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Analysis of Organizational Architectures for the Air Force Tuition Assistance Program

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ANALYSIS OF ORGANIZATIONAL ARCHITECTURES FOR THE AIR FORCE TUITION ASSISTANCE PROGRAM

THESIS

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Approved:

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Abstract

The consideration of restructuring through a change in organizational architecture is often a fiercely debated issue within an organization. The argument for restructuring to improve quality, customer service, and financial management is pitted against perceived lack of job security and historically poor results from previous restructuring initiatives. To balance all sides when considering a change in organizational architecture, the organization should use a method of evaluating potential architectures that assists in determining the best new architecture and generates support from those involved.

The objective of this research is to provide the Air Force Education Division with a defendable methodology for evaluating and selecting an organizational architecture. This thesis effort utilizes Value-Focused Thinking to develop a model that identifies the values associated with the management and execution of the Tuition Assistance (TA) program. The resulting value model is used to evaluate how well different organizational architectures perform with respect to these values.

The results of the analysis suggest the implementation of an organizational architecture in which a single office handles the payment of invoices and a central database stores all enrollment and funding data would best enable the TA program to fulfill its role in meeting the needs of the Air Force.

ANALYSIS OF ORGANIZATIONAL ARCHITECTURES FOR THE AIR FORCE TUITION ASSISTANCE PROGRAM

Chapter 1. Introduction

1.0 Overview

The consideration of restructuring through a change in organizational architecture is often a fiercely debated issue within an organization. The argument for restructuring to improve quality, customer service, and financial management is pitted against perceived lack of job security and historically poor results from previous restructuring initiatives. To bring all sides to the table when considering a change in organizational architecture, the organization should use a method of evaluating potential architectures that assists in determining the best new architecture and generates support from those affected. The United States Air Force Education Division (AF/DPLE) requires such a methodology to study candidate organizational architectures for the implementation of the Air Force Tuition Assistance (TA) program.

1.1 Background

The Department of Defense defines tuition assistance as "funds provided by the Military Services to pay a percentage of the charges of an educational institution for the

tuition of an active duty member of the Armed Forces enrolled in courses of study during his or her off-duty time" (Department of Defense, 1997). The processing of Air Force TA is currently handled at the local level by the Base Education Centers. However, beginning in 1997, these Education Centers began to undergo a restructuring process as a result of outsourcing and privatization efforts. This restructuring required a complete evaluation of all functional and business processes handled by the Education Centers. These evaluations showed limited standardization and limited efficiencies in the processing of TA from base to base. AF/DPLE suggests restructuring "the TA program and related processes will allow immediate and long-term savings in dollars, manpower and man-years, as well as gains in efficiency, accuracy, and consistency" (Baker, 2001).

In the early 1990's, the United States Navy began to operate the Navy TA program from a centralized office administered by the Naval Education and Training Professional Development and Technology Center (NETPDTC). Prior to establishing a central TA office, the Navy experienced the same type of problems reflected in the Air Force restructuring evaluations. Navy TA was handled by Base Education Centers that were geographically separated and had no standardized processing system. This resulted in "untimely, inconsistent, and sometimes nonexistent processing of course cancellations and grades, school refunds, and collections from students for courses not passed" (Myatt, 1997). As a result of developing a centralized organizational structure for TA, the Navy has seen "millions of dollars in savings and improved service to military members…and functions have been standardized" (Myatt, 1997).

Prior to October 1994, the United States Marine Corps had a TA program that was operating with an inadequate ability to track course enrollment statistics, spending,

and student reimbursements (Taylor, 2002). In October 1994, the Marine Corps adopted a centrally managed TA program operated by NETPDTC in conjunction with the Navy TA program. Centralization led to dramatic improvements in the handling of the Marine Corps TA program and in the recoupment of funds from billing errors, course cancellations, and course failures. Additional benefits seen from centralization included improved "distribution of funds, policy standardization, and enhanced quality assurance" (Taylor, 2001). Both the Navy and the Marine Corps have seen the type of dramatic increase in cost savings and record accuracy that AF/DPLE hopes to achieve through a change in organizational architecture for the Air Force TA program. The attainment of these types of savings and improvements will be directly linked to the core values of the Air Force as they relate to the TA program. The organizational architecture recommended for the management of TA will be the one that best reflects these values and achieves the desired enhancements.

1.2 Problem Statement

There is currently no framework established for quantitatively determining the values associated with the TA program. There is also no framework for evaluating the possible organizational architectures that the TA program could adopt. The purpose of this research is to develop a methodology for identifying the important aspects of the TA process, quantifying these aspects, and evaluating the candidate organizational architectures with respect to these aspects.

1.3 Research Objective

The first objective of this research is to provide a framework to assist in quantifying the values associated with the TA program. The second objective is to aid AF/DPLE in determining the best organizational architecture for the management of TA. These goals will be achieved through the use of a multi-objective decision analysis process known as Value-Focused Thinking (VFT). The VFT methodology will assist in identifying both the qualitative and the quantitative organizational values associated with the execution of the TA program. These values will be organized into a value hierarchy. This hierarchy will be used to assist in the evaluation of how well the possible organizational architectures achieve the objectives of the TA program.

1.4 Thesis Overview

Chapter 2 is divided into three main sections. The first section provides background on the current procedures associated with the management and execution of the TA program. The second section contains a review of literature on decision analysis, focusing mainly on VFT, its benefits, and cases where it has previously been used. Finally, the third section describes a ten-step approach to VFT that is used for this research. Chapter 3 shows the development of a value hierarchy for AF/DPLE to assist in their evaluation of different organizational architectures for managing the TA program. Chapter 4 assesses the proposed organizational architectures using the value hierarchy created in Chapter 3. An analysis of the results of the assessment is also provided in

Chapter 4. Finally, the strengths and limitations of the developed value hierarchy and suggested topics for further research are described in Chapter 5.

Chapter 2. Literature Review

2.0 Chapter Overview

Chapter 2 focuses on a review of the literature associated with the key components of this research. The chapter begins with an explanation of the current operating procedures associated with the TA program, including the application budgeting processes. This is followed by an overview of decision analysis, with a focus on VFT, its relative benefits, and its recent applications. Finally, a detailed description of a ten-step process for the implementation of VFT is presented.

2.1 Tuition Assistance Process

The first critical step in analyzing a restructuring initiative for an organization is developing an understanding how the organization currently operates. Therefore, a visual depiction and a description of the complete TA process, currently operating at eighty-two individual Air Force bases follows. The explanation of the process is broken down into the following three sections: budget development and fund distribution, application and approval process, and TA completion. The application and approval process and the completion of the TA process are illustrated in Figure 2.1. Coupled with this illustration, these three sections provide a brief overview of the TA process as it currently functions. The information in these sections is taken from interviews with AF/DPLE unless otherwise noted (Air Force Education Division, 2002).

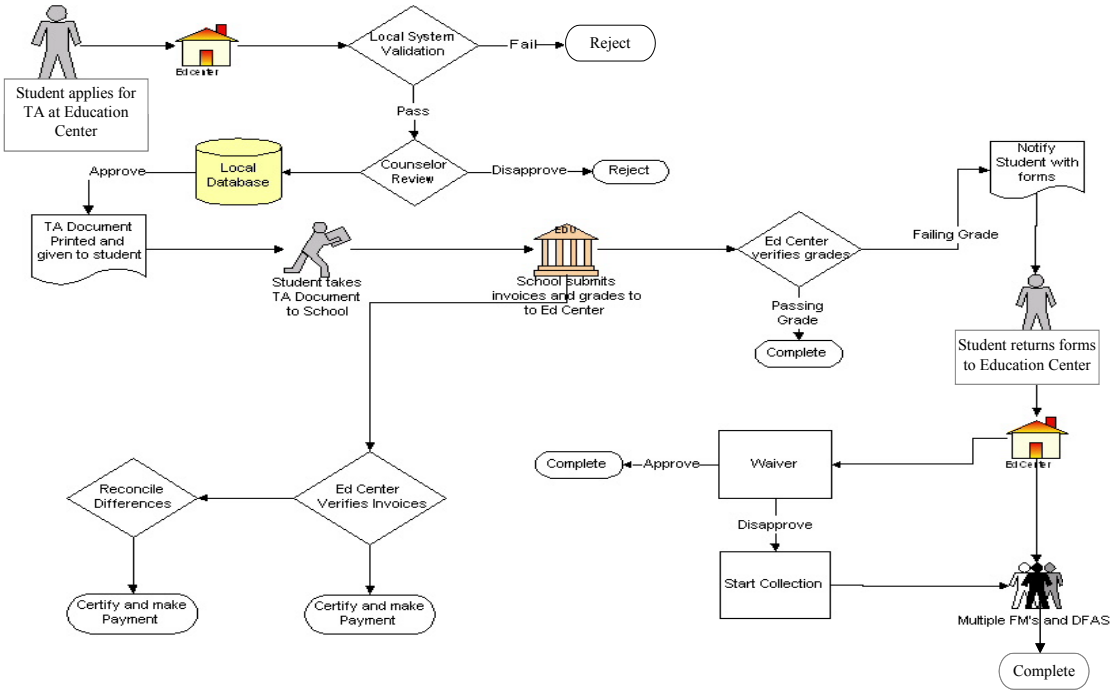

Figure 2.1 Current TA Process (Baker, 2001)

2.1.1 Budget Development and Fund Distribution

The initial step in the TA process is the preparation of a budget proposal indicating the expected amount of funding necessary for the TA program as a whole. As the development of the budget proposal begins, AF/DPLE requests submissions from each MAJCOM (Major Command) indicating the amount of funding they will need to support the TA program at the bases within their command. To prepare these submissions, the MAJCOMS attempt to aggregate past TA data (to include the number of students utilizing TA, the number of courses for which TA is being used, and any impending Air Force changes with respect to TA) from each of their bases. This aggregated data is used to determine the amount of TA required in the future. When the

MAJCOMS complete their submissions, AF/DPLE verifies the information and develops an overall budget proposal for the TA program.

When the TA budget is determined, the funds are allocated to the MAJCOMS based on their original submissions to AF/DPLE. The MAJCOMS then become responsible for dividing the funds among the bases within their commands. Each MAJCOM retains the ability to recall and redistribute funds to other bases within their command as necessary throughout the fiscal year. However, the same ability does not exist for AF/DPLE to recall and redistribute funds between the MAJCOMS. This may lead to a situation in which some MAJCOMS have excess funding and others are short the funding necessary to fully support the TA program within their command. This is an important concern, which AF/DPLE hopes to resolve in their restructuring efforts.

2.1.2 Application and Approval Process

The current application process begins with an Air Force member, referred to as the student, going to their local Base Education Office to request TA for a course in which they intend to enroll. Initially, the Education Office verifies the student has a degree plan on file. The degree plan indicates the degree the student is working toward and the projected courses needed to meet the requirements of the degree. A student must complete a degree plan prior to being approved for TA (Department of the Air Force, 2000). After the degree plan is verified, the Education Office uses the Air Force Automated Education Management System (AFAEMS) to generate an Air Force Form 1227 for the student. This form, shown in Figure 2.2, serves as a record of the pertinent

information of a student's course enrollment and their consent to follow the guidelines associated with the acceptance of TA. All data for the Air Force Form 1227 is entered directly into AFAEMS and stored in a local database at each Education Office.

Authority For Tuition Assistance - Education Services Program

PRIVACY ACT STATEMENT

AUTHORITY: 10 U.S.C. 8013 and EO 9397.
PRINCIPAL PURPOSE: To process an individual's request for Air Force tuition assistance. Use of SSN is necessary to make positive identification of the individual and records.
ROUTINE USES: Records may be disclosed to civilian schools for the purposes of ensuring correct enrollment and billing information.
DISCLOSURE IS VOLUNTARY: Disclosure of SSN is voluntary; however, failure to provide the information required may result in disapproval of the individual's request for tuition assistance.

Student Personal Data:

LASTNAME - FIRSTNAME - MIDDLE INITIAL	RANK	DOS	SSAN
DOE JANE	SRA	04 Aug 2006	111-11-1111

ORGANIZATION	DUTY PHONE	NAME OF SCHOOL
1 CIVIL ENGINEERING SQ / CCE	555-5555	UNIVERSITY OF MARYLAND

Student Enrollment Data:

Code	Course Title	Hours	Start Date	End Date	Level	Loc	Cost	Pay Meth
MGT101	management	3	02 Oct 2002	14 Dec 2002	C	B	$750.00	C
FEE-MBT	ENROLLMENT FEE	0	02 Oct 2002	14 Dec 2002	Y	B	$100.00	C

Per Hour Cost	Total Lab Fees	Total Course Cost	Total Government Cost	Total Student Cost
$300.00	$0.00	$1,000.00	**$850.00**	**$150.00**

Conditions and Certifications

I agree that no changes will be made in the above course or dollar amounts without the approval of the issuing education center staff; otherwise, I will pay the difference to the Air Force and/or the school. I understand that the Air Force will pay 100% of my tuition and fees up to $250 per SH and $166.66 per QH. I understand that my annual fiscal year CAP is $4500. I agree to pay the remaining amount and any other costs and fees. IAW AFI 36-2306, I will reimburse the Total Government Cost above for non-completions, withdrawals, or unsatisfactory grades due to reasons within my control. I hereby voluntarily authorize the amount to be withdrawn from my pay if it is determined that my failure to complete the course was not due to circumstances beyond my control. I authorize the release of academic information (course grades, completion status) by the above institution to the Air Force (PL 93-568). I agree to notify the education services office of degree completion or completion of 15 semester hour increments (or quarter hour equivalent) according to AFI 36-2305 for update of my military record. I agree (officers only) to remain on active duty for at least 2 years following the end of the course. I understand that offers to repay Tuition Assistance after completing a course will not remove the ADSC. Only the Secretary of the Air Force or his designee may excuse my obligation to serve on active duty for the period specified on this agreement. All policies and conditions in AFI 36-2306 apply.

Initial:	I will inform my Commander and/or supervisor of my enrollment in the above course. If necessary I will disenroll from the above course before the first class meeting.

Signature of Applicant:	Date: 10/16/2002

Verification By MPF/ESO (Education Services Office/Approving Official)

Initial:	Approved. This applicant has been counseled and is considered qualified for the course. Eligibility is based on the certification above.

Disapproved Because:

Tuition Assistance Approved by ESO/Approving Official

Signature of Education Services Officer Representative/Approving Official:

Date: 10/16/2002

Mail Invoices To:
11 MSS/DPE
112 BROOKLEY AVENUE, STE 1
BOLLING AFB, DC 20332-

Amount to be invoiced: ***$850.00***

Accounting Classification:
12345678901010101010

Master Account	TA Doc #	EEIC
TA FY03	HH-998128	6

AF Form 1227

Figure 2.2 Sample Air Force Form 1227

The Air Force Form 1227 is divided into four main sections: Student Personal Data, Student Enrollment Data, Conditions and Certifications, and Verification. The Student Personal Data section includes relevant personal information about the student. The section on Student Enrollment Data contains relevant course and tuition information including the portion of the cost covered by TA and the portion of the cost for which the student is responsible. The third section, Conditions and Certifications, summarizes the regulations associated with the issuance and acceptance of TA as stipulated by AFI 36-2306. The fourth section, Verification, indicates whether the issuance of TA is approved or disapproved by the Education Office. Upon approval, the student then enrolls in the specified course or courses, pays the portion of tuition not covered by TA, and provides the school with the completed Air Force Form 1227.

2.1.3 TA Completion

While the course in which the student enrolled is in progress, no action is taken with respect to TA. Upon the completion of the course, the college or university bills the Education Office for the amount of tuition covered by TA as specified on the Air Force Form 1227. The payment for this portion of tuition is then made by the Education Center directly to the college or university. The student has sixty days from the course completion date to provide their course grade to the Education Office. While many colleges and universities will send a copy of the course grade directly to the Education Office, it is still the responsibility of the student to confirm the Education Office receives the final grade. If the student provides the Education Office with proof of a passing

grade, defined as a “D” or better for undergraduate courses and “C” or better for graduate courses, then the TA process, with respect to this course enrollment, is complete for the student (Department of the Air Force, 2000).

If the student does not receive a passing grade, withdraws, or fails to complete the course, the student is obligated to reimburse the government for the amount of TA paid to the college or university. The student is notified of their obligation to provide reimbursement through an Air Force Form 118, shown in Figure 2.3. The student has the choice of having the amount taken directly from their military pay , writing a check to the Education Office, or applying for a waiver.

REFUND OF TUITION ASSISTANCE - EDUCATION SERVICES PROGRAM

AUTHORITY: 44 USC 3101 and EO 9397
PRINCIPAL PURPOSE: To notify a student that refund of Air Force tuition assistance may be required. Use of SSAN is necessary to make positive identification of the individual and records.
ROUTINE USES: To determine the specific reason(s) for a tuition assisted course noncompletion and the amount of AF tuition assistance funds to be refunded, if applicable.
DISCLOSURE IS VOLUNTARY: However, failure to complete this form may cause the student to be denied additional tuition assistance. Disclosure of SSAN is voluntary.

Instructions

The education office will fill out Section I and forward to the student's commander. The student will complete Section II or IV, as appropriate, obtain commander's or supervisor's certification, if applicable; and return this form to the Education Services Officer (ESO).

I. NOTIFICATION TO STUDENT

TO: *(Name of student/grade/organization)*	FROM: Education Services Officer

We have received notification from the school indicated below that you have withdrawn, are presently withdrawing, or have not completed the following courses, using Air Force tuition assistance.

COLLEGE OR SCHOOL AND LOCATION	INCLUSIVE DATES OF COURSE(S)	
	TO	FROM
COURSE NUMBER(S) AND TITLE(S)	CREDIT HOURS	GRADE(S)

Unless you provide justification for waiver of tuition assistance reimbursement, or elect a cash, lump sum or monthly deduction, a lump sum deduction will be processed against your pay in thirty days. You may elect a payment preference or submit justification for a waiver within this time frame.

SUSPENSE DATE	AMOUNT OF REFUND	ACCOUNT CLASSIFICATION
	$	

TYPED NAME AND GRADE OF EDUCATION SERVICES OFFICER	SIGNATURE	DATE

II. STUDENT REFUND PREFERENCE

TO: Education Services Officer	FROM: *(Name of student)*

I voluntarily withdrew from, am presently withdrawing from, or did not complete, the above courses for reasons within my control. I elect to voluntarily refund the amount of tuition assistance indicated above to the Air Force. I prefer:

☐ CASH PAYMENT *(Certification of immediate commander not required.)*

☐ LUMP SUM PAYMENT *(Certification of immediate commander required.)*

☐ DEDUCTION FROM MY PAY IN MONTHLY PAYMENTS OF $_____
(Certification of immediate commander required.)

SIGNATURE OF STUDENT	DATE

III. CERTIFICATION OF IMMEDIATE COMMANDER

I certify that the above lump sum payment or monthly payroll deduction will not cause financial hardship on the student and approve the payment or deduction.

TYPED NAME, GRADE AND TITLE OF COMMANDER	SIGNATURE	DATE
		DUTY PHONE

AF FORM 118, 19830704 ***(EF-V2)*** PREVIOUS EDITION IS OBSOLETE.

Figure 2.3 Air Force Form 118

A student may apply for a reimbursement waiver for "unanticipated health reasons, TDY, PCS, or change in work schedules, emergency leave, or hospitalization of a length that precludes course completion" (Department of the Air Force, 2000). In addition to the waiver application, a student must provide supporting documentation to verify their waiver eligibility. This is submitted to the Education Office for approval or denial. If approved, the student is not obligated to provide reimbursement. If denied, the student must make payment using one of the two methods stated previously. The TA process, with respect to this course enrollment, is then complete for the student.

The Education Office is responsible for entering grades, notifying students if they must provide reimbursement, approving waivers, and tracking reimbursements. In addition, the Education Office receives invoices from all schools that have students enrolled who are receiving TA. The Education Office must verify that each invoice is for the correct students, courses, and dollar amounts and then make the appropriate payment to the school, usually using a Government Purchase Card (GPC). When the school does not accept the GPC, the payment must be processed through the Defense Finance and Accounting Service (DFAS). This completes the overview of the current TA process.

2.2 Decision Analysis

Making a decision is often an extremely difficult process. This difficulty results from the following main factors (Clemen, 2001:2-3):

1. Inherent complexity. This complexity may stem from a plethora of differing opinions or from the financial impact associated with the outcome.

