 1980s when Adamson [1] proposed several methods for linking corporate objectives to the planning process. Kraljic [10] subsequently created several models for clarifying the strategic environment in which purchasing decisions were being made. The process has since evolved to encompass the entire supply chain and development of the strategic sourcing approach. However, little effort was made to implement strategic souring in the government until a 2002 Government Accountability Office (GAO) report cited the potential government savings [4]. The Office of Management and Budget (OMB) subsequently required all federal agencies to implement strategic sourcing programs to reduce the cost of government operations [13]. This memo defined strategic sourcing as "the collaborative and structured process of critically analyzing an organization's spending and using this information to make business decisions about acquiring commodities and services more effectively and efficiently" [13]. In response, strategic sourcing efforts have grown consistently within the DoD, with each service establishing programs to search for acquisition efficiencies using this process.

Within the Air Force, strategic sourcing efforts are managed by the Enterprise Sourcing Group (ESG), which is comprised of multiple cross-functional teams managing eight commodity groupings. This research focused on the Civil Engineering Commodity Council (CECC), which uses opportunity assessments based on spend analysis to prioritize commodities for which strategic sourcing will be implemented. However, spend analysis focuses almost exclusively on expenditure data. This is problematic for many public sector organizations, which often have a diverse set of organizational values that constrain them from simply spending the least amount possible. Statutes such as the McNamara-O'Hara Service Contract Act, Davis-Bacon Act, and Buy American Act, as well as advocacy programs for small businesses, may thus hinder strategic sourcing [16]. While minimizing costs is clearly an important part of the government's mission, other objectives are also important. Therefore, we used Value-Focused Thinking to develop a new method of opportunity assessment incorporating a broad range of objectives.

METHODOLOGY

Value-Focused Thinking (VFT) is a multiple criteria decision analysis method requiring independence of the values considered. Developed by Keeney [8], Kirkwood [9] developed the 8-step process shown in Figure 1. The first step in the VFT process is to identify the decision that needs to be made. While this may seem obvious, failure to fully understand the context of the decision may result in an inappropriate model. The second step is to clearly identify the values, or objectives, applicable to the decision. This is usually accomplished by determining the fundamental objective and decomposing it to create a value hierarchy [8]. Once the values have been identified, evaluation measures are developed in step 3 to assess the relative merits of each alternative being considered. From the insight gained during the first three steps, the decision-maker can create alternatives that seem to best address the identified objectives [8]. This is accomplished in step 4.

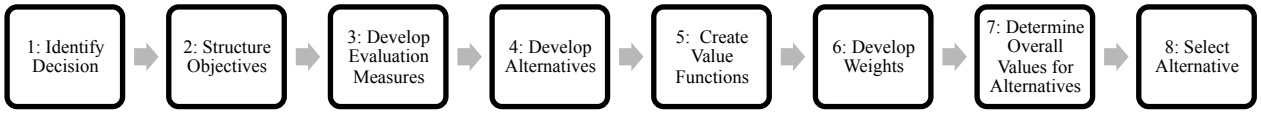

Figure 1. Kirkwood's 8-step VFT process (1997)

To evaluate the alternatives, step 5 converts each measure's units into common units of value using Single Dimensional Value Functions (SDVFs). Step 6 consists of assigning weights to each value and evaluation measure to indicate their relative importance to the fundamental objective, with the most common weighting methods being the direct method and the swing method. With direct weighting, the decision-maker directly determines the relative importance of each objective within each tier in a given branch of the hierarchy. Swing weighting refers to an iterative process using pair-wise comparison between two objectives to determine weights [8]. Step 7 represents a deterministic analysis which consists of scoring each alternative using the additive value function [9],

$$v(x) = \sum_{i=1}^{n} w_i v_i(x) \tag{1}$$

where $v(x)$ is the overall value of the alternative being evaluated, n is the number of evaluation measures, w_i is the weight assigned to the i^{th} measure, and $v_i(x)$ is the corresponding value score from the SDVF for the i^{th} measure. Once each of the alternatives has received an aggregate value score, which can range from 0 for the worst score to 1 for the best score, a basis for comparison exists that can be used to select the most attractive alternative (step 8). The ultimate purpose of the additive value function is to rank order alternatives in a manner consistent with the decision-maker's preferences [2]. While this is a straightforward process, a sensitivity analysis can provide additional insight to explore how varying the weights affects the value scores.