2. Uncertainty. By not having perfect knowledge of the outcome for each alternative, uncertainty complicates the decision process.
3. Multiple objectives. In many cases, the decision maker has to weight several (possibly conflicting) objectives. For example, the tradeoff may be between reducing costs and increasing employee satisfaction.
4. Numerous decision makers. Group consensus may greatly complicate the process, especially when each member possesses a different personal agenda.

The science of decision analysis helps to reduce the difficulties involved in decision-making. The objective of decision analysis is to provide a set of techniques for creating a structured environment in which to examine decisions and then taking advantage of this structuring to aid the decision maker (Kimbrough, 2001:249). Decision analysis provides several benefits; including adding objectivity to the decision process, generating improved alternatives, and justifying why selecting a given alternative is suitable (Clemen, 2001:4).

Objectivity in the decision process is increased through the use of "tools for quantitatively analyzing decisions with uncertainty and/or multiple conflicting objectives" (Keefer et al, 2000:1). If decisions are analyzed quantitatively, then mathematical techniques are employed in the analysis process. While subjectivity cannot be eliminated from the decision process, objectivity can be augmented through the use of mathematical techniques.

The generation of alternatives is improved through techniques such as the use of strategy generation tables. A strategy generation table is made of columns that represent various elements of the decision and different possibilities for those elements (Kirkwood, 1997:48). Selecting one possibility from each column then generates a strategy or

alternative. The strategy generation table can be a beneficial tool that can lead to the identification of a multitude of new alternatives (Howard, 1988:684-685).

Justification of alternative selection results from the detailed nature of the decision analysis model. A decision analysis model explicitly identifies the tradeoffs involved in a decision. This level of detail makes it possible to review the assumptions of the tradeoffs and the impact of varying them. Therefore, the model is "open and supportive of deliberation by the relevant public" which in turn leads to justification of alternative selection (Kimbrough, 2001:250).

While decision analysis offers many benefits, it is important to note that it provides insight into the decision situation, not a final solution for the decision at hand. Decision analysis utilizes models, which are abstractions and therefore approximate, to determine the preferable alternative (Kimbrough, 2001:255; Aven and Korte, 2002:9). As a result, a decision maker should use the outcome of the decision analysis, in conjunction with a thorough review process, to make the decision (Aven and Korte, 2002:3). This review process allows the decision maker to consider issues beyond the scope of the analysis such as political or ethical implications (Aven and Korte, 2002:13).

2.3 Value-Focused Thinking

The science of decision analysis includes a variety of methodologies. The method applied in this study is Value-Focused Thinking (VFT). VFT is a multi-objective decision analysis technique that focuses on what an individual or organization values and uses that to motivate the decisions (Keeney, 1992:3). VFT involves the identification and

organization of what is valued by the decision maker followed by the creation and evaluation of the alternatives based on those values. This differs from the Alternative-Focused Thinking (AFT) approach often used by decision makers. AFT identifies alternatives first and then specifies values (Keeney, 1992:49). AFT tends to lead to a less complete and creative collection of alternatives since they are specified at the outset (Keeney, 1992:49). AFT also generates a set of values based on the specific alternatives rather than on the fundamental objective of the decision. This set of values is less complete and less understandable (Leon, 1999:225). In addition, the values generated by AFT do not "capture the differences between the alternatives when they are evaluated" (Leon, 1999:220).

VFT produces a value structure that is more extensive and includes issues related to the problem that AFT fails to incorporate (Leon, 1999:213). Using VFT provides the decision-maker with beneficial insight into the decision and a support system to assist in defending their decision by showing that the alternative achieves what is valued. In addition, approaching a decision from a value-based perspective provides several other advantages as shown in Figure 2.4.

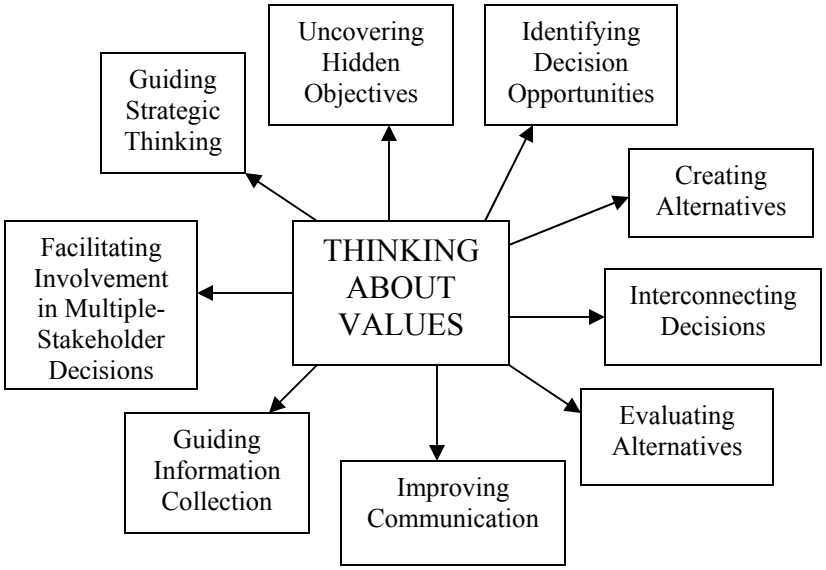

Figure 2.4 Benefits of VFT (Keeney, 1992:24)

2.4 Value-Focused Thinking Applications

The use of VFT as a methodology for performing multi-objective decision analysis is prevalent both in military and civilian sectors. This section begins by briefly identifying four cases, with military significance, where VFT has been successfully used to aid in decision-making. **SPACECAST 2020** is an in-depth Air Force study designed to provide an unbiased, traceable, and robust evaluation of the potential value of future space systems (Burk and Parnell, 1997:60). To accomplish this goal, a VFT methodology was implemented. The results of **SPACECAST 2020**, presented to the Air Force Chief of Staff and key space organizations within the Air Force, were so well received that the VFT methodology was adopted for a follow-on study, called ***Air Force 2025***, designed to focus on future Air Force missions (Burk and Parnell, 1997:73). The success of **SPACECAST 2020** is attributed to several factors including the credibility of

the value model and the ability to provide a structure for decision-making that was both traceable and logical (Burk and Parnell, 1997:71).

The follow-on study, ***Air Force 2025***, began in 1995 with the intention of evaluating system concepts and technologies that the United States may use in the future to dominate military forces (Jackson et al., 1996:1). VFT was selected as the methodology for this study for four main reasons: the understanding of VFT developed in **SPACECAST 2020**, the ability of VFT to lend structure to the decision process, the capability to use the value framework to assess systems in a variety of situations, and the objectivity that VFT provides (Jackson et al., 1996:5-6). The value model, called ***Foundations 2025***, resulting from this analysis, served to quantify the relative value associated with various system concepts and provide a framework that can be adapted to aid future decision makers involved with the use of air and space power (Jackson et al., 1996:vi).

A third military study involves a modernization program for the Global Positioning System (GPS) including an initiative to revamp the waveform transmitted by satellites. As proposals for new waveforms were submitted, the Air Force GPS Joint Program Office enlisted the help of the Space Warfare Center Analysis and Engineering Division to conduct an analysis of the relative value of various proposals. The main goals of this analysis were to pinpoint the most effective GPS redesign and to effectively convey the rationale for this recommendation (Lehmkuhl et al., 2001:6). The study team cited several advantages associated with using VFT including its ability to quantify intuition, bring to light results that were contrary to intuition, and diminish individuals' underlying biases (Lehmkuhl et al., 2001:16-17). In summarizing the overall impact, the

use of VFT is credited with having enhanced the ability of the Independent Review Team to make an informed decision regarding the new GPS waveform (Lehmkuhl et al., 2001:17).

The final military example involves resource allocation at the National Reconnaissance Office (NRO). As more focus is placed on preparing for the future, the importance of effective resource allocation becomes critical. This is especially true for the Operational Support Office (OSO), the customer support organization of the NRO, as it attempts to provide the best reconnaissance information to the nation's leaders and the military (Parnell et al., 2002:77). The OSO desired a method for determining the value of initiatives relative to OSO and NRO strategic objectives. VFT was used as part of the future value analysis designed to help the NRO allocate resources. The study team credits the value model with providing the OSO a better understanding of what was valued within initiatives and support for the decisions they made regarding resource allocation (Parnell et al., 2002:87).

Several successful uses of VFT outside the military have also been documented. Brief descriptions of two examples are presented here. British Columbia Hydro and Power Authority (BC Hydro) has implemented VFT in a wide range of strategic decisions such as the allocation of capital budget reductions, development of an integrated electricity plan, and reliability planning. Through the work done in implementing VFT at BC Hydro, it was found that "by carefully structuring values, one can provide significant insight for virtually all major decisions facing an organization" (Keeney and McDaniels, 1992:94). The Office of Fissile Materials Disposition of the Department of Energy employed VFT to assist in evaluating various alternatives for the

disposal of excess weapons-grade plutonium. This method provided an approach that integrated the many factors involved in evaluating disposal alternatives, such as cost, environmental issues, and public health and safety concerns. VFT also provided a model that was useful in justifying to the public why the hybrid disposal method was selected (Dyer et al., 1998:749-761).

Studies such as those presented here highlight the benefits of applying VFT to decision situations. These studies emphasize the importance of providing an evaluation that is unbiased, traceable, and robust through VFT. They also discuss the valuable insight that the VFT process provides. In addition, the studies stress that the VFT methodology offers support for justifying why a particular decision was made. When examined collectively, these studies endorse the application of the VFT methodology to a wide range of decision situations.

2.5 A Ten-Step Approach

For this thesis effort, a ten-step approach for accomplishing VFT is used. In the following sections, the ten steps are explained in detail. This provides a clear understanding of the structured approach used to analyze the TA process. Figure 2.5 is a visual illustration of this ten-step process for VFT.

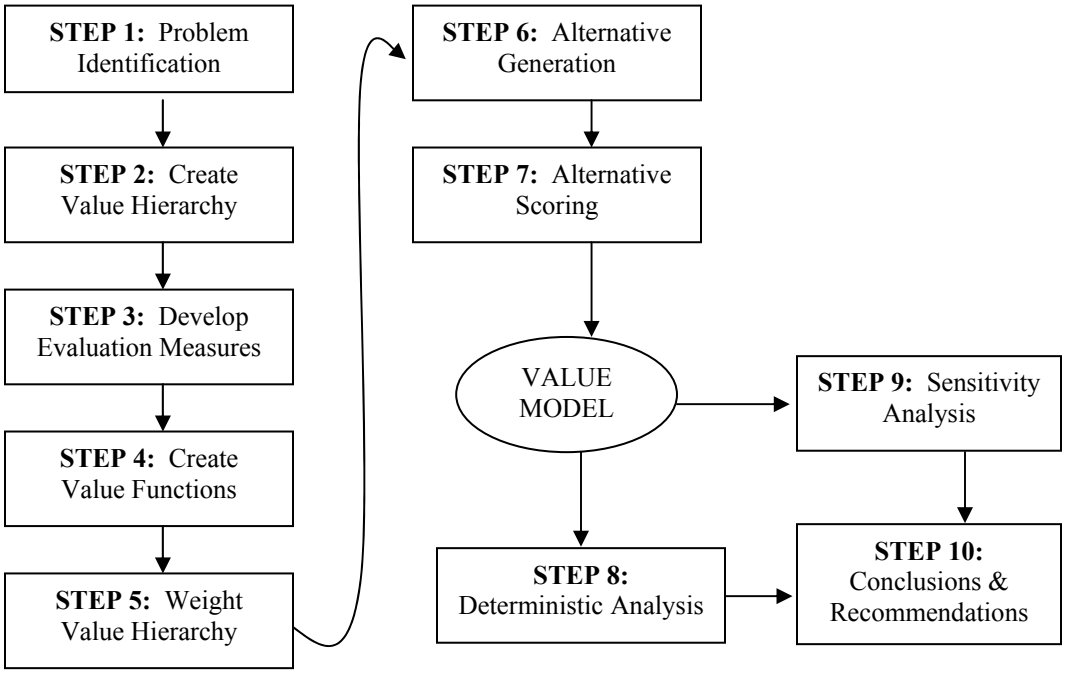

Figure 2.5 A Ten-Step Approach for VFT (Chambal, 2002)

While this process is depicted as flowing directly from one step to the next, it is important to note that VFT is an iterative process. Thus, it is not uncommon to revisit previous steps in order to make modifications based on issues that have arisen in later steps (Keeney, 1992:131).

2.5.1 Step 1: Problem Identification

The first step in successfully analyzing any decision is to clearly identify what decision needs to be made and the fundamental objective of that decision. All too often, people argue in favor of conflicting solutions to what they believe to be the same problem, only to find that they had interpreted the original problem differently (Howard, 1988:684). This predicament can be eliminated if the decision, and the context in which

it is to be made, are clearly identified at the outset of the process. The example that will be used involves buying a truck. The problem is defined as selecting the best truck for purchase by the decision-maker.

2.5.2 Step 2: Creation of the Value Hierarchy

The values relating to the fundamental objective must be determined after the problem is defined. To assist those involved with the decision-making process, a facilitation process is often used to identify the values associated with the fundamental objective (Keeney, 1992:130). The facilitator(s) guide the decision maker(s) through a discussion of the decision and assist in clarifying the important aspects of the decision process. Successful use of facilitation has been illustrated in several recent VFT applications including planning tourism for a remote area of the Philippines (McDaniels and Trousdale, 1999) and selecting force protection initiatives for evaluation by the Air Force (Jurk, 2002). Keeney suggests eight devices that can be used to assist in identifying values as shown in Table 2.1.

Table 2.1 Devices to Use in Identifying Values (Keeney, 1992:57)

DEVICE	BRIEF DESCRIPTION
1. Wish list	Focus discussion on what would be desired if there were no limitations
2. Alternatives	If some alternatives are already known, focus discussion on what makes one better than another
3. Problems and shortcomings	Focus discussion on what the organization is trying to improve
4. Consequences	Focus discussion on the perceived impact of various alternatives
5. Goals, constraints, and guidelines	Focus discussion on what they are trying to achieve, any restrictions, and guidelines that must be met
6. Different perspectives	Focus discussion on the decision from the point of view of someone else affected
7. Strategic objectives	Focus discussion on the ultimate objective and any critical values already determined
8. Generic objectives	Focus discussion on further dissecting a generic objective such as reducing cost

In addition to direct discussion with the decision maker, a review of relevant literature can also assist in the development of the value hierarchy. While value hierarchies must be specific to a particular decision, useful information can be obtained by examining how similar decisions were addressed (Kirkwood 1997:21). This information can then be used to aid in the development of the value hierarchy.

2.5.2.1 Structuring the Value Hierarchy

The fundamental objective and the values are organized into a hierarchical or "treelike" structure called a value hierarchy (Kirkwood, 1997:12). The top of the hierarchy represents the fundamental objective of the decision maker. Emanating from the fundamental objective are the values deemed to be most important. Each subsequent

layer of the hierarchy, from the top down, further defines the value found above it. An example of a value hierarchy for purchasing a truck is shown in Figure 2.6.

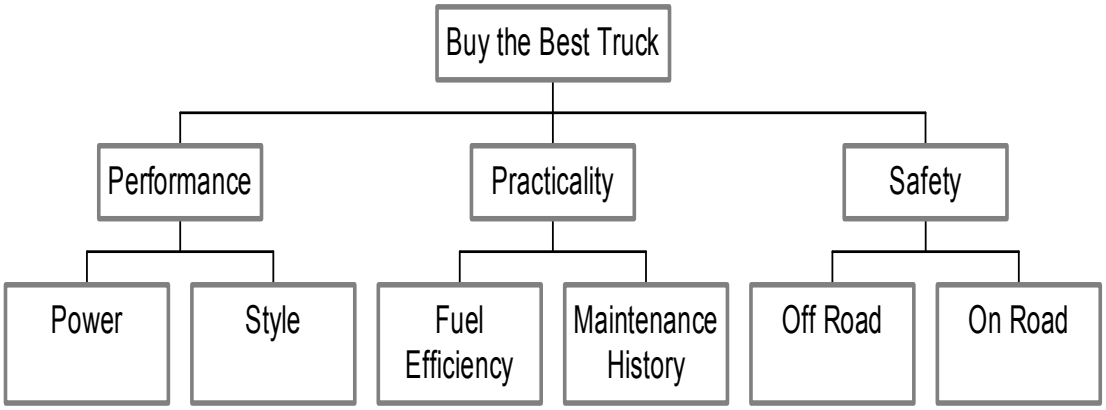

Figure 2.6 Example of a Value Hierarchy (Jurk, 2002:36)

Before explaining the details of this hierarchy, two terms associated with its structure must be understood. First, a tier in the hierarchy is defined as being a row of values or evaluation measures equidistant from the fundamental objective. For example, Performance, Practicality, and Safety make up one tier of the hierarchy. Second, a branch is a column of the hierarchy containing those values emanating from a specified value. Performance, Power, and Style form a branch of the hierarchy. In this example of a value hierarchy, the fundamental objective is Buy the Best Truck. The three main values associated with that objective are Performance, Practicality, and Safety. The next tier of values further clarifies these three values. Performance is broken down into Power and Style, Practicality into Fuel Efficiency and Maintenance History, and Safety into Off Road and On Road.

2.5.2.2 Desirable Properties of a Value Hierarchy

Keeney and Raffia (1976:50-53) suggest that a value hierarchy should be designed to possess five desirable properties including completeness, operability, decomposability, nonredundancy, and minimum size. Completeness, also referred to as being collectively exhaustive, entails two main requirements: the values, when examined as a whole, fully represent all issues involved in evaluating the fundamental objective and the evaluation measures sufficiently measure the degree of attainment of their associated value. Operability is the concept that those for whom its use is intended must understand the hierarchy. The property of decomposability, also described as independence, means a change in an alternative's score in one evaluation measure does not directly imply a change in score in another evaluation measure (Kirkwood, 1997:17). Nonredundancy implies that the values and measures are defined in such a way that double counting does not occur (Keeney and Raffia, 1976:51). Double counting occurs when a value receives more than its specified weight because multiple evaluation measures indicate the level of achievement for that value (Kirkwood, 1997:17). The property of minimum size is important for three main reasons: it is less difficult to explain the values and measures, collecting the necessary data to score the alternatives is a more manageable task, and it keeps the hierarchy from expanding to a point where useful analysis becomes extremely difficult (Kirkwood, 1997:18-19).

2.5.3 Step 3: Development of Evaluation Measures

Evaluation measures identify the characteristics that a decision maker will use to assess alternatives. An evaluation measure provides "an unambiguous rating of how well an alternative does with respect to each objective [or value]" (Kirkwood, 1997:24). When developing the evaluation measures of a value hierarchy, there are three properties that must be achieved. First, the evaluation measures must be obtainable for all alternatives (Chambal, 2002). This means that the data required to score that measure must be available. Second, the evaluation measures must pass the clairvoyance test (Kirkwood, 1997:28). The clairvoyance test implies there is no ambiguity in the meaning of the scale. Therefore there is no disagreement with respect to the score an alternative would receive for a given measure. Third, a scale must contain no overlap if it is divided into bins (Keeney, 1992:118). Thus a scale where the bins were "0-20, 20-50, 50-100, or over 100" would not be acceptable because a score of 20 would fall into both the first and the second categories. Instead, the scale should be "0-20, 21-50, 51-100, or over 100" to show no overlap. An evaluation measure that possesses these three characteristics may be included in the hierarchy.

2.5.4 Step 4: Single Dimensional Value Function Construction

A single dimensional value function (SDVF) must be created for every evaluation measure using input from the decision maker and/or the appropriate subject matter experts. Since each of the measures in the hierarchy may have different units associated

with it, the SDVFs convert each measure to a unitless standard so that they can be combined later in the VFT process. The SDVF also accounts for the returns to scale, the idea that equal increases within the measure may not hold equal value (Kirkwood, 1997:60).

The x-axis of the SDVF represents the possible scores for each evaluation measure. The y-axis of the SDVF uses the same scale across all measures for a particular hierarchy. It is common practice to let the y-axis vary from zero to one, where "the least preferred score being considered for a particular evaluation measure will have a single dimensional value of zero, and the most preferred score will have a single dimensional value of one" (Kirkwood, 1997:61). This leads to the idea that the hypothetical worst case alternative, one that obtains the least preferred score for every evaluation measure, will have a total value of zero and the hypothetical best case alternative, one that obtains the most preferred score for every evaluation measure, will have a total value of one (Chambal, 2002; Kirkwood, 1997:61). The actual shape of a SDVF can vary greatly, so long as it remains monotonic.

2.5.5 Step 5: Determination of Hierarchy Weighting

Weighting the hierarchy is a critical step because it accounts for the fact that not all values or measures may be equally important to the decision maker. Therefore, weights are assigned to each value and measure to signify their relative importance to the decision maker (Kirkwood, 1997:82). There are two types of weights encountered in this

process, local and global. These weights differ in terms of their meaning and in terms of what portion of the hierarchy they encompass.

Local weights represent the percent of importance that a given value or measure has relative to the other values or measures within the tier of a given branch. Global weights can be described as the percent of importance that a given value or measure has relative to all other values or measures across an entire tier (Chambal, 2002). Global weights can also be described as the percent of the overall score of an alternative that a given measure or value contributes. Local weights must sum to 1 across the tier of a given branch whereas global weights must sum to 1 across an entire tier of the hierarchy. This is illustrated in Figure 2.7 and Figure 2.8. Global weights can be calculated if the local weights are known and vice versa. Note that the global weights of the measures will be used in determining the final score of the alternatives later in the process (Kirkwood, 1997:230).

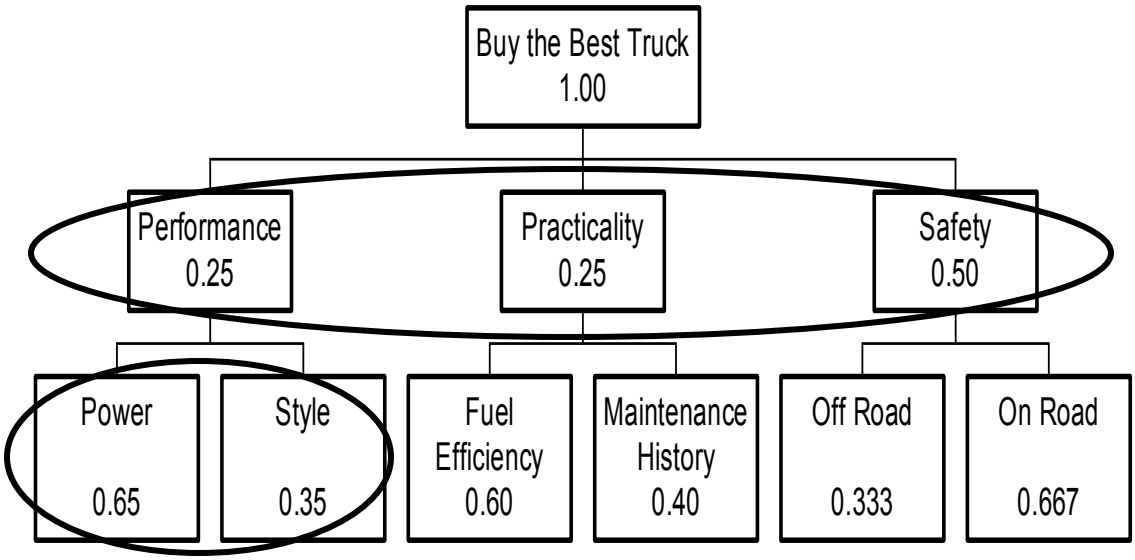

Figure 2.7 Hierarchy with Local Weights (Jurk, 2002:45)

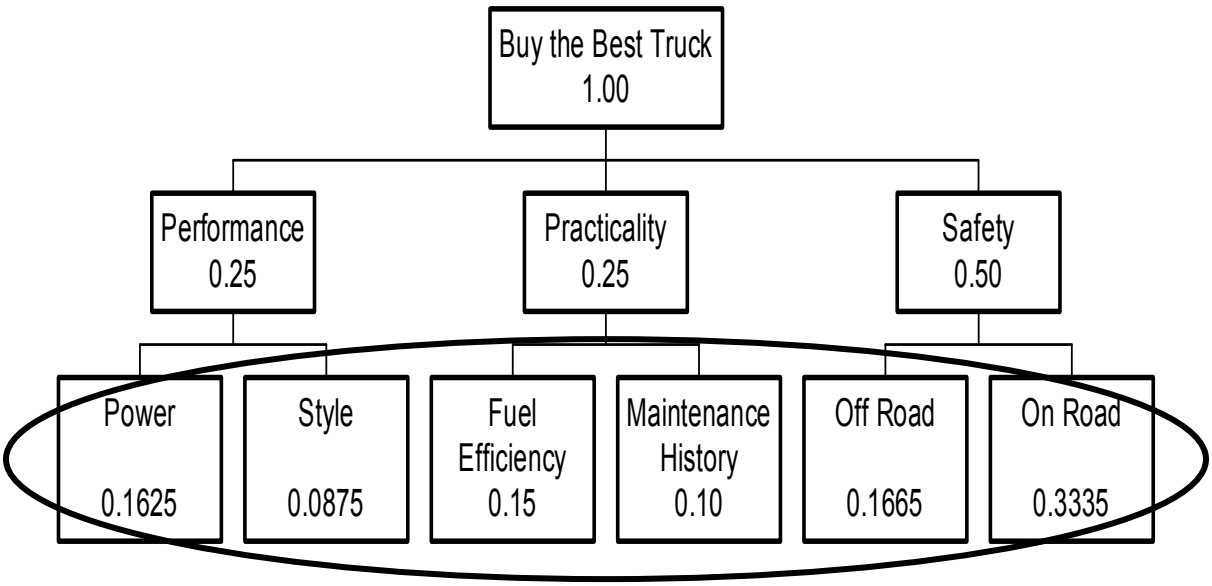

Figure 2.8 Hierarchy with Global Weights (Jurk, 2002:49)

When looking at methods of devising the weights for the hierarchy, there are two approaches that are commonly utilized, swing weighting and direct weighting. The swing weighting technique examines "the increments in value that would occur by increasing (or 'swinging') each of the evaluation measures [or values] from the least preferred end of its range to the most preferred end" (Kirkwood, 1997:70). These increments are then placed in increasing order and scaled as multiples of the smallest increment. The smallest increment is determined so that the sum of all the increments equals one. This increment is then substituted in to determine the remaining weights. While this method involves some mathematical insight, it is such that it can easily be explained to a decision maker without a mathematics background.

The other approach, direct weighting, is commonly referred to as the "100 Marble" technique. This method ascertains the local weights of the hierarchy by asking

the decision maker to divide 100 marbles among the values within a tier of a specific branch. The 100 marbles represent the percent of importance placed on each value or measure, relative to the others within that tier of the branch. This is then done for every tier of every branch including the measures. This method can often be more intuitive to the decision maker when weighting the hierarchy (Chambal, 2002).

2.5.6 Step 6: Alternative Generation

Generating the alternatives related to a decision plays an important role in the decision analysis process. However, many decision makers find alternative generation to be quite difficult. One of the main reasons for this difficulty is that people tend to "think about a new situation by making mental associations with previous situations that seem relevant" (Kirkwood, 1997:43). This type of correlated thinking can limit the alternatives generated to those with which people are already familiar. VFT is designed to do exactly the contrary by enhancing the development of creative alternatives that reach beyond individuals' experiences (Keeney, 1992:26-27).

2.5.7 Step 7: Alternative Scoring

Alternative scoring is the process of collecting the data associated with each evaluation measure for each alternative. This scoring process usually involves direct data collection or consultation with subject matter experts for their opinion on the score each alternative should receive. When scoring is done by a group of subject matter experts, all alternatives should be scored on a given measure before moving on to the next measure.

This ensures consistency in scoring among the alternatives (Chambal, 2002). When scoring alternatives, maintaining proper documentation of data collection methods and resources is vital in supporting the validity of the results (Kimbrough, 2001:250). This documentation will also be beneficial when using the value hierarchy to justify a decision.

2.5.8 Step 8: Deterministic Analysis

The process by which the total value of an alternative is calculated and the relative rankings of the alternatives are ascertained is known as deterministic analysis. To calculate the overall value of each alternative, the additive value function is frequently used (Kirkwood, 1997:230). This function, which is a weighted average of the individual SDVFs, is expressed as

$$v(x) = \sum_{i=1}^{n} \lambda_i \cdot v_i(x_i) \tag{2.1}$$

where λ_i is the *global weight of measure i* and $v_i(x_i)$ is the *value of the alternative's score for measure i* (Kirkwood,1997:230). An alternative's total value represents the "percent of the distance in a value sense from the hypothetical worst possible alternative to the hypothetical best possible alternative" (Kirkwood, 1997:74). Once the overall value of each alternative has been calculated, the alternatives can then be ranked according to that value. This ranking provides insight for the decision maker as to the preferred alternative based on value, but does not afford the decision maker a final conclusion as to the alternative that should be chosen (Chambal, 2002). That choice ultimately lies with the decision maker.

2.5.9 Step 9: Sensitivity Analysis

Sensitivity analysis is done to determine what impact, if any, changes in different model assumptions have on the ranking of alternatives (Kirkwood, 1997:82). The weights within the value hierarchy tend to be the major focus of sensitivity analysis since they are often a source of disagreement within a decision-making group (Kirkwood, 1997:82). It is possible to perform sensitivity analysis on the weights in any tier of the value hierarchy. Often sensitivity analysis focuses on higher tiers as those tiers generally contain the values that are of greatest concern to the decision maker. Doing sensitivity analysis imparts greater knowledge into the decision-making process by increasing the understanding of how changes in various weights could alter the ranking of the alternatives.

2.5.10 Step 10: Conclusions and Recommendations

The conclusion of the VFT process focuses on the presentation of the analysis to the decision maker. This step is of fundamental importance in order to complete the project to the satisfaction of the decision maker. The presentation of the analysis must be clear and concise and on a level that allows it to be understood by all involved (Winston, 1994:5). This final step should contain a summary of what was accomplished in the first nine steps. Recommendations about areas of the process that warrant further study should also be discussed. Finally, the decision maker should be reminded that the intention of the analysis is to provide insight, not to draw a conclusion as to what decision should be made.

Chapter 3. Methodology

3.0 Chapter Overview

In Chapter 3, the application of the VFT methodology to the analysis of organizational architectures for the Air Force Tuition Assistance Program is described. The first seven steps of the ten-step VFT process form the outline of this chapter. An explanation of the problem is presented, followed by a description of the value hierarchy created for this analysis including the values, measures, SDVFs, and weights. The chapter concludes with the details of the alternatives to be analyzed and the scores for each measure of the hierarchy.

3.1 Problem Identification

Several meetings were held with AF/DPLE, the office in charge of the TA program, at the outset of this research effort. Meetings with other offices directly involved in the TA process at the MAJCOM and Base level were also conducted. These meetings revealed that there was no existing framework for evaluating possible organizational architectures for the TA program. The main thrust of this study is the development of such a framework using VFT. The identification of values for the TA program, quantifying these values, and using them to evaluate potential organizational architectures is this framework. The fundamental problem addressed in this research effort is to determine the best organizational architecture to enable the TA program to efficiently fulfill its role in meeting the needs of the Air Force.

3.2 Creation of the Value Hierarchy

A decision group was formed to participate in the creation of the value hierarchy for the TA program. This group consisted of representatives from all levels of the TA program whose areas of experience included Headquarters, MAJCOM, Base, and recipients of TA. This group contributed their knowledge, insight, and experiences throughout this analysis. The value hierarchy for this research was created using a top down approach. First, the fundamental objective is determined, then the first tier of values is created, and finally subsequent tiers are added to further describe previous values. Several of the strategies for developing values discussed in Chapter 2, such as discussing a wish list for an ideal TA system and discussing problems and shortcomings with the current TA system, aided in the development of values for the hierarchy. Figure 3.1 shows the final set of values created by the decision group to evaluate alternative organizational architectures for the TA program.

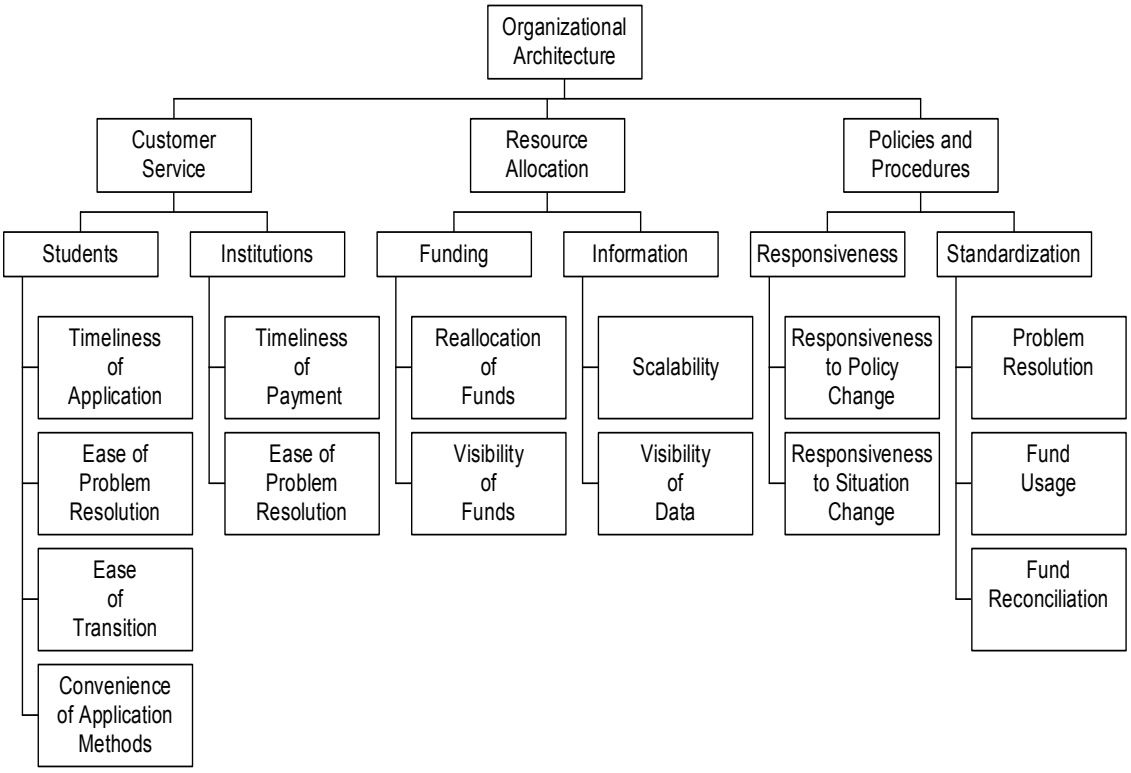

Figure 3.1 Value Hierarchy for the Air Force Tuition Assistance Program

The decision group reviewed the hierarchy and agreed it represented all the issues relative to evaluating the candidate TA organizational architectures. They also confirmed there was no overlap between any of the values found in the hierarchy and that the values were independent. This means the hierarchy is complete, decomposable, and nonredundant. Since the decision group actively played a part in the creation of the value hierarchy it can be considered operable. The hierarchy also maintains a minimum size. Thus the value hierarchy achieves the desirable properties outlined in Chapter 2. The following three sections, divided by the first tier values, contain detailed descriptions of the values included in the hierarchy.

3.2.1 *Customer Service* Branch Values

Customer Service is defined as the provision of quality assistance to all those served by the TA program. This is one of the three key values included in the first tier of the hierarchy. The decision group included *Customer Service* in the hierarchy because it plays a critical role in their mission. The military members are the reason programs such as TA exist, resulting in *Customer Service* being a required consideration when choosing an organizational architecture. Table 3.1 explains the values found under *Customer Service* in the hierarchy.

Table 3.1 Description of Values within the *Customer Service* Branch

VALUE	DESCRIPTION
Students	Providing quality customer service as it pertains to the students who utilize TA when taking courses
Timeliness of Application	Timeliness of the entire application process, from initial application to approval, from the perspective of the student attempting to obtain TA
Ease of Problem Resolution	Ease with which a student can get a problem involving some aspect of TA resolved
Ease of Transition	Ease with which a student can change bases, whether through a PCS or an extended TDY, while receiving TA
Convenience of Application Process	Convenience of the application process as it relates to students, including when and how a student can apply for TA
Institutions	Providing quality customer service as it pertains to the institutions (schools) who accept TA from students
Timeliness of Payment	Timeliness of the receipt of payment by the institution for a course for which a student used TA
Ease of Problem Resolution	Ease with which an institution can get a problem involving some aspect of TA resolved

3.2.2 *Resource Allocation* Branch Values

Resource Allocation is the effective management of resources associated with the TA program. The decision group concluded accountability for funds and information is vital, especially for an organization within the Department of Defense. For this reason, and because so many issues involved with the TA program can be incorporated under the idea of effective management of resources, *Resource Allocation* became one of the first tier values. Table 3.2 details the remaining values found under *Resource Allocation* in the hierarchy.

Table 3.2 Description of Values within the *Resource Allocation* Branch

VALUE	DESCRIPTION
Funding	Effective management of funding resources associated with the TA program
Reallocation of Funds	Ability to reallocate funds as necessary to support the entire TA program throughout the fiscal year
Visibility of Funds	Ability to know where all funds are, across the TA program, at any given time, including funds already spent and those remaining
Information	Effective management of information resources associated with the TA program
Scalability	Ability to scale the information system, either up or down, to accommodate the needs of the TA program
Visibility of Data	Ability to readily access TA data, such as the number of students enrolled or the number of courses in which students are enrolled

3.2.3 *Policies and Procedures* Branch Values

Policies and Procedures is the ability to effectively implement policies and procedures related to the TA program. This is the final value in the first tier of the hierarchy. *Policies and Procedures* was included in the first tier by the decision group because it encompasses some of the major concerns regarding uniformity in policy implementation and the ability of TA to meet the needs of the Air Force. Table 3.3 describes the values found under *Policies and Procedures* in the hierarchy.

Table 3.3 Description of Values within the *Policies and Procedures* Branch

VALUE	DESCRIPTION
Responsiveness	Ability of the system to adapt to changes in a timely manner
Responsiveness to Policy Change	Responsiveness to changes in TA policy, such as switching from 75% to 100% coverage of tuition rates
Responsiveness to Situation Change	Responsiveness to situation changes in the Air Force that affect TA, such as deployments
Standardization	Consistency in execution of TA policies and procedures throughout the Air Force
Problem Resolution	Standardization in how problems are resolved
Fund Usage	Standardization in the usage of TA funds, including proper allocation and consistency in fund availability for students
Fund Reconciliation	Standardization in the handling of fund reconciliation including processing waivers, obtaining reimbursements from students, and handling reconciliations with institutions

3.3 Development of Evaluation Measures

Evaluation measures must be developed for each of the lowest tier values. These measures serve to quantify how well different alternatives achieve the values in the hierarchy. Since improving the current TA system through a change in organizational architecture is a motivating factor behind examining this problem, several of the evaluation measures score achievement relative to the current system. Due to the non-numerical nature of the measures utilized, the x-axes are all categorical. The necessary properties of evaluation measures described in Chapter 2 were verified as the measures were developed. The following three sections, categorized by the first tier values, contain tables showing the associated second and third tier values, their respective measures, and lower and upper bounds for each measure's x-axis. Separate tables containing descriptions of each measure are also presented.

3.3.1 *Customer Service* Branch

Customer Service is one of the three key values found in the first tier of the hierarchy. All values within this branch further define the importance of providing quality assistance to those served by the TA program. *Customer Service* is broken down into *Students* and *Institutions*. Table 3.4 shows the measures associated with the first tier value of *Customer Service*, their associated second and third tier values, and the lower and upper bound for each. A description of each measure is found in Table 3.5.