RESULTS

Identify Decision

The ESG indicated that a problem existed regarding the opportunity assessment phase of the strategic sourcing process. While a process for conducting opportunity assessments had been in use for 2 years, it failed to capture the full range of objectives important to the Air Force Civil Engineer (CE) functional community. Therefore, the research goal was to create an alternative means of opportunity assessment that would better capture the CECC's full range of objectives.

Structure Objectives

While identifying strategic objectives usually requires "deep and serious thought" [8], many of the CECC's objectives were stated in the organization's charter. To more fully develop the objectives, a series of informal interviews with subject matter experts from the ESG and the Air Force Civil Engineer Center (AFCEC) were used. By combining the charter contents with the working knowledge of the experts, a more accurate model of the true strategic objectives of the strategic sourcing program was developed that meets Parnell's [14] gold standard. As the hierarchy evolved, three broad categories of objectives emerged: rate-related (cost and quality), process efficiency-related, and demand management. These became the tier 1 objectives, and the fundamental objective was defined as: "Support the CE Mission by improving the efficiency of CE acquisitions." The final hierarchy was approved by AFCEC and CECC leadership. Although not discussed in this paper, definitions fully described each objective. Figure 2 shows the final value hierarchy developed during the research; throughout the process, every effort was made to develop a hierarchy in which the objectives were independent of each other.

Develop Evaluation Measures

Once the objective hierarchy had been established, evaluation measures were developed to determine the level of value attained from each alternative. The subject matter experts required that the measures use existing data sources and that the data gathering process be manageable. The panel of subject matter experts subsequently developed one evaluation measure for each second-tier objective, as shown in Table 2. Detailed definitions and scoring scales were used to maintain objectivity while scoring the alternatives.

Develop Alternatives

During the initial phases of planning for the CECC's first contract targets, a Commodity Management Plan (CMP) was developed to provide direction to CECC personnel and forecast potential efficiencies for budgeting purposes. During this process, the CECC developed a prioritized list of strategic sourcing opportunities based on a spend analysis and initial feasibility assessment. This prioritized list of six commodities and services was included as alternatives to evaluate. This provided a means of comparing the original opportunity assessment model with the model developed during this research. The ESG engineers also recommended adding two alternatives that were not evaluated and prioritized in the CMP. In addition, one alternative was selected due to research interest. Table 1 lists the nine alternatives evaluated during this research.

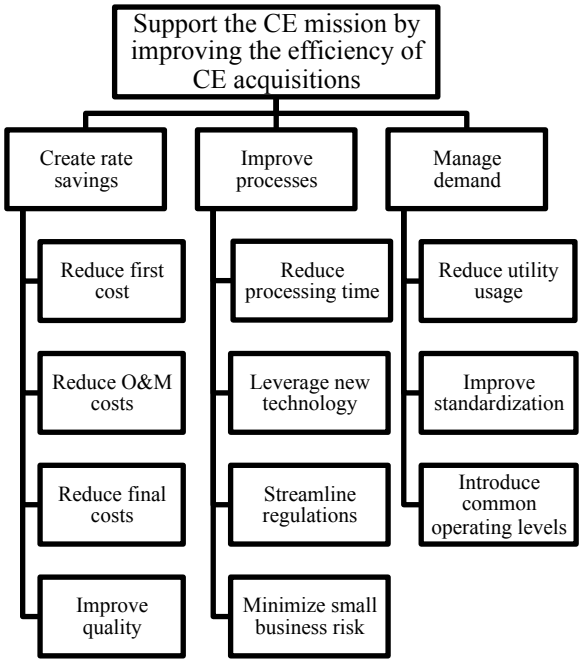

Figure 2. Objective Hierarchy

Table 1. List of Identified Alternatives

Opportunity Name	**Source**
Elevator Maintenance	Commodity Management Plan
Fire Personal Protective Equipment	ESG Recommendation
Grounds Maintenance	Research Interest
HVAC Systems, Chillers and Boilers	Commodity Management Plan
Roofing	Commodity Management Plan
Rubber Removal and Airfield Restriping	Commodity Management Plan
Generators	Commodity Management Plan
Taxiway Lighting	Commodity Management Plan
Water Leak Detection	ESG Recommendation