Table 3.4 Evaluation Measures for *Customer Service* Branch

2nd TIER VALUE	3rd TIER VALUE	MEASURE	LOWER BOUND	UPPER BOUND
Students	Timeliness of Application	Timeliness of Application and Approval Process	Significantly Decreases	Significantly Increases
	Ease of Problem Resolution	Ease of Resolution	Significantly Decreases	Significantly Increases
	Ease of Transition	Ease of Transition	Significantly Decreases	Significantly Increases
	Convenience of Application Process	Time of Application Availability	Duty Hours	24 hrs./day 7 days/week
Institutions	Timeliness of Payment	Timeliness of Invoice Processing	Significantly Decreases	Significantly Increases
	Ease of Problem Resolution	Ease of Resolution	Significantly Decreases	Significantly Increases

Table 3.5 Description of Measures for *Customer Service* Branch

Measure	Description
Timeliness of Application and Approval Process	Measures the timeliness of the entire application and approval process, relative to the current system
Ease of Resolution	Measures the ease with which a student can get a problem with TA resolved, relative to the current system
Ease of Transition	Measures the ease with which a student can make a transition from one base to another while receiving TA, relative to the current system
Time of Application Availability	Proxy for convenience of application which also captures the methods of application; measures the time of day when a student can apply for TA
Timeliness of Invoice Processing	Proxy for the timeliness of payment since payment is made at the completion of invoice processing; measures the timeliness of the processing of an invoice for TA from an institution, relative to the current system
Ease of Resolution	Measures the ease with which an institution's problem regarding TA can be resolved, relative to the current system

3.3.2 *Resource Allocation* Branch

Resource Allocation is the second key value found in the first tier of the hierarchy. The values within this branch further define the importance of effective management of resources associated with the TA program. *Resource Allocation* is valued as it pertains to *Funding* and *Information*. Table 3.6 shows the measures associated with the first tier value of *Resource Allocation*, their associated second and third tier values, and the lower and upper bound for each. A description of each measure is found in Table 3.7.

Table 3.6 Evaluation Measures for *Resource Allocation* Branch

2nd TIER VALUE	3rd TIER VALUE	MEASURE	LOWER BOUND	UPPER BOUND
Funding	Reallocation of Funds	Ease of Reallocation	Significantly Decreases	Significantly Increases
	Visibility of Funds	Responsibility for Database Management	100% Distributed	Single Source
		Widespread Access to Real Time Funding Data	Single Source	100% Distributed
Information	Scalability	Ease of Scalability	Significantly Decreases	Significantly Increases
	Visibility of Data	Responsibility for Database Management	100% Distributed	Single Source
		Widespread Access to Real Time Data	Single Source	100% Distributed

Table 3.7 Description of Measures for *Resource Allocation* Branch

Measure	Description
Ease of Reallocation	Measures the ease of reallocating funds within the TA program to handle shortfalls and excesses, relative to the current system
Responsibility for Database Management	Proxy for visibility of funds where a single location of responsibility implies better visibility than multiple locations; measures where the responsibility for database management, with respect to funding data, is located
Widespread Access to Real Time Funding Data	Proxy for visibility of funds where distributed access implies better visibility than single source; measures how well-distributed access is to real time funding data
Ease of Scalability	Measures the ease of scaling the system, either up or down, to meet the needs of the TA program, relative to the current system
Responsibility for Database Management	Proxy for visibility of data where a single source of responsibility implies better visibility than multiple locations; measures where the responsibility for database management, with respect to student data, is located
Widespread Access to Real Time Data	Proxy for visibility of data where distributed access implies better visibility than single source; measures how well-distributed access is to real time student data

3.3.3 *Policies and Procedures* Branch

Policies and Procedures is the third key value found in the first tier of the value hierarchy. Values within this branch further detail the ability to effectively implement policies and procedures related to the TA program. *Policies and Procedures* is subsequently divided into *Responsiveness* and *Standardization*. Table 3.8 shows the measures associated with the first tier value of *Policies and Procedures*, their associated second and third tier values, and the lower and upper bound for each. A description of each measure is found in Table 3.9.

Table 3.8 Evaluation Measures for *Policies and Procedures* Branch

2nd TIER VALUE	3rd TIER VALUE	MEASURE	LOWER BOUND	UPPER BOUND
Responsiveness	Responsiveness to Policy Change	Timeliness of Implementation	Significantly Decreases	Significantly Increases
	Responsiveness to Situation Change	Ease of Responsiveness	Significantly Decreases	Significantly Increases
Standardization	Problem Resolution	Responsibility for Problem Resolution	100% Distributed	Single Source
	Fund Usage	Responsibility for Determining Usage of Funds	100% Distributed	Single Source
	Fund Reconciliation	Responsibility for Funds Reconciliation	100% Distributed	Single Source

Table 3.9 Description of Measures for *Policies and Procedures* Branch

Measure	Description
Timeliness of Implementation	Proxy for responsiveness to policy change where timeliness implies responsiveness; measures the timeliness for implementing changes in policy involving TA, relative to the current system
Ease of Responsiveness	Proxy for responsiveness to situation change since these changes may not affect the entire TA program; measures the ease of being responsive to situation changes that affect the TA program, relative to the current system
Responsibility for Problem Resolution	Proxy for standardization in problem resolution where fewer locations implies more standardization; measures where the responsibility for handling problem resolution is located
Responsibility for Determining Usage of Funds	Proxy for standardization in fund usage where fewer locations implies more standardization; measures where the responsibility for determining fund usage is located
Responsibility for Funds Reconciliation	Proxy for standardization in fund reconciliation where fewer locations implies more standardization; measures where the responsibility for funds reconciliation is located

3.4 Single Dimensional Value Function Creation

Since all of the measures are categorical, the decision group used the following procedures to create all of the SDVFs. The worst score was assigned a value of zero and the best score a value of one. Other possible scores were assigned a value within this range to reflect the view of the decision group regarding the amount of value associated with the score. For those evaluation measures relative to the current system, the best score, "Significantly Increases", was assigned a value of one and the worst score, "Significantly Decreases", was assigned a value of zero. The group then evaluated what value, between zero and one, the current system achieved for the score of "No Change".

The group then determined the value of the score of "Increases", falling between the value of "No Change" and one. This was repeated for the value of the score of "Decreases", with the value being between zero and the value of "No Change". Figure 3.2 shows this type of SDVF from the *Timeliness of Application and Approval Process* measure. The remaining SDVFs are shown in Appendix A.

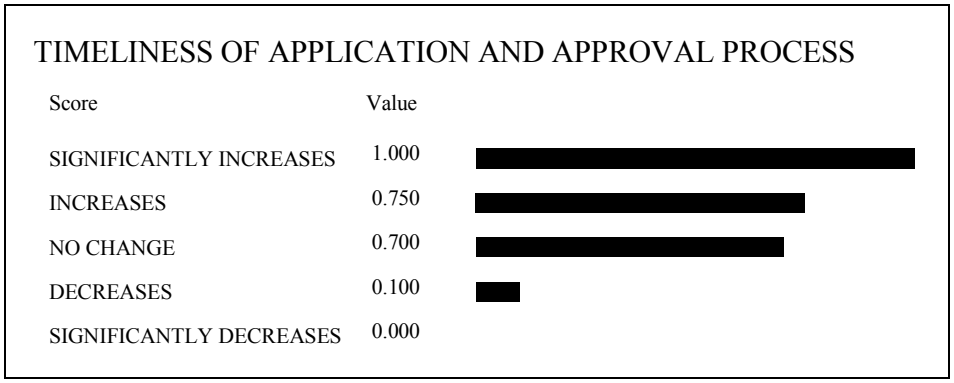

Figure 3.2 Example of a Single Dimensional Value Function

3.5 Determination of Hierarchy Weighting

The direct weighting method, also known as the "100 Marble" method is used in this study. To start the weighting process, each member of the decision group weighted the hierarchy individually several days before the group weighting session. Group members received a sheet of instructions for weighting, a copy of the value hierarchy, a description of each value and measure in the hierarchy, and a spreadsheet for recording their weights. These individual weightings, shown in Appendix B, allowed each group member the opportunity to reflect on the relative importance of the values prior to a group discussion. Each member submitted their weights to the facilitation team prior to

the group weighting session. This provided the groundwork for the facilitation of the group weighting session. Table 3.10 shows the individuals' weights and the group average for the first tier values.

Table 3.10 First Tier Weights for Individual Group Members

	CUSTOMER SERVICE	RESOURCE ALLOCATION	POLICIES AND PROCEDURES
MEMBER A	60	30	10
MEMBER B	30	40	30
MEMBER C	50	30	20
MEMBER D	45	30	25
MEMBER E	33.3	33.4	33.3
AVERAGE	43.66	32.68	23.66

Individual group members were not shown the weights of other members or the group average prior to or during the group weighting session. The group weighting session began with a brief refresher on the direct weighting technique. The decision group was asked to reach a consensus on the weight of each value and evaluation measure in the hierarchy using the direct weighting technique. The decision group allocated 100 marbles across each tier of each branch, beginning with the fundamental objective and working down the hierarchy, to determine the local weights. The global weights were then calculated by multiplying the local weight of the particular value with those values leading back to the fundamental objective. Figure 3.3 shows the local weights, reached by group consensus, of the fundamental objective and first tier values, with the global weights in parentheses.

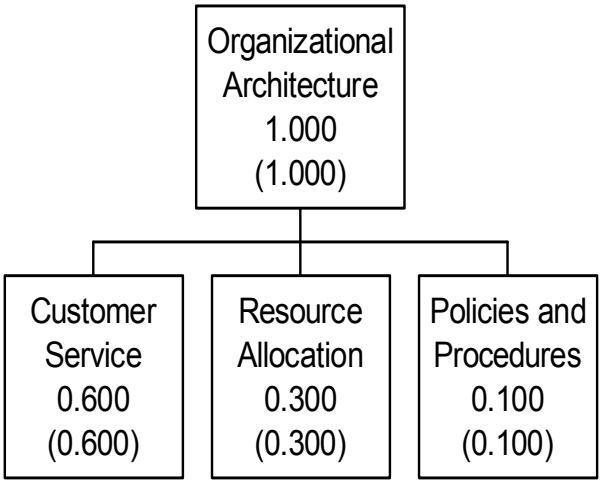

Figure 3.3 Weights of Fundamental Objective and First Tier Values

Once the first tier weights were determined, the group proceeded down each branch of the hierarchy, beginning with *Customer Service*, then *Resource Allocation*, then *Policies and Procedures*, and repeated the direct weighting procedures. Figures 3.4 - 3.6 show the local weights of the values and measures in each branch from the first tier values, with the global weights in parentheses. The solid boxes denote values and the dotted boxes denote measures. The global weights of the measures, showing the percentage of importance each measure has relative to all other measures in the hierarchy, are used later in the analysis to calculate the total value of each alternative.

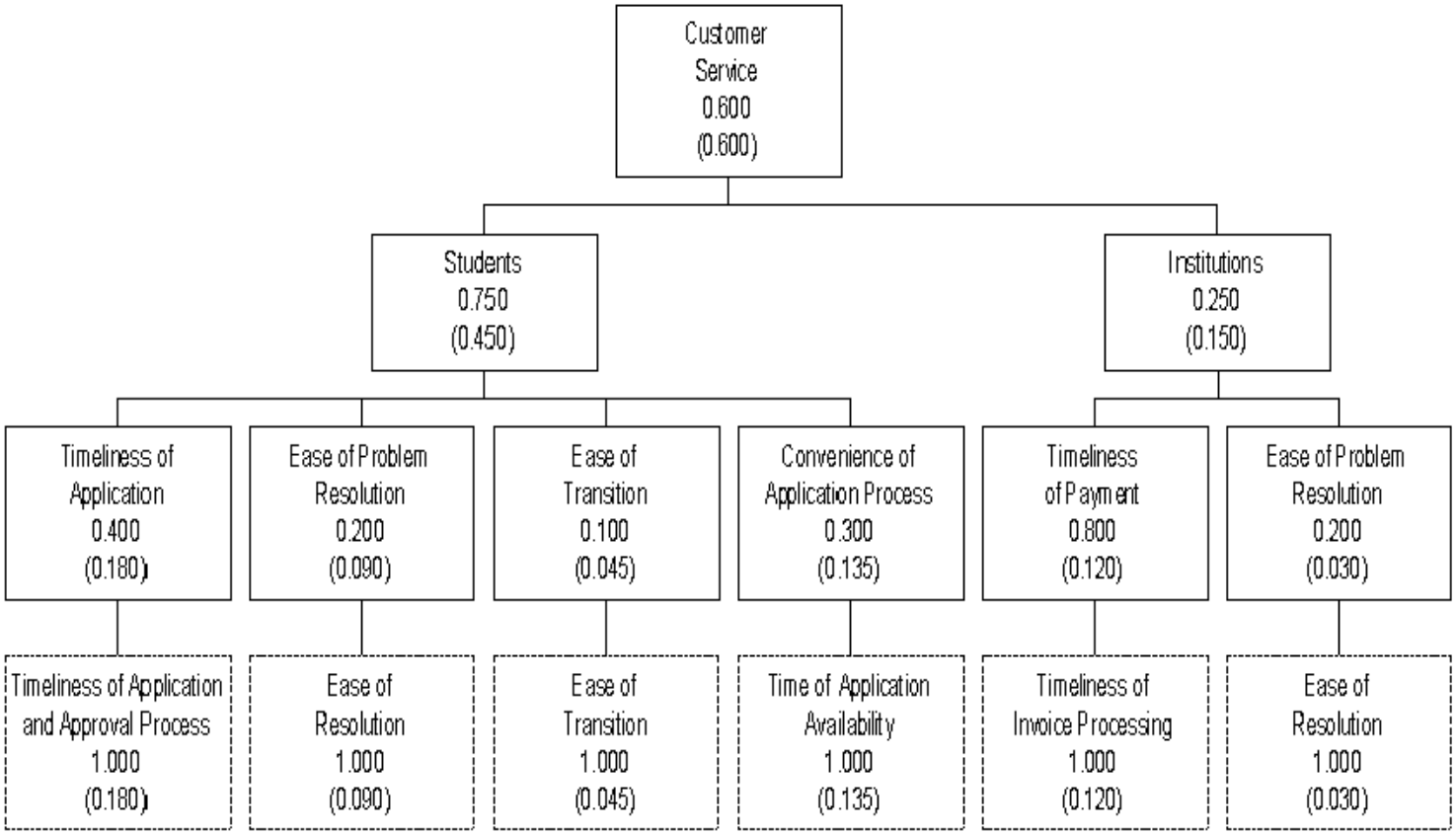

Figure 3.4 Local and Global Weights for *Customer Service* Branch

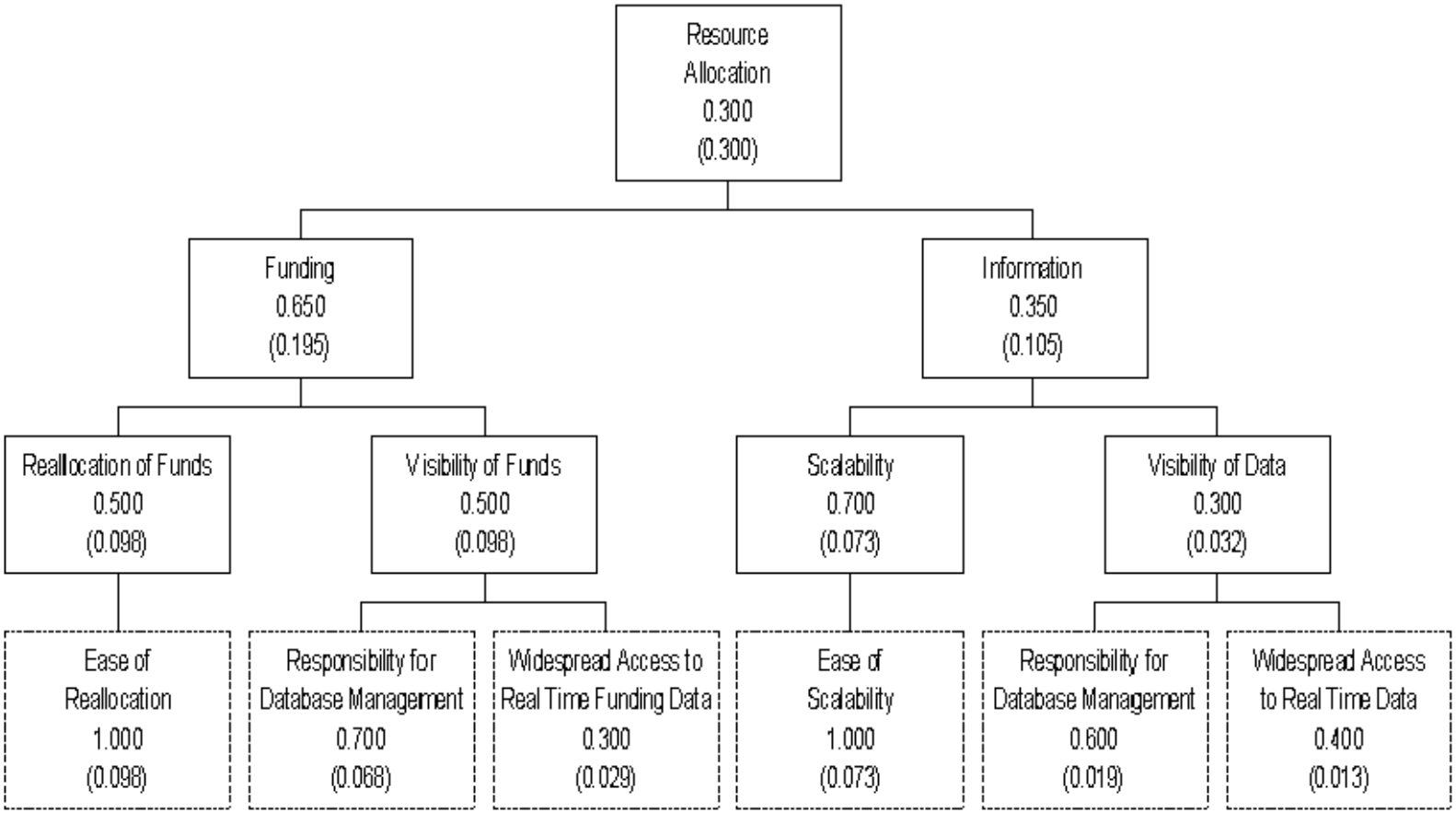

Figure 3.5 Local and Global Weights for *Resource Allocation* Branch

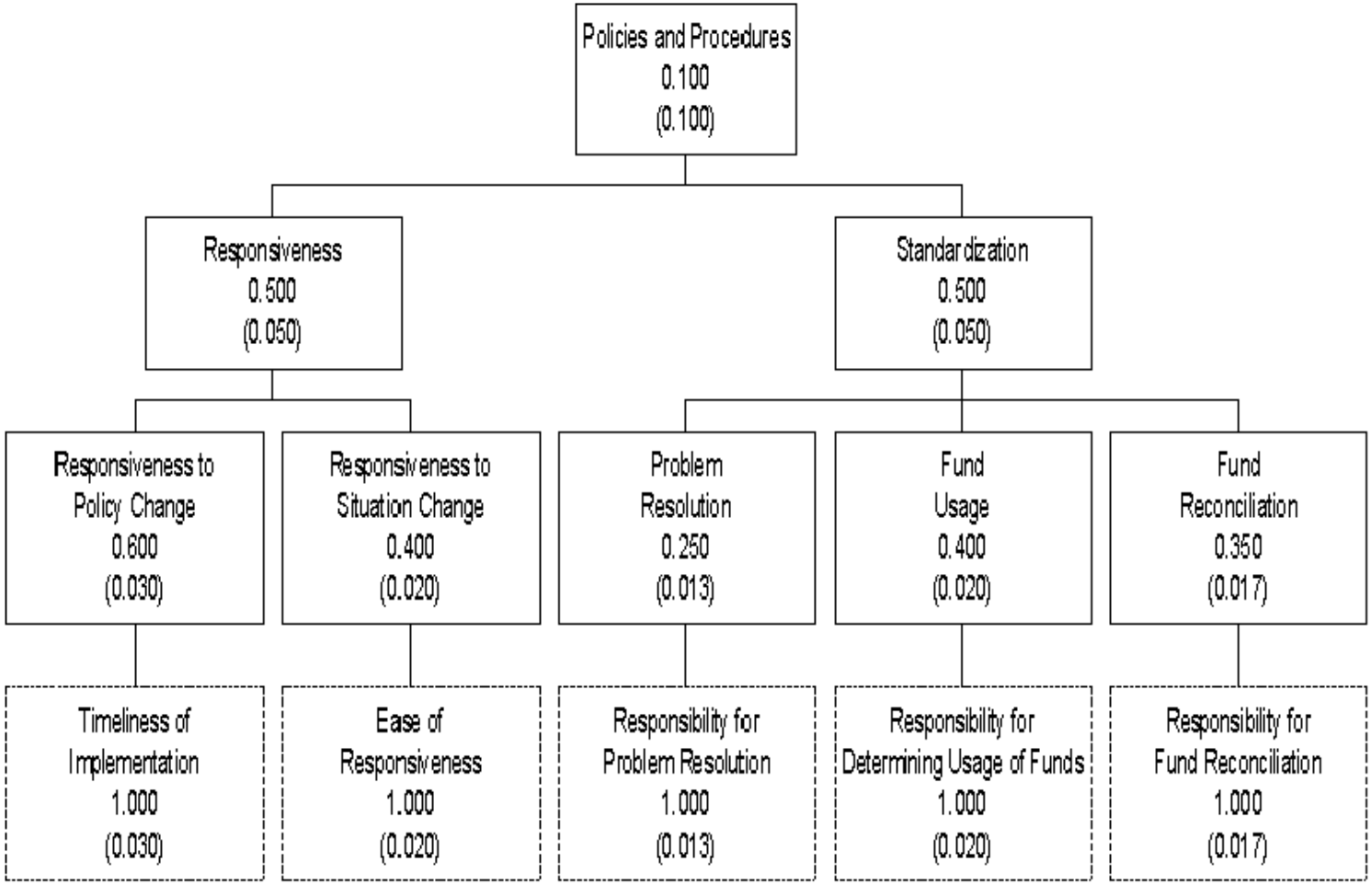

Figure 3.6 Local and Global Weights for *Policies and Procedures* Branch

3.6 Alternative Generation

A list of the critical functions associated with the TA program was developed with input from the decision group. The proposed location of responsibility for each of these functions was charted to develop each alternative. Table 3.11 shows an example of the completed chart for the Current System architecture, including the critical functions and the location of responsibility.

Table 3.11 Current System Architecture

FUNCTION	HQ	MAJCOM	BASE
Provides Academic Advisement			X
Monitors Degree Progress			X
Inputs Application Data			X
Receives Completed Applications			X
Approves Applications			X
Stores Real-Time Student Data			X
Handles Database Management			X
Has Ability To View Real-Time Student Data			X
Has Ability To View Real-Time Data Reports			X
Tracks Grades			X
Tracks Reimbursements			X
Waives Reimbursements	X	X	X
Waives Ta Policy ($ Cap, Credit Hours, Etc.)	X	X	
Has Budget Input, Handles Financial Planning	X	X	X
Handles Final Funds Management	X	X	
Has Reallocation Control		X	
Certifies Invoices			X
Pays Invoices			X
Stores Real-Time Budget Data			X
Has Ability To View Real-Time Budget Data			X

Appendix C contains clarifications regarding some of the functions as well as a completed chart for each alternative. These charts present a clear understanding of the organizational architecture associated with each alternative. They are also beneficial aids in scoring the alternatives.

Since the TA program currently has a functioning organizational architecture, the first alternative is to maintain the current architecture. A discussion of changes being made to the current TA system led to the development of two other alternatives. AFAEMS is currently testing a central database for a small group of Air Force bases. This led to the development of an alternative, referred to as Modified Current, which would apply this central database concept to the entire TA program along with the availability of online application for students. This Modified Current proposal sparked another idea referred to as the Main Funding Office alternative. This involves utilizing the Modified Current proposal, but adding a main office whose responsibilities include storing all TA data and paying the invoices for TA.

Studies of how the other military services operated their TA programs led to the development of five other possible alternative organizational architectures. The first four are the organizational architectures of the other military services (Army, Navy, Marines, and Coast Guard) for the implementation of their TA programs. The fifth is an organizational structure based on the centralized concept of the Navy and Marines, but with minor modifications. These modifications are based on lessons learned by the Navy and Marines and on other suggestions that members of the decision group viewed as improving the architecture to meet the needs of the Air Force. The organizational architecture utilized by the Army was eliminated from consideration since it could not be adapted to meet the capabilities of the current TA program run by the Air Force. Also, the architectures used by the Navy and Marines were determined to be fundamentally the same and were combined into one alternative.

3.7 Alternative Scoring

The scoring of the alternatives began with a discussion of the characteristics of each alternative. The table showing the location of responsibility for different TA functions and an explanation of details such as whether the alternative included central databases and online application capability were presented for each alternative. Questions about each alternative were also answered. Every alternative was scored for a particular measure before moving on to the next measure. This assured consistency in the understanding and scoring of each measure. The scoring often involved intense discussions about the alternative or measure in question and was decided by group consensus. The same scoring process was repeated for every measure in the hierarchy. The scores for each alternative are shown in Appendix D.

Chapter 4. Results and Analysis

4.0 Chapter Overview

Chapter 4 describes the results and analysis from the VFT methodology utilized to evaluate organizational architectures for the Air Force TA program. The weighting determined by group consensus is utilized throughout this chapter. The chapter begins with an explanation of the results and insight gained from the deterministic analysis. Insight gained from sensitivity analysis, performed on the weights of the first tier of the hierarchy, is then presented.

4.1 Deterministic Analysis

The deterministic analysis involves the ranking of alternatives based on their total value and provides insight from the data associated with those rankings. An alternative's total value is calculated using the additive value function described in Chapter 2. This involves multiplying the global weight of each measure with the alternative's value from the SDVF for that measure and then summing those products over all measures (see Equation 2.1). Figure 4.1 shows the total value of the alternatives, as well as the hypothetical best and worse case, in decreasing rank order.

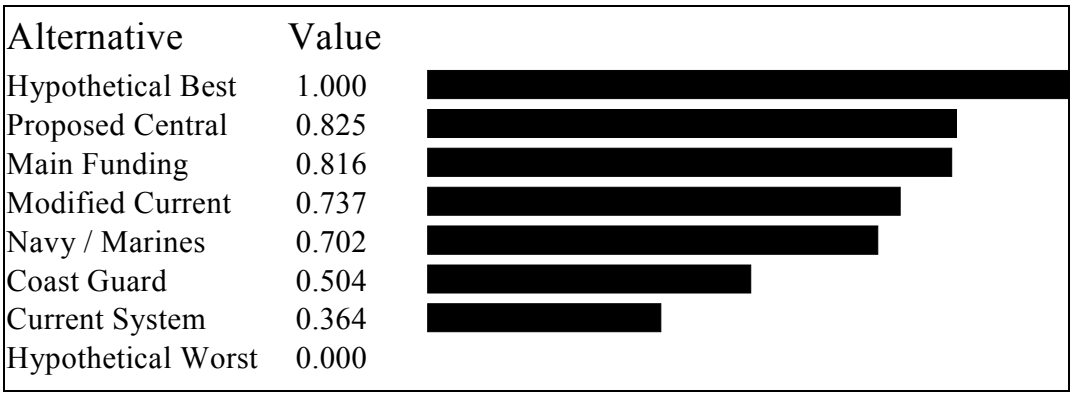

Figure 4.1 Ranking of Alternatives by Total Value

The Proposed Central architecture ranks highest, achieving 82.5% of the potential value. The Main Funding architecture, ranked second, also scores extremely well. This architecture achieves 81.6% of the potential value. The Current Systems architecture ranks the lowest, achieving only 36.4% of the potential value. Several observations, other than the overall ranking, can be made from the calculations performed to determine the total value of each alternative. The following two sections detail these observations and their importance to the decision group.

4.1.1 Analysis By First Tier Values

This section examines how the alternatives rank in terms of the value gained from each of the first tier areas. These rankings are based strictly on the achievement within the specified first tier value and differ from the overall ranking shown previously. These values indicate the percentage of achievement within the specific first tier value and when multiplied by the respective first tier weights and added together form the total value shown in Figure 4.1. This section also shows how well the individual alternatives

do in terms of the second tier values within each first tier area. This type of breakdown provides significant insight regarding the level of achievement of each alternative for the first and second tier values. Figure 4.2 shows the ranking of alternatives in terms of their achievement in the *Customer Service* branch. This achievement is broken down into the second tier values, *Students* and *Institutions*, under *Customer Service*.

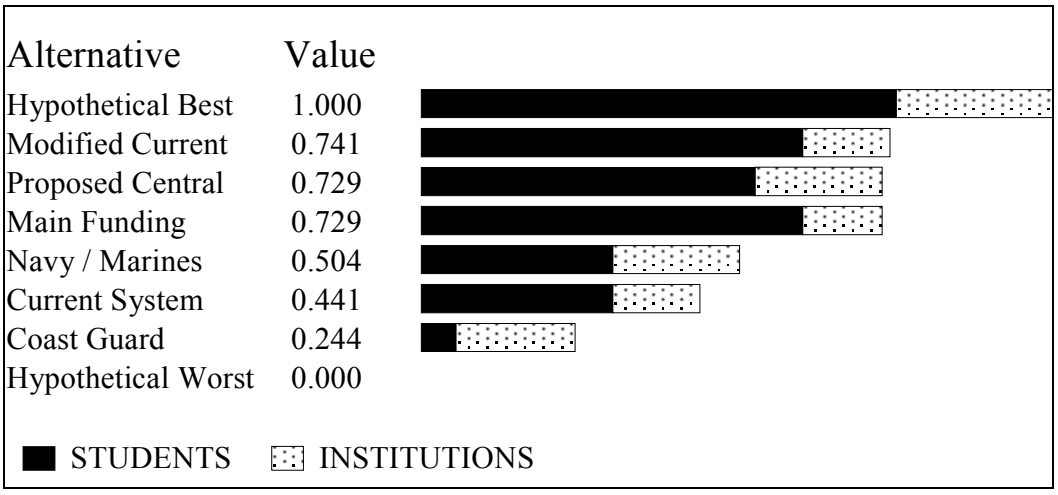

Figure 4.2 Ranking of Alternatives by *Customer Service*

In terms of *Customer Service*, the Modified Current architecture ranks the highest, just slightly ahead of the Proposed Central and the Main Funding architectures, which tie for second. The Main Funding and Modified Current achieve the same value for *Students*, but the Modified Current achieves more value for *Institutions*, which leads to its higher ranking. The Proposed Central achieves less than the Main Funding and Modified Current in terms of *Students*, but achieves more in terms of *Institutions*. The Navy / Marines, the Current System, and the Coast Guard all score significantly lower in terms of *Students*, though the Navy / Marines and the Coast Guard score extremely well in terms of *Institutions*.

There are two driving factors behind an alternative's success in the area of *Customer Service*. First, the architectures that take advantage of technology in providing online access for students achieve higher value in terms of *Students*. This is not surprising since online access provides considerable improvement in terms of convenience and timeliness for the student. Second, the architectures with a single point of contact for the schools achieve higher value in the area of *Institutions*. This is to be expected since a single point of contact improves problem resolution and timeliness of payments, both of which are important to the institutions.

Figure 4.3 shows the ranking of alternatives based on their achievement in the *Resource Allocation* branch. This category is broken down into the second tier values, *Funding* and *Information*.

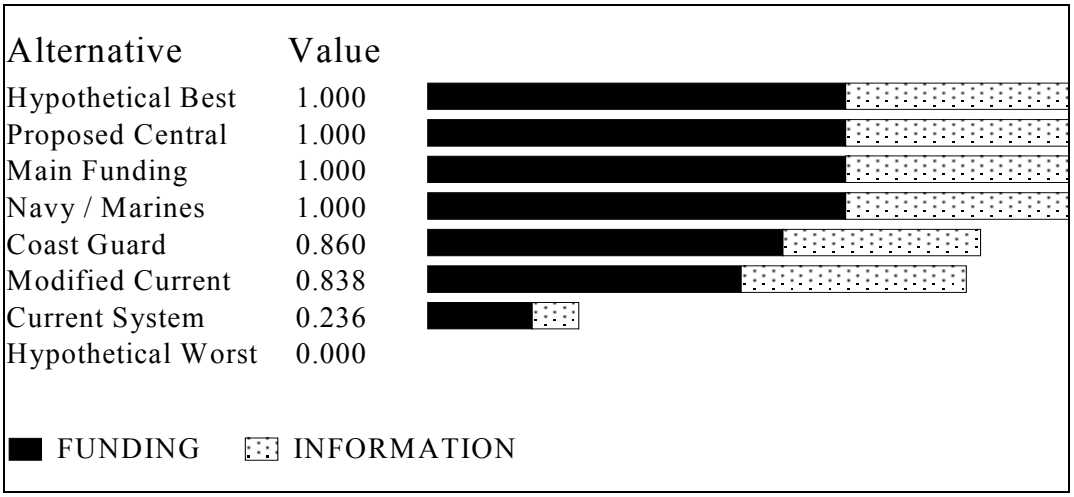

Figure 4.3 Ranking of Alternatives by *Resource Allocation*

The Proposed Central, the Main Funding, and the Navy / Marines architectures all tie as the highest ranked alternative when considering only *Resource Allocation*. This indicates that in this area, the decision group would be indifferent between the selection

of any of these three architectures and would need to look to the other branches to select a preferred architecture. The Coast Guard and the Modified Current architectures also do extremely well in *Resource Allocation*. Only the Current System architecture does poorly in both the *Funding* and *Information* areas of *Resource Allocation*. These results come directly from the fact that those architectures where control of the resources is in a single location are better able to provide an overall Air Force view of the TA program with respect to spending and student enrollment whereas the dispersed nature of the Current System architecture makes it unable to provide such a view.

Figure 4.4 shows the ranking of alternatives in terms of their achievement in the *Policies and Procedures* branch. This category is broken down into the second tier values, *Responsiveness* and *Standardization*.

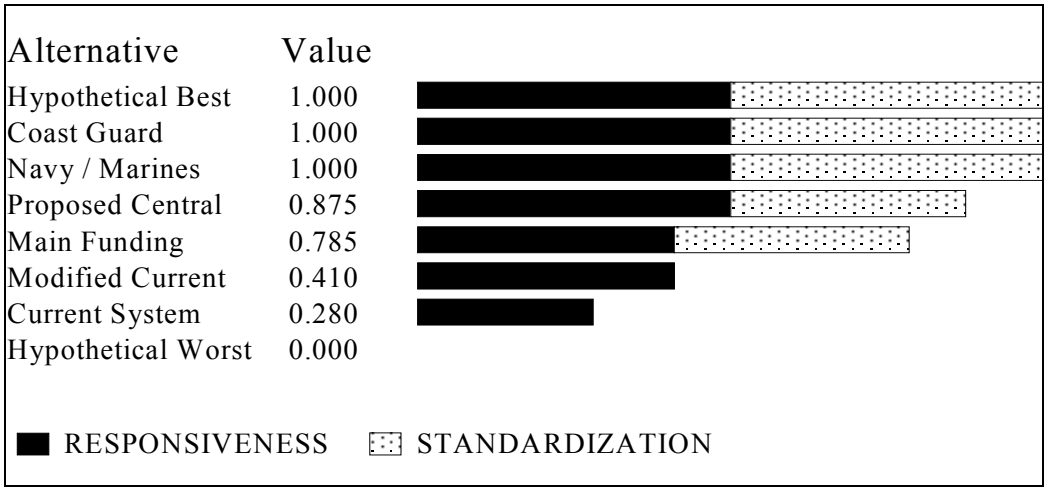

Figure 4.4 Ranking of Alternatives by *Policies and Procedures*

Both the Coast Guard and the Navy / Marines architectures achieve the maximum value possible, and thus rank the highest in the area of *Policies and Procedures*. The Proposed Central architecture achieves maximum value in *Responsiveness*, but not in

Standardization. The Main Funding architecture does relatively well in *Responsiveness* and *Standardization*, though it does not achieve the maximum value in either area. Both the Modified Current and the Current System architectures achieve no value in *Standardization*, though the Modified Current does moderately well in *Responsiveness*. These results, when viewed together, lead to the conclusion that those architectures in which key functions are handled at a single location achieve higher value in the area of *Policies and Procedures*. This is a direct result of the decision group's beliefs that policies and procedures are more consistently executed when handled at a single location than when dispersed at multiple locations and that the system can be more responsive to change when the change only needs to be implemented at a single location.

This type of analysis clearly provides insight for identifying value gaps, those areas in need of improvement, in specific architectures. It highlights those areas in which particular architectures are currently lacking and may be improved to achieve more value, possibly leading to the development of new alternatives that improve on the weak areas of existing alternatives.

4.1.2 Insight from Measures

There are seventeen measures within the value hierarchy. Table 4.1 shows the global weight of each of these measures, ordered from largest to smallest.

Table 4.1 Global Weights of Measures

MEASURE	GLOBAL WEIGHT
TIMELINESS OF APPLICATION AND APPROVAL PROCESS	0.180
TIME OF APPLICATION AVAILABILITY	0.135
TIMELINESS OF INVOICE PROCESSING	0.120
EASE OF REALLOCATION	0.098
EASE OF RESOLUTION (*Students*)	0.090
EASE OF SCALABILITY	0.074
RESPONSIBILITY FOR DATABASE MANAGEMENT (*Funding*)	0.068
EASE OF TRANSITION	0.045
EASE OF RESOLUTION (*Institutions*)	0.030
TIMELINESS OF IMPLEMENTATION	0.030
WIDESPREAD ACCESS TO REAL TIME FUNDING DATA	0.029
EASE OF RESPONSIVENESS	0.020
RESPONSIBILITY FOR DETERMINING USAGE OF FUNDS	0.020
RESPONSIBILITY FOR DATABASE MANAGEMENT (*Information*)	0.019
RESPONSIBILITY FOR FUNDS RECONCILIATION	0.018
WIDESPREAD ACCESS TO REAL TIME DATA	0.013
RESPONSIBILITY FOR PROBLEM RESOLUTION	0.013
SUM OF GLOBAL WEIGHTS	**1.000**

The top three measures, all found in the *Customer Service* branch, account for 43.5% of the total weight. This implies that how an alternative scores on those measures can have a notable effect on the final ranking of the alternatives. For example, if an alternative achieves no value in these three areas, the total overall value possible for that alternative is at most 56.5%. Hence, the decision group has these three critical areas on which to initially focus their attention when examining alternatives. Also, particular attention

should be paid to these areas when developing new alternatives since these three measures can have a dramatic impact on the overall value of an alternative.

4.2 Sensitivity Analysis

Sensitivity analysis was carried out on the local weights of the first tier values since these weights were of greatest concern to the decision group. This type of analysis demonstrates the impact of various weighting scenarios on the ranking of the alternatives. This analysis involves varying the local weight of a first tier value from zero to one, while maintaining the proportionality of the local weights of the remaining first tier values. This same process is completed for every value found in the first tier. The next three sections detail the sensitivity analysis for the first tier values: *Customer Service*, *Resource Allocation*, and *Policies and Procedures*.

4.2.1 Sensitivity Analysis on *Customer Service*

Customer Service is the first tier value with the highest weight of 0.600. The analysis shows how the alternative rankings change if the weight on *Customer Service* is increased or decreased from its current value. Figure 4.5 shows the sensitivity graph for the first tier value of *Customer Service.* The vertical line indicates the current weight of *Customer Service*.

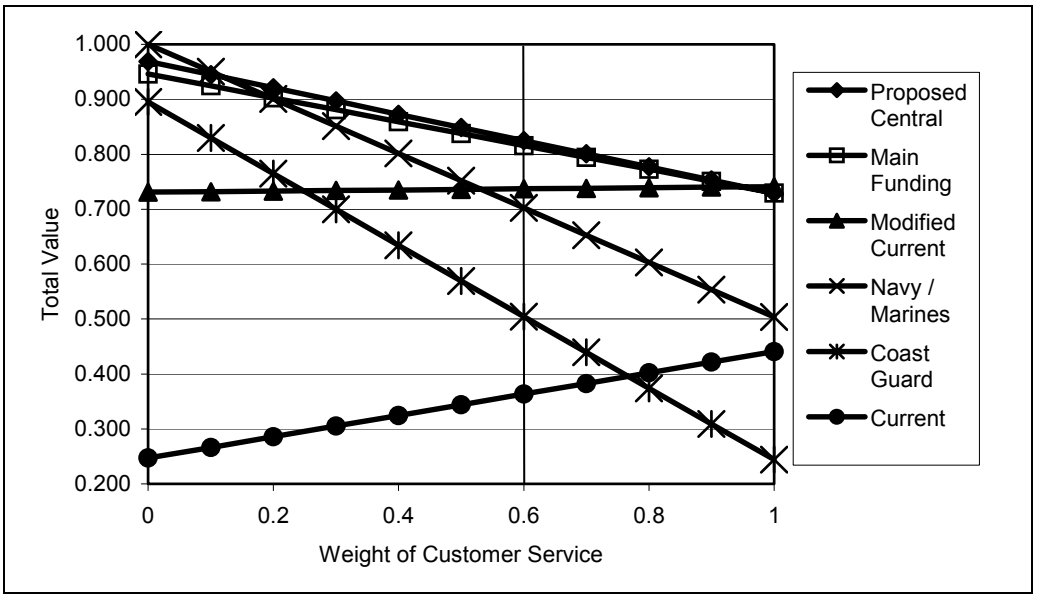

Figure 4.5 Sensitivity Graph for *Customer Service*

As the weight on *Customer Service* increases from zero to one, only two alternatives, Modified Current and Current, show increases in total value. This is due to the fact that those are the only two alternatives that score higher in *Customer Service* than they do in either of the other first tier areas. Thus the more weight *Customer Service* receives, the more their total value increases. The Proposed Central and Modified Current architectures are the preferred architectures over a reasonable range for the weight of *Customer Service*. It is not until the weight nears the extremes, below 0.20 or above 0.95, that these architectures are not the highest ranking. Based on discussion within the decision group, decreasing or increasing the weight to such extremes is not considered realistic. Therefore, the model is relatively insensitive to changes in the weight of *Customer Service* over a realistic range.