Create Value Functions

As shown in Table 2, three types of SDVFs were used: linear, curvilinear, and categorical. Note that increasing linear SDVFs were used for three measures: average first cost, average annual O&M costs, and average annual number of contracts. In other words, more value was assigned to alternatives with high first costs and large numbers of contracts. This may seem counter-intuitive but helps identify opportunities with the greatest potential for creating efficiencies. To "Minimize small business risk," a proxy measure was assigned that uses the total percentage of contracts awarded to small businesses; this measure helps approximate the level of possible adverse impact on small business objectives caused by pursuing strategic sourcing.

Develop Weights

To assign a relative level of importance to each objective, weighting factors were developed using the direct weighting method with the ESG and AFCEC experts. Local weights were assigned in a top-down fashion by tier group within each branch and global weights were calculated. The resulting weights, shown in Table 2, were then validated by the ESG leadership.

Table 2. Evaluation Measures

Objective	Measure	Lower Bound	Upper Bound	Type	Local Weight	Global Weight
Create Rate Savings						0.3640
Reduce first costs	Average total spent per FY on the service or commodity	$0	$92.3M	Increasing linear	0.40	0.1456
Reduce O&M costs	Average total spent per FY on O&M for the commodity	$0	$52.37M	Increasing linear	0.30	0.1092
Reduce final costs	Range of potential final cost savings	0-2%	>25%	Increasing categorical	0.10	0.0364
Improve quality	Evaluation of current quality issues in the commodity or service area	Never	Constant	Increasing categorical	0.20	0.0728
Improve Processes						0.3640
Reduce processing time	Average number of contracts executed per FY	0	307	Increasing linear	0.25	0.0910
Leverage new technology	Availability of new technology	No	Yes	Binary categorical	0.20	0.0728
Streamline regulations	Consolidation potential of existing regulations, standards, and guidance	No	Yes	Binary categorical	0.25	0.0910
Minimize small business risk	Percentage of total contracts per FY awarded to small businesses	0	100	Decreasing curvilinear	0.30	0.1092
Manage Demand						0.2720
Reduce utility usage	Percentage of possible utility reductions	0-2%	>25%	Increasing categorical	0.40	0.1088
Improve standardization	Number of current distinct solutions for the requirement	1	>11	Increasing categorical	0.30	0.0816
Introduce COLs	Percentage of demand reduced by implementation of applicable COLs	0-2%	>25%	Increasing categorical	0.30	0.0813

Score Alternatives

The data used for each alternative were collected from either spend and contract data or from interviews conducted with subject matter experts and a "value score" was calculated using Equation 1. The results are shown in Figure 3, which can also be used to identify general trends and determine the relative impact of each objective on the overall score for each alternative. For example, the single largest contributor to the value scores of the alternatives was the "Streamline regulations" objective, even though it only had the fifth largest weighting factor. This can be attributed to the fact that the objective used a binary categorical SDVF for which most of the alternatives achieved a maximum

score. Another trend is the fact that no individual objective had an overpowering influence on the overall rankings of the alternatives; this indicates that the model was well balanced across the objectives. Table 3 compares the alternative rankings between the VFT model and the original opportunity assessment analysis. The different results were not unexpected as the VFT approach included additional objectives for consideration. In fact, most of the data used in the VFT model was not considered during the original process. Additionally, the insight gained during the process prompted the identification of three additional alternatives to consider. Most importantly, the roofing alternative was not originally ranked very highly, but it clearly meets more of the decision-maker's values than other alternatives. Furthermore, taxiway lighting and runway rubber removal were originally ranked highly but represent the least valued alternatives. This critical insight will help the ESG focus on the alternatives offering the most value.