4.2.2 Sensitivity Analysis on *Resource Allocation*

Resource Allocation has the second highest weight (0.300) of the first tier values. The weight on *Resource Allocation* was varied from zero to one, using the same method described previously, to determine the effect of such changes on the ranking of the alternatives. Figure 4.6 shows the sensitivity graph for the first tier value of *Resource Allocation.* The vertical line indicates the current weight of *Resource Allocation*.

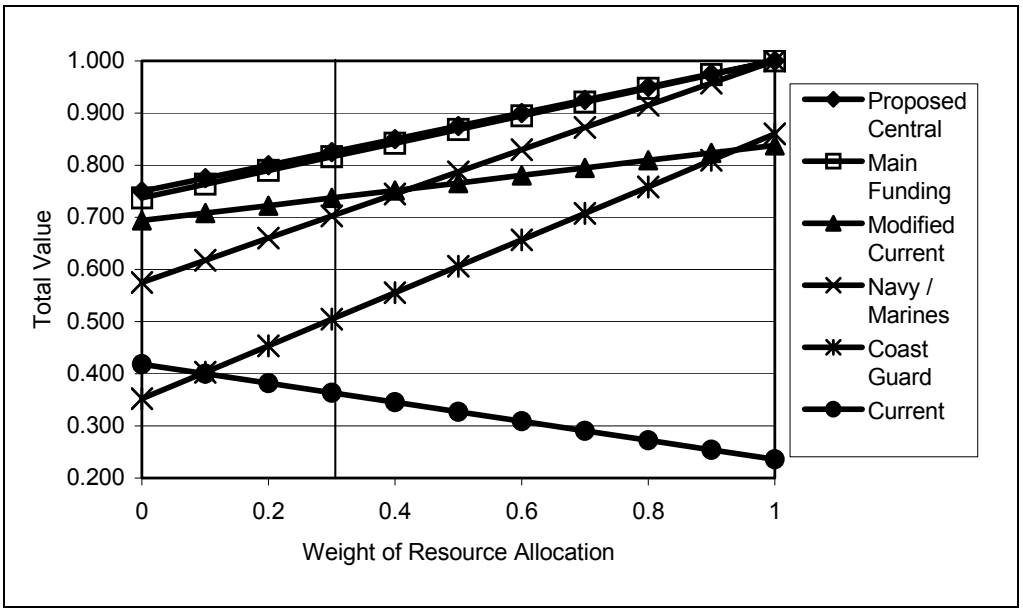

Figure 4.6 Sensitivity Graph for *Resource Allocation*

As the weight on *Resource Allocation* increases from zero to one, only the Current architecture decreases in total value. This directly results from the fact that only the Current architecture scores lower in *Resource Allocation* than in either of the other first tier values. While there are slight changes in the final ranking of alternatives as the weight of *Resource Allocation* is adjusted, the Proposed Central and Main Funding architectures remain the top ranked alternatives over the entire range of weights. This

shows the model is reasonably insensitive to changes in the weight of *Resource Allocation*.

4.2.3 Sensitivity Analysis on *Policies and Procedures*

Policies and Procedures is the first tier value receiving the lowest weight of 0.100. Figure 4.7 shows the sensitivity graph for the first tier value of *Policies and Procedures.* The vertical line indicates the current weight of *Policies and Procedures*.

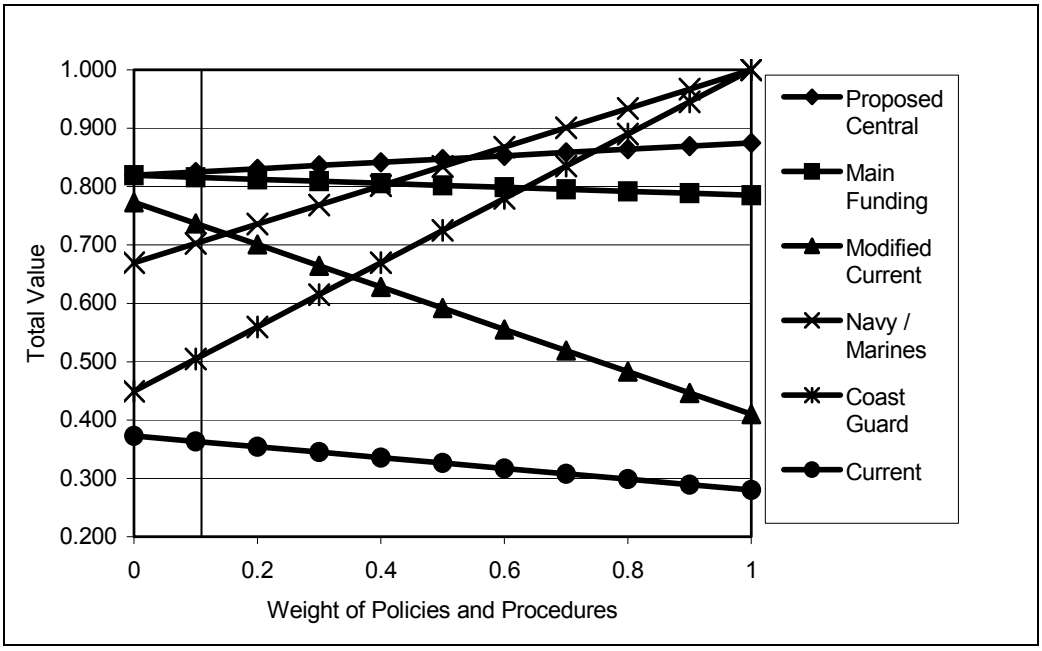

Figure 4.7 Sensitivity Graph for *Policies and Procedures*

The change in total value for the Modified Current, the Navy / Marines, and the Coast Guard architectures is significantly more dramatic than for the other architectures. This stems from their scores in *Policies and Procedures* differing considerably from their scores in at least one of the other first tier areas. The Proposed Central and Main Funding

architectures are again the highest-ranking alternatives until the weight of *Policies and Procedures* exceeds 0.400. However, the decision group felt that it would be unrealistic to assign *Policies and Procedures* a weight higher than 40% because that would leave only 60% of the weight to be distributed between the other first tier values, which currently account for 90% of the weight. Therefore the Proposed Central and Main Funding architectures are again the preferred alternatives over a realistic range of weights. These outcomes indicate that the model is generally insensitive to changes in the weight of *Policies and Procedures*.

4.2.4 Summary of Sensitivity Analysis

Examining the results of the sensitivity analysis as a whole provides further insight for the decision group. Those architectures that achieve high total value do so in all of the scenarios examined in the sensitivity analysis. The Proposed Central and the Main Funding architecture, which are the two highest ranked alternatives, maintain a total value of higher than 0.720 in every scenario. These two architectures are clearly preferred over a realistic range of local weights for the first tier values. The Current System architecture, ranked the lowest, never achieves a value higher than 0.450 or a rank above fifth out of six alternatives. The consistency in the results over a variety of sensitivity analysis scenarios demonstrates the robustness of the value model.

Chapter 5. Conclusions and Recommendations

5.0 Chapter Overview

Chapter 5 is the capstone of this thesis research. Initially, the chapter presents a summary of the results of the analysis and provides recommendations for the decision group as to the preferred organizational architecture. A discussion of the strengths and limitations of the value model developed for this research follows. The chapter concludes with suggestions for future research.

5.1 Summary of Research

The objectives of this research effort are to quantify the values associated with the Air Force Tuition Assistance Program and to use these values to evaluate potential organizational architectures for the management of the TA program. The value model, in conjunction with the results of the deterministic and sensitivity analyses, accomplishes these objectives. The results serve as one piece in the decision process. The final decision is ultimately made by AF/DPLE with other information to include cost, manpower, and political implications.

The Current System architecture achieves the lowest value (36.4%) of all the architectures evaluated. The implementation of any of the proposed alternative architectures will improve the level of achievement in overall value and allow for more efficient management of the TA program. The final ranking of the alternatives shows the Proposed Central architecture achieves the most value, 82.5% of the possible value, while

the Main Funding architecture also does extremely well, achieving 81.6% of the possible value. Both of these alternatives score equally well in the area of *Customer Service*, though within that branch, the Proposed Central architecture achieves more value within *Institutions* while the Main Funding architecture achieves more value within *Students*. The Proposed Central architecture is more responsive to *Institutions* since, unlike the Main Funding architecture, it provides a single location that handles all aspects of the TA process involving the institutions. The Main Funding architecture is more responsive to *Students* because it leaves all aspects of the TA process relating to the student at the base level; this structure does not lose the "personal" interactions.

In the areas of *Funding* and *Information*, within *Resource Allocation*, both alternatives score equally well. This results from the fact that both architectures provide a single source management of databases as well as full visibility of both funding and enrollment data. They also take advantage of efficiencies through advancements in technology. In the area of *Policies and Procedures*, the Proposed Central architecture achieves slightly more value than the Main Funding architecture. Within the *Policies and Procedures* branch, the two architectures achieve equal value in *Standardization*, but the Proposed Central architecture achieves slightly more value in *Responsiveness* because it moves the majority of functions to a single location, which enables the implementation of changes to be more efficient.

The Proposed Central and the Main Funding architectures are clearly the preferred alternatives based on the results of the deterministic analysis. These two architectures also perform extremely well across the range of weighting scenarios examined during sensitivity analysis. The initial recommendation to AF/DPLE is to

select the Main Funding architecture for the TA program. The Main Funding alternative provides a total value that is less than one percent below that of the Proposed Central while requiring fewer changes to the architecture under which the TA program currently operates and would most likely require less manpower than the Proposed Central. However, the Main Funding architecture may not provide some of the benefits AF/DPLE hopes to achieve (e.g. significant reduction in the work load at the base level and an increase in the collection of reimbursements).

If AF/DPLE selects the Proposed Central architecture, the recommendation is to initially implement the Main Funding architecture since it requires fewer changes to the architecture under which the TA program is currently operating and then gradually implement changes required for the Proposed Central architecture. This would allow AF/DPLE to modify the current system in smaller increments, which would provide two major benefits. First, it would permit those currently working within the TA program time to adapt to the changes at a slower pace thus making the changes easier for them to implement. Second, it would provide AF/DPLE time to reconcile operational issues encountered with the changes for the Main Funding architecture before implementing the Proposed Central architecture, which would allow for a smoother transition for all involved.

5.2 Model Strengths

The model developed for this research effort establishes the values of AF/DPLE with respect to the Air Force Tuition Assistance Program. Furthermore, it demonstrates

how those values can assist in the selection of an organizational architecture for the management of the TA program. Examination of those values, and the level of achievement of those values by various architectures, provides essential insight for the decision group. Not only can the decision group see how well a particular architecture does overall, they are also able to gain insight into the specific strengths and weaknesses of an architecture in terms of the values initially set forth. In addition, the value model has the capability to evaluate as many alternatives as the decision group generates.

The use of the VFT process to develop the value model also provides AF/DPLE with a defendable methodology to support their selection of a specific organizational architecture. This thesis effort utilizes a clearly structured process to develop a value model that explicitly details the tradeoffs associated with selecting an organizational architecture for the TA program. This level of detail, in conjunction with the documentation of the analysis, creates a complete model that can be easily reviewed by all those interested in the selection of an organizational architecture for the management of TA.

5.3 Model Limitations

One of the weaknesses found in this value model is that it does not account for potential uncertainty in the creation of the SDVFs or the scoring of the alternatives. Developing the SDVFs and scoring the alternatives as a group, rather than as individuals, helps to alleviate some of this uncertainty. Uncertainty in the weighting of the values is accounted for through sensitivity analysis.

Another weakness found in this model is that it does not account for the cost or manpower associated with the various architectures. These issues should be considered independently of the value assessment of alternatives and though examination of these issues was limited in this research, further investigation of them could provide useful insight to the decision group.

5.4 Recommendations for Future Research

One area for future research is the investigation of different approaches to account for uncertainty within the SDVFs and the scoring of alternatives. A range of probabilistic techniques, such as expected value and risk analysis, could be utilized in such research. Another area for future research is the further examination of the benefits and limitations associated with various techniques in developing hierarchy weights when a decision group is involved. While this thesis effort provides a cursory review of averaging individual weights from a group as compared to weighting by group consensus, future research in this area could provide vast insight for studies involving decision groups. Finally, future research into the cost and manpower requirements associated with implementing each of the different organizational architectures evaluated for the TA program would provide the decision group with more information that could aid in the selection of an organizational architecture.

Appendix A. Single Dimensional Value Functions of Measures

The figures in Appendix A illustrate the Single Dimensional Value Functions developed by the decision group for each measure in the hierarchy. The measures are shown in the order they appear in the hierarchy.

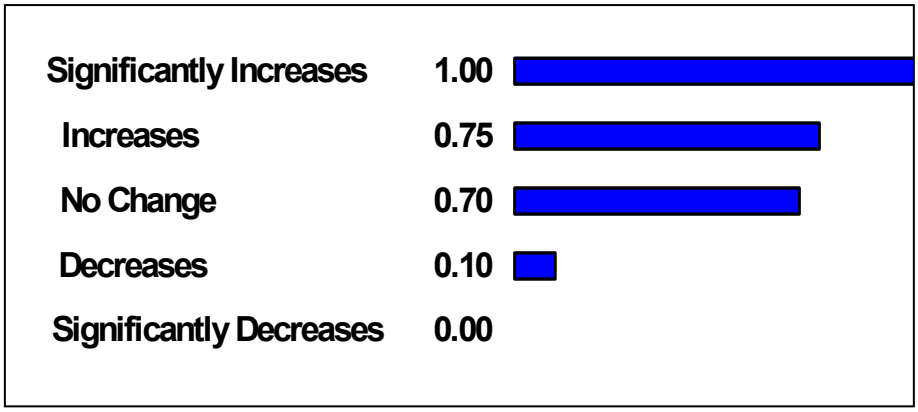

Figure A.1 SDVF for Timeliness of Application & Approval Process Measure

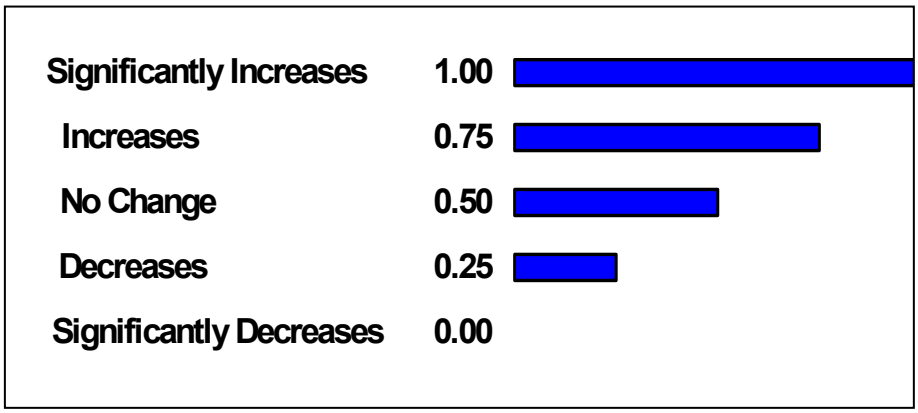

Figure A.2 SDVF for Ease of Resolution Measure (under Students)

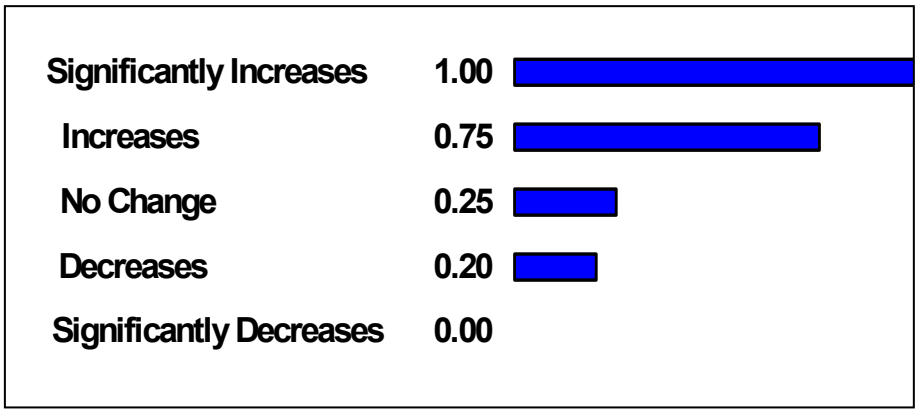

Figure A.3 SDVF for Ease of Transition Measure

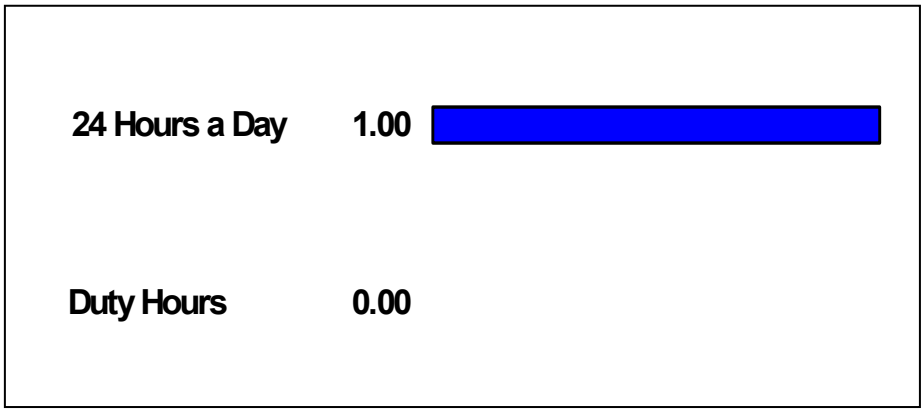

Figure A.4 SDVF for Time of Application Availability Measure

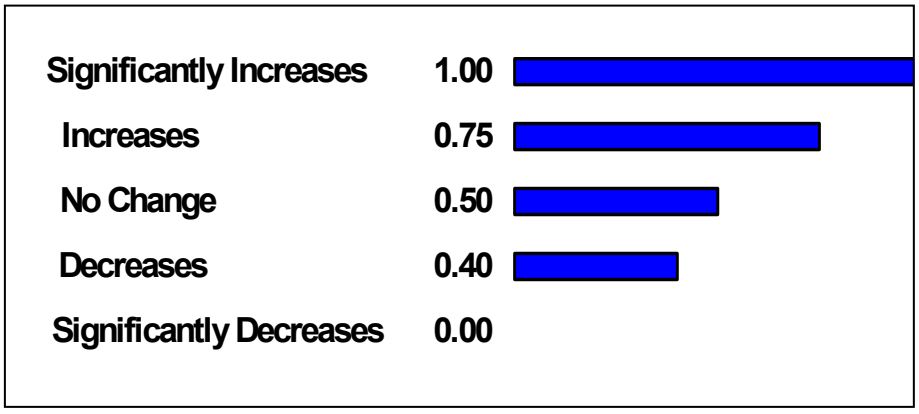

Figure A.5 SDVF for Timeliness of Invoice Processing Measure

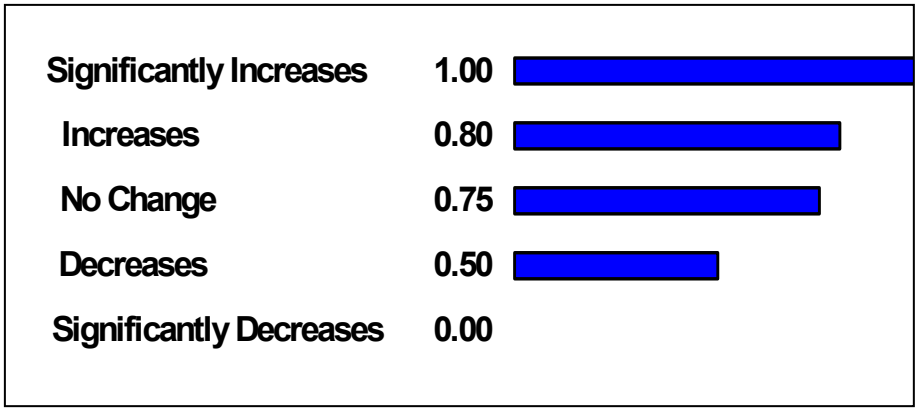

Figure A.6 SDVF for Ease of Resolution Measure (under Institutions)

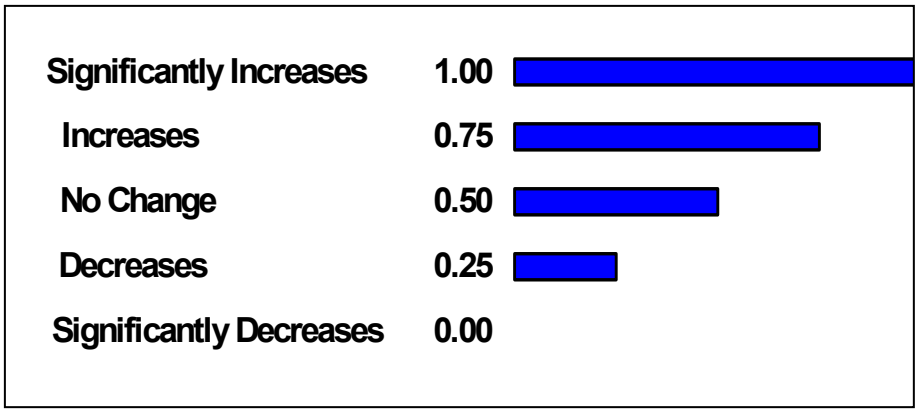

Figure A.7 SDVF for Ease of Reallocation Measure

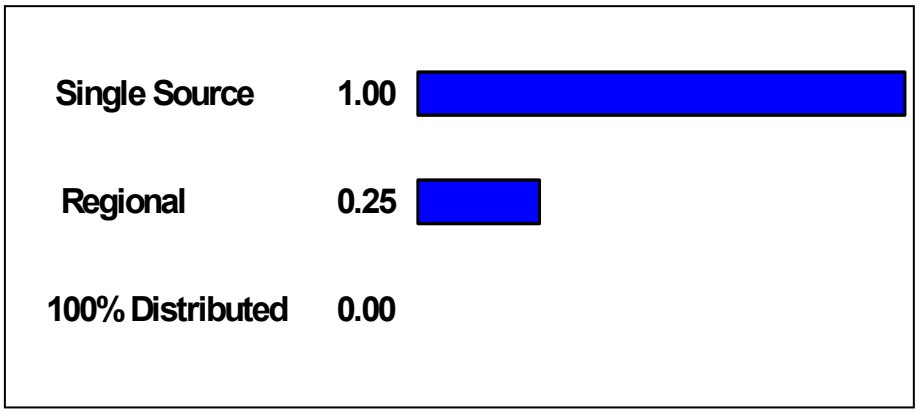

Figure A.8 SDVF for Responsibility for Database Management Measure (under Funding)

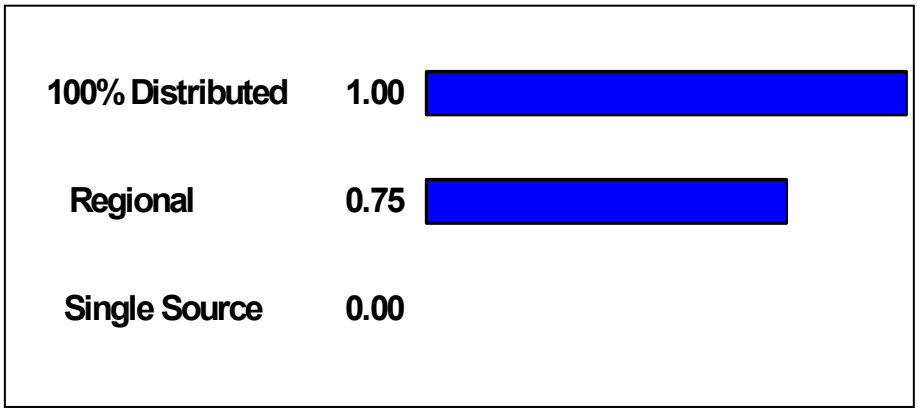

Figure A.9 SDVF for Widespread Access to Real Time Funding Data Measure

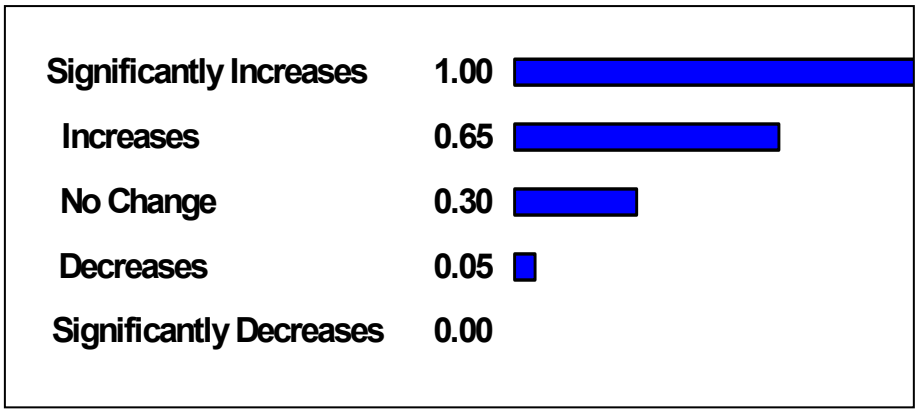

Figure A.10 SDVF for Ease of Scalability Measure

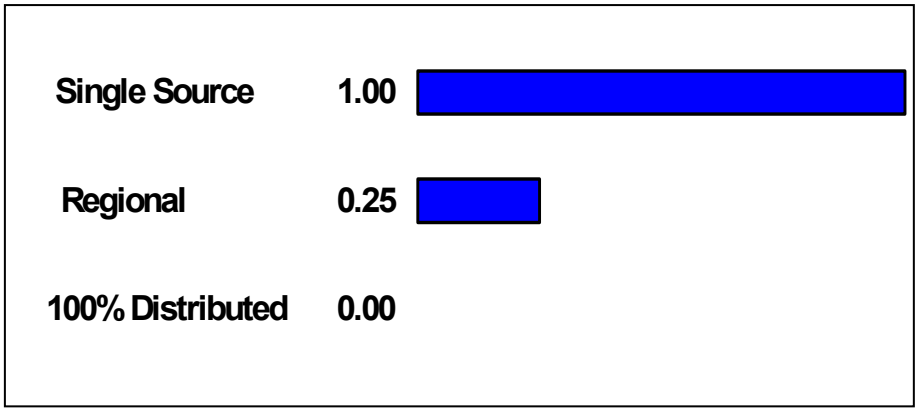

Figure A.11 SDVF for Responsibility for Database Management Measure (under Information)

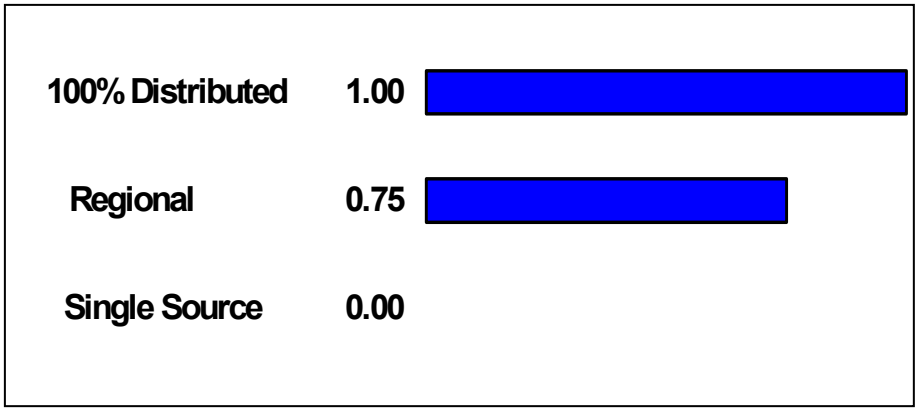

Figure A.12 SDVF for Widespread Access to Real Time Data Measure

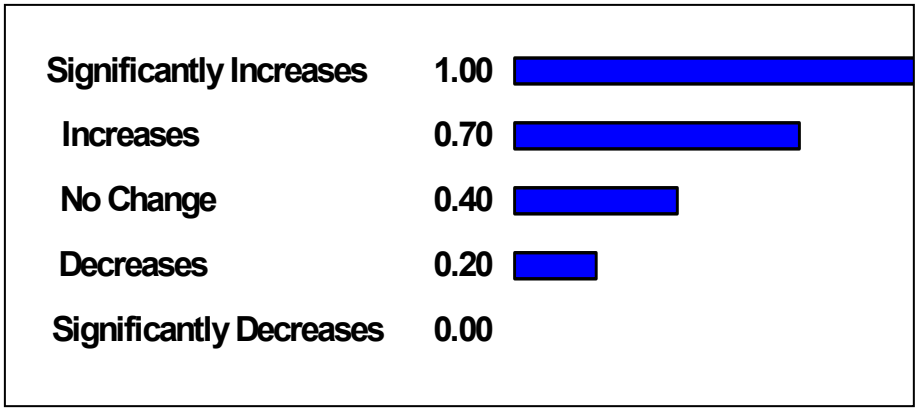

Figure A.13 SDVF for Timeliness of Implementation Measure

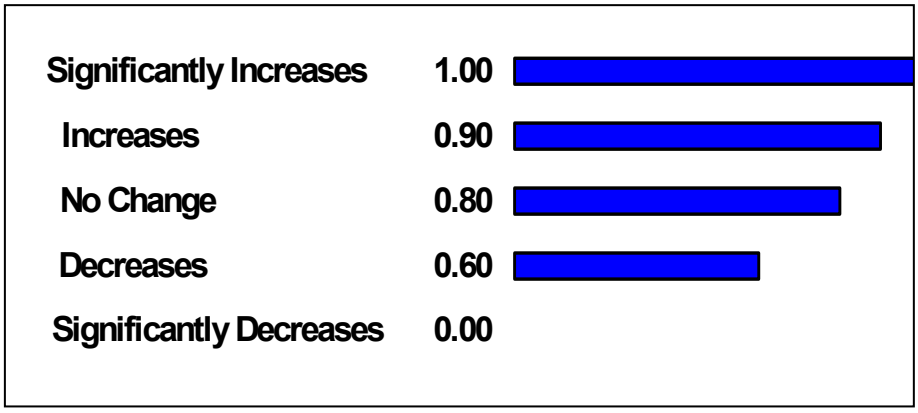

Figure A.14 SDVF for Ease of Responsiveness Measure

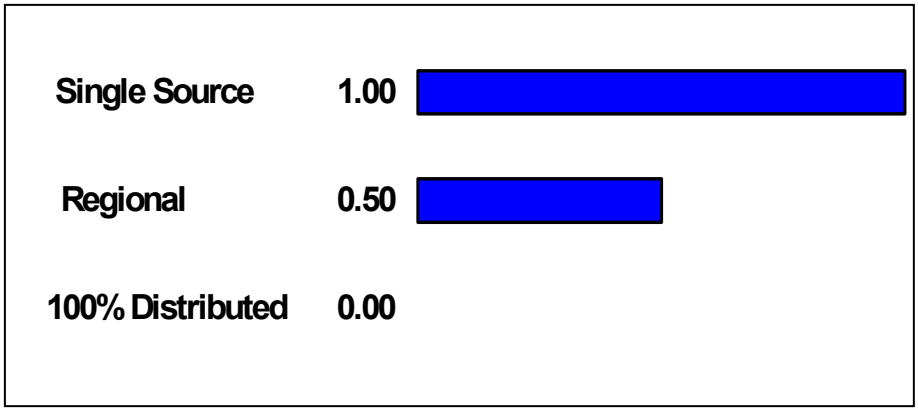

Figure A.15 SDVF for Responsibility for Problem Resolution Measure

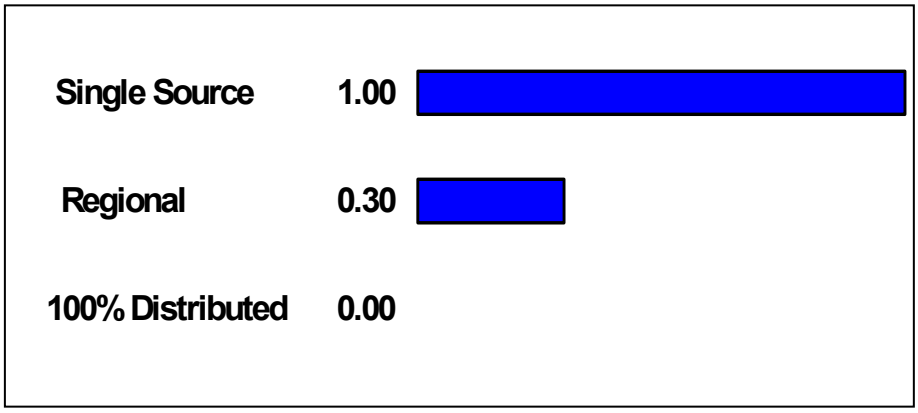

Figure A.16 SDVF for Responsibility for Determining Usage of Funds Measure

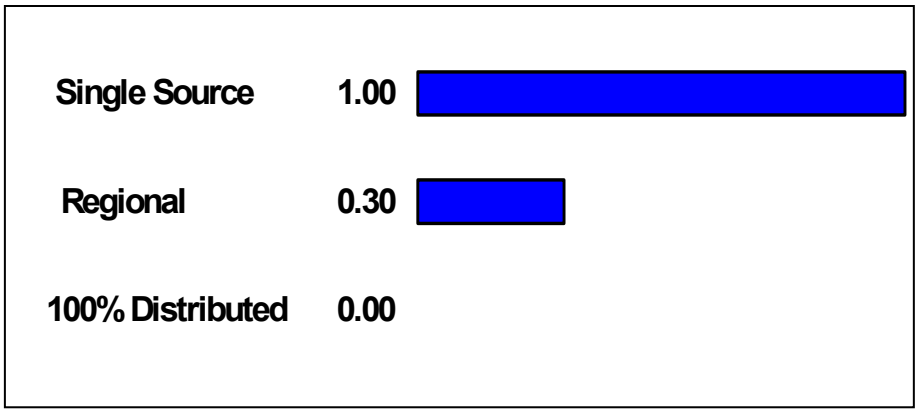

Figure A.17 SDVF for Responsibility for Funds Reconciliation Measure

Appendix B. Individual Group Members' Weightings

Table B.1 Initial Weighting by Group Member A

Value / Measure	Local Weight
Customer Service	0.600
Students	0.800
Timeliness of Application	0.500
Ease of Problem Resolution	0.300
Ease of Transition	0.100
Convenience of Application Process	0.100
Institutions	0.200
Timeliness of Payment	0.700
Ease of Problem Resolution	0.300
Resource Allocation	0.300
Funding	0.700
Reallocation of Funds	0.700
Visibility of Funds	0.300
Responsibility for Database Management	0.700
Widespread Access to Real Time Funding Data	0.300
Information	0.300
Scalability	0.400
Visibility of Data	0.600
Responsibility for Database Management	0.700
Widespread Access to Real Time Data	0.300
Policies and Procedures	0.100
Responsiveness	0.500
Responsiveness to Policy Change	0.600
Responsiveness to Situation Change	0.400
Standardization	0.500
Problem Resolution	0.200
Fund Usage	0.400
Fund Reconciliation	0.400

Table B.2 Initial Weighting by Group Member B

Value / Measure	Local Weight
Customer Service	0.300
Students	0.600
Timeliness of Application	0.250
Ease of Problem Resolution	0.250
Ease of Transition	0.250
Convenience of Application Process	0.250
Institutions	0.400
Timeliness of Payment	0.400
Ease of Problem Resolution	0.600
Resource Allocation	0.400
Funding	0.600
Reallocation of Funds	0.400
Visibility of Funds	0.600
Responsibility for Database Management	0.600
Widespread Access to Real Time Funding Data	0.400
Information	0.400
Scalability	0.550
Visibility of Data	0.450
Responsibility for Database Management	0.600
Widespread Access to Real Time Data	0.400
Policies and Procedures	0.300
Responsiveness	0.400
Responsiveness to Policy Change	0.500
Responsiveness to Situation Change	0.500
Standardization	0.600
Problem Resolution	0.350
Fund Usage	0.350
Fund Reconciliation	0.300

Table B.3 Initial Weighting by Group Member C

Value / Measure	Local Weight
Customer Service	0.500
Students	0.800
Timeliness of Application	0.400
Ease of Problem Resolution	0.250
Ease of Transition	0.100
Convenience of Application Process	0.250
Institutions	0.200
Timeliness of Payment	0.700
Ease of Problem Resolution	0.300
Resource Allocation	0.300
Funding	0.500
Reallocation of Funds	0.500
Visibility of Funds	0.500
Responsibility for Database Management	0.400
Widespread Access to Real Time Funding Data	0.600
Information	0.500
Scalability	0.500
Visibility of Data	0.500
Responsibility for Database Management	0.400
Widespread Access to Real Time Data	0.600
Policies and Procedures	0.200
Responsiveness	0.500
Responsiveness to Policy Change	0.800
Responsiveness to Situation Change	0.200
Standardization	0.500
Problem Resolution	0.400
Fund Usage	0.300
Fund Reconciliation	0.300

Table B.4 Initial Weighting by Group Member D

Value / Measure	Local Weight
Customer Service	0.450
Students	0.650
Timeliness of Application	0.400
Ease of Problem Resolution	0.200
Ease of Transition	0.200
Convenience of Application Process	0.200
Institutions	0.350
Timeliness of Payment	0.500
Ease of Problem Resolution	0.500
Resource Allocation	0.300
Funding	0.650
Reallocation of Funds	0.400
Visibility of Funds	0.600
Responsibility for Database Management	0.500
Widespread Access to Real Time Funding Data	0.500
Information	0.350
Scalability	0.400
Visibility of Data	0.600
Responsibility for Database Management	0.500
Widespread Access to Real Time Data	0.500
Policies and Procedures	0.250
Responsiveness	0.500
Responsiveness to Policy Change	0.600
Responsiveness to Situation Change	0.400
Standardization	0.500
Problem Resolution	0.200
Fund Usage	0.400
Fund Reconciliation	0.400

Table B.5 Initial Weighting by Group Member E

Value / Measure	Local Weight
Customer Service	0.333
Students	0.600
Timeliness of Application	0.250
Ease of Problem Resolution	0.250
Ease of Transition	0.250
Convenience of Application Process	0.250
Institutions	0.400
Timeliness of Payment	0.400
Ease of Problem Resolution	0.600
Resource Allocation	0.334
Funding	0.600
Reallocation of Funds	0.650
Visibility of Funds	0.350
Responsibility for Database Management	0.600
Widespread Access to Real Time Funding Data	0.400
Information	0.400
Scalability	0.500
Visibility of Data	0.500
Responsibility for Database Management	0.600
Widespread Access to Real Time Data	0.400
Policies and Procedures	0.333
Responsiveness	0.500
Responsiveness to Policy Change	0.500
Responsiveness to Situation Change	0.500
Standardization	0.500
Problem Resolution	0.400
Fund Usage	0.300
Fund Reconciliation	0.300

Table B.6 Average of Group Members' Initial Weightings

Value / Measure	Local Weight
Customer Service	0.4366
Students	0.690
Timeliness of Application	0.360
Ease of Problem Resolution	0.250
Ease of Transition	0.180
Convenience of Application Process	0.210
Institutions	0.310
Timeliness of Payment	0.540
Ease of Problem Resolution	0.460
Resource Allocation	0.3268
Funding	0.610
Reallocation of Funds	0.530
Visibility of Funds	0.470
Responsibility for Database Management	0.560
Widespread Access to Real Time Funding Data	0.440
Information	0.390
Scalability	0.470
Visibility of Data	0.530
Responsibility for Database Management	0.560
Widespread Access to Real Time Data	0.440
Policies and Procedures	0.2366
Responsiveness	0.480
Responsiveness to Policy Change	0.600
Responsiveness to Situation Change	0.400
Standardization	0.520
Problem Resolution	0.310
Fund Usage	0.350
Fund Reconciliation	0.340

Appendix C. Function List and Alternative Charts

Table C.1 List of Functions and Descriptions

FUNCTION
PROVIDES ACADEMIC ADVISEMENT
MONITORS DEGREE PROGRESS
INPUTS APPLICATION DATA
RECEIVES COMPLETED APPLICATIONS
APPROVES APPLICATIONS
STORES REAL-TIME STUDENT DATA
HANDLES DATABASE MANAGEMENT
HAS ABILITY TO VIEW REAL-TIME STUDENT DATA [1]
HAS ABILITY TO VIEW REAL-TIME DATA REPORTS
TRACKS GRADES
TRACKS REIMBURSEMENTS
WAIVES REIMBURSEMENTS [2]
WAIVES TA POLICY ($ CAP, CREDIT HOURS, ETC.)
HAS BUDGET INPUT, HANDLES FINANCIAL PLANNING
HANDLES FINAL FUNDS MANAGEMENT [3]
HAS REALLOCATION CONTROL [4]
CERTIFIES INVOICES
PAYS INVOICES
STORES REAL-TIME BUDGET DATA
HAS ABILITY TO VIEW REAL-TIME BUDGET DATA [1]

[1] Only data that is relevant to the person or office viewing it. For a student this would only apply to whether they can view their data, for a base this would only apply to whether they can view the data for that base, etc.