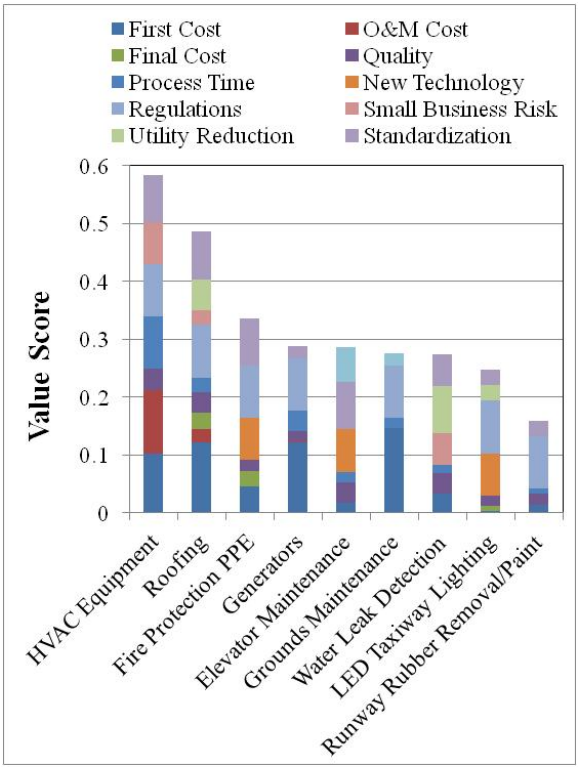

Figure 3. Value Scores for Alternatives

Table 3. Comparison of Rankings

Alternative	VFT Rank	Original Rank
HVAC Equipment	1	2
Roofing	2	5
Fire Protection PPE	3	*
Generators	4	6
Water Leak Detection	5	*
Grounds Maintenance	6	*
Elevator Maintenance	7	4
Taxiway Lighting	8	1
Runway Rubber Remove/Paint	9	3

* alternative not included in original list

Select Alternative

Based on overall value to the decision-maker as shown in Figure 3, the model suggests that HVAC equipment and roofing are clearly the best alternatives to benefit from strategic sourcing. When using decision models though, there is a common mantra: "models do not make decisions – people do." Therefore, to gain further insight into the decision context, sensitivity analysis was conducted on the weights used during the VFT process. The sensitivity analysis revealed that the ranking of the top three alternatives was relatively insensitive to changes in weights. Therefore, as long as significant changes in the weights are not expected, the top three ranked alternatives are consistently the best candidates to benefit from strategic sourcing. Furthermore, the runway rubber removal/painting and taxiway lighting alternatives were always ranked last and thus insensitive to weight changes. Given that only one of the alternatives met at least 50% of the values expressed by the stakeholders (0.58 for HVAC equipment), this begs the question: are there other alternatives that would help the stakeholders achieve more of their values? Based on the insight gained through this research effort, the subject matter experts brainstormed and identified additional alternatives as potential opportunities to assess. However, to fully embrace the VFT approach and implement step 4 in the process (see Figure 1), a more structured approach would be useful in developing alternatives. Howard [7] suggests a strategy generation table as one way of creating alternatives. The strategy generation table forces creative thought about the values/objectives pertinent to the decision and may prompt the experts to consider combinations of options that were not considered before. To reduce the number of feasible alternatives to be evaluated by the model, alternatives that are dominated by other alternatives can be eliminated.

CONCLUSIONS

The overall goal of developing a decision model to assist with strategic sourcing opportunity assessments was achieved. Instead of using an alternative-focused system of opportunity assessment like the one currently in use, an objective hierarchy was developed to determine the broad range of values and objectives important to the key decision-makers. By opening the aperture of how opportunities are examined for strategic sourcing potential to encompass all aspects of the program important to senior leadership, it is possible to make better, more informed decisions about the most attractive opportunities to invest the time and resources pursuing for strategic sourcing.

The difference in the alternative rankings indicates that the new criteria included in the VFT approach add information to the model that is independent of and fundamentally different from the information included in the original model being used. Because inclusion of this additional information is justified by the objectives of the strategic sourcing program specified in the objective hierarchy, the new model's results are influenced by a more complete picture of each alternative's true value to the strategic sourcing program. This indicates the new model is successful in introducing new criteria in the evaluation process, thereby strengthening the validity of the model. It is clear that further analysis of strategic sourcing alternatives must take into account the full range of strategic sourcing objectives to make decisions consistent with the goals of the program. Incorporation of these additional objectives into the decision method used by the CECC is the main recommendation of this research.

In addition to incorporating the full range of program objectives into the decision-making process, a more systematic and objective approach to opportunity assessments is also recommended. Budgetary issues have resulted in an overemphasis on first costs as a discriminator in strategic sourcing decisions to the exclusion of additional strategic factors. With this focus on first cost, the decision-maker may be overlooking more important factors and lose sight of the forest for the trees. Additionally, the pressure to produce results in the form of accurate future savings projections drives personnel to spend an inordinate amount of time and energy analyzing the few alternatives they have been able to consider to date. This process greatly delays the execution of strategic sourcing contracts to the point of negatively impacting the perception of the effectiveness of the strategic sourcing process. Creating and implementing a defensible methodology for opportunity assessments can help alleviate this issue by institutionalizing the full range of strategic sourcing objectives into an approved, standardized process. This process can then be executed without an overemphasis on first costs as the "low hanging fruit" of the strategic sourcing process. Educating and achieving the approval of the model by senior leadership is critical to this concept.

While the decision model developed in the research is useful for evaluating strategic sourcing alternatives, there are limitations to its effectiveness. First and foremost, the quality of the data used to evaluate the alternatives is of utmost importance to the quality of the results. In particular, the quantitative data used to calculate first costs and operations and maintenance costs seemed to be plagued with errors. While the monetary amounts listed for each item in the database appeared accurate, the supporting data fields characterizing the nature of the expenses were not. It seemed that the consistency and accuracy of the data describing the type of expenses varied as much as the users who generated the data. This inevitably caused the cost data used in the model to be inaccurate. Utilizing the same data in the VFT model was an attempt to mitigate the effect of this bias on the comparison of the model results. The fact that the original approach relied more heavily on this inaccurate data than the VFT model adds more credence to the need to implement additional factors for consideration into the decision model.

In addition to limitations regarding the quantitative data, the qualitative data used in the model relied on personal opinions of a few subject matter experts. Therefore, the personal biases of the experts impact the results of the model. The most prominent instance of bias encountered during the research was a hostility bias against the strategic sourcing concept itself. Due to the experts' personal experiences with the strategic sourcing program over the past several years, opinions as to the effectiveness of both the strategic sourcing concept and its implementation have developed. These opinions may have influenced the answers to questions posed during the interview process to limit any perceived credit ascribed to strategic sourcing. To limit the effect of this bias, the interview questions were designed to compel the experts to quantify their opinions in an objective manner. Questions were standardized between the different interviews, and answers were limited to specific quantifiable factors where possible. While this served to mitigate the effect of bias on the part of the experts consulted, some level of bias is inevitable whenever personal opinions are used for data.

Through the process of conducting this research, various opportunities for future research related to the VFT opportunity assessment model and strategic sourcing in general were identified. One major complication with completing an accurate analysis of services and commodities in use in federal government acquisitions is the poor quality of spend data available. Therefore, exploring new ways to capture independent cost data could result in a more accurate and consistent opportunity assessment model. While this research conducted an analysis of several alternatives in a portion of the federal government, conducting a systematic analysis of commodity and service contract areas would benefit most organizations. The methodology used in this research can be used to develop similar models for other commodity councils in different industries.

DISCLAIMER: The views expressed in this article are those of the writers and do not reflect the official policy or position of the U.S. Air Force, Department of Defense, U.S. government, or Air Force Institute of Technology.

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