[2] MAJCOM or HQ would only be options if a student has been denied a waiver, they would not be the first office involved.

[3] This is the distribution of funds to the office(s) that are responsible for paying invoices.

[4] Reallocation control is the ability to move funds once they have initially been distributed. This is only within the military; it does not imply funds can be taken from a student or institution once distributed to them.

Table C.2 Chart for Current System Architecture

FUNCTION	HQ	MAJ	BASE
Provides Academic Advisement			X
Monitors Degree Progress			X
Inputs Application Data			X
Receives Completed Applications			X
Approves Applications			X
Stores Real Time Student Data			X
Handles Database Management			X
Has Ability to View Real Time Student Data			X
Has Ability to View Real Time Data Reports			X
Tracks Grades			X
Tracks Reimbursements			X
Waives Reimbursements	X	X	X
Waives TA Policy ($ Cap, Credit Hours, etc.)	X	X	
Has Budget Input, Handles Financial Planning	X	X	X
Handles Final Funds Management	X	X	
Has Reallocation Control		X	
Certifies Invoices			X
Pays Invoices			X
Stores Real Time Budget Data			X
Has Ability to View Real Time Budget Data			X

Table C.3 Chart for Modified Current Architecture

FUNCTION	HQ	MAJ	BASE	STUDENT
Provides Academic Advisement			X	
Monitors Degree Progress			X	X
Inputs Application Data			X	X
Receives Completed Applications			X	
Approves Applications			X	
Stores Real Time Student Data	X			
Handles Database Management	X			
Has Ability to View Real Time Student Data	X	X	X	X
Has Ability to View Real Time Data Reports	X	X	X	
Tracks Grades			X	
Tracks Reimbursements			X	
Waives Reimbursements	X	X	X	
Waives TA Policy ($ Cap, Credit Hours, etc.)	X	X		
Has Budget Input, Handles Financial Planning	X	X	X	
Handles Final Funds Management	X	X		
Has Reallocation Control		X		
Certifies Invoices			X	
Pays Invoices			X	
Stores Real Time Budget Data	X			
Has Ability to View Real Time Budget Data	X	X	X	

This is a modification of the existing TA system based on changes that are being tested at a limited number of bases. The key differences are that the Modified Current architecture takes advantage of online application availability and utilizes a central database for storing information.

Table C.4 Chart for Main Funding Architecture

FUNCTION	HQ	MAJ	BASE	MAIN	STUDENT
Provides Academic Advisement			X		
Monitors Degree Progress			X		X
Inputs Application Data			X		X
Receives Completed Applications			X		
Approves Applications			X		
Stores Real Time Student Data				X	
Handles Database Management				X	
Has Ability to View Real Time Student Data	X	X	X	X	X
Has Ability to View Real Time Data Reports	X	X	X	X	
Tracks Grades			X		
Tracks Reimbursements			X		
Waives Reimbursements	X	X	X		
Waives TA Policy ($ Cap, Credit Hours, etc.)	X	X			
Has Budget Input, Handles Financial Planning	X			X	
Handles Final Funds Management	X				
Has Reallocation Control	NOT APPLICABLE				
Certifies Invoices			X		
Pays Invoices				X	
Stores Real Time Budget Data				X	
Has Ability to View Real Time Budget Data	X	X	X	X	

This is an architecture based on a combination of the Modified Current architecture and the Proposed Central architecture. This architecture takes advantage of online application availability and a central database for storing information. This architecture also implements a Main Office that would handle the payment of invoices, while the responsibility for the majority of TA functions remains at the base level.

Table C.5 Chart for Proposed Central Architecture

FUNCTION	HQ	MAJ	BASE	MAIN	STUDENT
Provides Academic Advisement			X		
Monitors Degree Progress			X		X
Inputs Application Data			X		X
Receives Completed Applications			X		
Approves Applications			X		
Stores Real Time Student Data				X	
Handles Database Management				X	
Has Ability to View Real Time Student Data	X	X	X	X	X
Has Ability to View Real Time Data Reports	X	X	X	X	
Tracks Grades				X	
Tracks Reimbursements				X	
Waives Reimbursements	X	X		X	
Waives TA Policy ($ Cap, Credit Hours, etc.)	X	X			
Has Budget Input, Handles Financial Planning	X			X	
Handles Final Funds Management	X				
Has Reallocation Control	NOT APPLICABLE				
Certifies Invoices				X	
Pays Invoices				X	
Stores Real Time Budget Data				X	
Has Ability to View Real Time Budget Data	X	X	X	X	

This is the architecture initially proposed when AF/DPLE began considering a reorganization of the TA program. This architecture takes advantage of online application availability and utilizes a central database for storing information. This architecture requires the development of a Main Office to handle the majority of TA functions that occur after the initial application and approval process.

Table C.6 Chart for Navy / Marines Architecture

FUNCTION	HQ	MAJ	BASE	MAIN
Provides Academic Advisement			X	
Monitors Degree Progress			X	
Inputs Application Data			X	
Receives Completed Applications			X	
Approves Applications			X	
Stores Real Time Student Data				X
Handles Database Management				X
Has Ability to View Real Time Student Data	X	X	X	X
Has Ability to View Real Time Data Reports	X	X	X	X
Tracks Grades				X
Tracks Reimbursements				X
Waives Reimbursements	X	X		X
Waives TA Policy ($ Cap, Credit Hours, etc.)	X			
Has Budget Input, Handles Financial Planning	X			X
Handles Final Funds Management	X			
Has Reallocation Control	NOT APPLICABLE			
Certifies Invoices				X
Pays Invoices				X
Stores Real Time Budget Data				X
Has Ability to View Real Time Budget Data	X	X	X	X

This architecture is based on the system currently being used by the Navy and the Marines for the management of their TA programs. This architecture implements a Main Office responsible for the majority of TA functions that occur after the initial application and approval process. This architecture utilizes a central database, but does take advantage of online application availability.

Table C.7 Chart for Coast Guard Architecture

FUNCTION	HQ	BASE	MAIN
Provides Academic Advisement		X	
Monitors Degree Progress	X		
Inputs Application Data	X		
Receives Completed Applications		X	
Approves Applications	X		
Stores Real Time Student Data	X		
Handles Database Management			X
Has Ability to View Real Time Student Data	X		X
Has Ability to View Real Time Data Reports	X		X
Tracks Grades			X
Tracks Reimbursements			X
Waives Reimbursements	X		
Waives TA Policy ($ Cap, Credit Hours, etc.)	X		
Has Budget Input, Handles Financial Planning	X		
Handles Final Funds Management	X		
Has Reallocation Control	NOT APPLICABLE		
Certifies Invoices			X
Pays Invoices			X
Stores Real Time Budget Data			X
Has Ability to View Real Time Budget Data			X

This architecture is based on the system currently being used by the Coast Guard for the management of its TA program. Much of the responsibility for the application and approval are handled at the HQ level, while a Main Office is responsible for the majority of TA functions that occur after the initial application and approval process. This architecture does not utilize a central database or take advantage of online application availability.

Appendix D. Alternative Scores

The tables in Appendix D show the score of each alternative for each evaluation measure in the hierarchy. These scores were determined by the decision group and later converted to a common scale using the SDVFs developed in Step 4 of the VFT process.

Table D.1 Scores for Current System Architecture

CURRENT SYSTEM	
TIMELINESS OF APPLICATION AND APPROVAL PROCESS	NO CHANGE
EASE OF RESOLUTION	NO CHANGE
EASE OF TRANSITION	NO CHANGE
TIME OF APPLICATION AVAILABILITY	DUTY HOURS
TIMELINESS OF INVOICE PROCESSING	NO CHANGE
EASE OF RESOLUTION	NO CHANGE
EASE OF REALLOCATION	NO CHANGE
RESPONSIBILITY FOR DATABASE MANAGEMENT	100% DISTRIBUTED
WIDESPREAD ACCESS TO REAL TIME FUNDING DATA	SINGLE SOURCE
EASE OF SCALABILITY	NO CHANGE
RESPONSIBILITY FOR DATABASE MANAGEMENT	100% DISTRIBUTED
WIDESPREAD ACCESS TO REAL TIME DATA	SINGLE SOURCE
TIMELINESS OF IMPLEMENTATION	NO CHANGE
EASE OF RESPONSIVENESS	NO CHANGE
RESPONSIBILITY FOR PROBLEM RESOLUTION	100% DISTRIBUTED
RESPONSIBILITY FOR DETERMINING USAGE OF FUNDS	100% DISTRIBUTED
RESPONSIBILITY FOR FUNDS RECONCILIATION	100% DISTRIBUTED

Table D.2 Scores for Modified Current Architecture

MODIFIED CURRENT	
TIMELINESS OF APPLICATION AND APPROVAL PROCESS	NO CHANGE
EASE OF RESOLUTION	INCREASES
EASE OF TRANSITION	INCREASES
TIME OF APPLICATION AVAILABILITY	24 HRS/DAY
TIMELINESS OF INVOICE PROCESSING	NO CHANGE
EASE OF RESOLUTION	NO CHANGE
EASE OF REALLOCATION	NO CHANGE
RESPONSIBILITY FOR DATABASE MANAGEMENT	SINGLE SOURCE
WIDESPREAD ACCESS TO REAL TIME FUNDING DATA	100% DISTRIBUTED
EASE OF SCALABILITY	SIGNIFICANTLY INCREASES
RESPONSIBILITY FOR DATABASE MANAGEMENT	SINGLE SOURCE
WIDESPREAD ACCESS TO REAL TIME DATA	100% DISTRIBUTED
TIMELINESS OF IMPLEMENTATION	INCREASES
EASE OF RESPONSIVENESS	SIGNIFICANTLY INCREASES
RESPONSIBILITY FOR PROBLEM RESOLUTION	100% DISTRIBUTED
RESPONSIBILITY FOR DETERMINING USAGE OF FUNDS	100% DISTRIBUTED
RESPONSIBILITY FOR FUNDS RECONCILIATION	100% DISTRIBUTED

Table D.3 Scores for Main Funding Architecture

MAIN FUNDING	
TIMELINESS OF APPLICATION AND APPROVAL PROCESS	NO CHANGE
EASE OF RESOLUTION	INCREASES
EASE OF TRANSITION	INCREASES
TIME OF APPLICATION AVAILABILITY	24 HRS/DAY
TIMELINESS OF INVOICE PROCESSING	NO CHANGE
EASE OF RESOLUTION	DECREASES
EASE OF REALLOCATION	SIGNIFICANTLY INCREASES
RESPONSIBILITY FOR DATABASE MANAGEMENT	SINGLE SOURCE
WIDESPREAD ACCESS TO REAL TIME FUNDING DATA	100% DISTRIBUTED
EASE OF SCALABILITY	SIGNIFICANTLY INCREASES
RESPONSIBILITY FOR DATABASE MANAGEMENT	SINGLE SOURCE
WIDESPREAD ACCESS TO REAL TIME DATA	100% DISTRIBUTED
TIMELINESS OF IMPLEMENTATION	INCREASES
EASE OF RESPONSIVENESS	SIGNIFICANTLY INCREASES
RESPONSIBILITY FOR PROBLEM RESOLUTION	100% DISTRIBUTED
RESPONSIBILITY FOR DETERMINING USAGE OF FUNDS	SINGLE SOURCE
RESPONSIBILITY FOR FUNDS RECONCILIATION	SINGLE SOURCE

Table D.4 Scores for Proposed Central Architecture

PROPOSED CENTRAL	
TIMELINESS OF APPLICATION AND APPROVAL PROCESS	NO CHANGE
EASE OF RESOLUTION	DECREASES
EASE OF TRANSITION	INCREASES
TIME OF APPLICATION AVAILABILITY	24 HRS/DAY
TIMELINESS OF INVOICE PROCESSING	INCREASES
EASE OF RESOLUTION	SIGNIFICANTLY INCREASES
EASE OF REALLOCATION	SIGNIFICANTLY INCREASES
RESPONSIBILITY FOR DATABASE MANAGEMENT	SINGLE SOURCE
WIDESPREAD ACCESS TO REAL TIME FUNDING DATA	100% DISTRIBUTED
EASE OF SCALABILITY	SIGNIFICANTLY INCREASES
RESPONSIBILITY FOR DATABASE MANAGEMENT	SINGLE SOURCE
WIDESPREAD ACCESS TO REAL TIME DATA	100% DISTRIBUTED
TIMELINESS OF IMPLEMENTATION	SIGNIFICANTLY INCREASES
EASE OF RESPONSIVENESS	SIGNIFICANTLY INCREASES
RESPONSIBILITY FOR PROBLEM RESOLUTION	100% DISTRIBUTED
RESPONSIBILITY FOR DETERMINING USAGE OF FUNDS	SINGLE SOURCE
RESPONSIBILITY FOR FUNDS RECONCILIATION	SINGLE SOURCE

Table D.5 Scores for Navy / Marines Architecture

NAVY / MARINES	
TIMELINESS OF APPLICATION AND APPROVAL PROCESS	NO CHANGE
EASE OF RESOLUTION	DECREASES
EASE OF TRANSITION	INCREASES
TIME OF APPLICATION AVAILABILITY	DUTY HOURS
TIMELINESS OF INVOICE PROCESSING	INCREASES
EASE OF RESOLUTION	SIGNIFICANTLY INCREASES
EASE OF REALLOCATION	SIGNIFICANTLY INCREASES
RESPONSIBILITY FOR DATABASE MANAGEMENT	SINGLE SOURCE
WIDESPREAD ACCESS TO REAL TIME FUNDING DATA	100% DISTRIBUTED
EASE OF SCALABILITY	SIGNIFICANTLY INCREASES
RESPONSIBILITY FOR DATABASE MANAGEMENT	SINGLE SOURCE
WIDESPREAD ACCESS TO REAL TIME DATA	100% DISTRIBUTED
TIMELINESS OF IMPLEMENTATION	SIGNIFICANTLY INCREASES
EASE OF RESPONSIVENESS	SIGNIFICANTLY INCREASES
RESPONSIBILITY FOR PROBLEM RESOLUTION	SINGLE SOURCE
RESPONSIBILITY FOR DETERMINING USAGE OF FUNDS	SINGLE SOURCE
RESPONSIBILITY FOR FUNDS RECONCILIATION	SINGLE SOURCE

Table D.6 Scores for Coast Guard Architecture

COAST GUARD	
TIMELINESS OF APPLICATION AND APPROVAL PROCESS	SIGNIFICANTLY DECREASES
EASE OF RESOLUTION	SIGNIFICANTLY DECREASES
EASE OF TRANSITION	INCREASES
TIME OF APPLICATION AVAILABILITY	DUTY HOURS
TIMELINESS OF INVOICE PROCESSING	INCREASES
EASE OF RESOLUTION	NO CHANGE
EASE OF REALLOCATION	SIGNIFICANTLY INCREASES
RESPONSIBILITY FOR DATABASE MANAGEMENT	SINGLE SOURCE
WIDESPREAD ACCESS TO REAL TIME FUNDING DATA	SINGLE SOURCE
EASE OF SCALABILITY	SIGNIFICANTLY INCREASES
RESPONSIBILITY FOR DATABASE MANAGEMENT	SINGLE SOURCE
WIDESPREAD ACCESS TO REAL TIME DATA	SINGLE SOURCE
TIMELINESS OF IMPLEMENTATION	SIGNIFICANTLY INCREASES
EASE OF RESPONSIVENESS	SIGNIFICANTLY INCREASES
RESPONSIBILITY FOR PROBLEM RESOLUTION	SINGLE SOURCE
RESPONSIBILITY FOR DETERMINING USAGE OF FUNDS	SINGLE SOURCE
RESPONSIBILITY FOR FUNDS RECONCILIATION	SINGLE SOURCE

Bibliography

Air Force Education Division (AF/DPLE), Personal Interviews and Correspondence with Jim Sweizer, Marylee Baker, Kendall McAree, George Barborak, and John Hill. June 2002 to July 2003.

Aven, T. and J. Korte. "On the Use of Risk and Decision Analysis to Support Decision-Making." Excerpt from unpublished article. http://www.risikoforsk.no/Publikasjoner/costbenefit-RESS.pdf. 15 December 2002.

Baker, Marylee. "Centralization of Air Force Tuition Assistance." Staff Summary Sheet, AF/DPLEV, Washington DC, 22 October 2001.

Burk, Roger C. and Gregory S. Parnell. "Evaluating Future Military Space Technologies," *Interfaces*, 27: 60-73 (May - June 1997).

Chambal, Stephen P. Class notes, OPER 643, Advanced Decision Analysis: Multiple Objective Decision Analysis. School of Engineering and Logistics, Air Force Institute of Technology, Wright-Patterson AFB OH, Summer Quarter 2002.

Clemen, Robert T. and Terence Reilly. *Making Hard Decisions (with DecisionTools®)*. Pacific Grove, CA: Duxbury, 2001.

Department of Defense. *Voluntary Education Programs for Military Personnel*. DOD Directive 1322.8. Washington: GPO, 6 January 1997.

Department of the Air Force. *The Education Services Program*. AFI 36-2306. Washington: HQ USAF, 16 October 2000.

Dyer, James S., Thomas Edmunds, John C. Butler, and Jianmin Jia. "A Multiattribute Utility Analysis of Alternatives for the Disposition of Surplus Weapons-Grade Plutonium," *Operations Research*, 46: 749-762 (November - December 1998).

Howard, Ronald A. "Decision Analysis: Practice and Promise," *Management Science*, 34: 679-695 (June 1988).

Jackson, Jack A. Jr., Brian L. Jones, and Lee J. Lehmkuhl. *2025: An Operational Analysis*. Maxwell AFB: Air University Press, June 1996.

Jurk, David M. *Decision Analysis with Value Focused Thinking as a Methodology to Select Force Protection Initiatives for Evaluations.* MS thesis, AFIT/GEE/ENV/02M-05. School of Systems and Logistics, Air Force Institute of Technology (AU), Wright-Patterson AFB OH, March 2002.

Keefer, Donald L., James L. Corner, and Craig W. Kirkwood. *Decision Analysis Applications in the Operations Research Literature, 1990-1999*. July 2000.

Keeney, Ralph L. *Value-Focused Thinking: A Path to Creative Decisionmaking*. Cambridge, MA: Harvard University Press, 1992.

Keeney, Ralph L. and Timothy L. McDaniels. "Value-Focused Think about Strategic Decisions at BC Hydro," *Interfaces*, 22: 94-109 (November - December 1992).

Keeney, Ralph L. and Howard Raffia. *Decisions with Multiple Objectives*. New York: Wiley, 1976.

Kimbrough, Steven O. *Information and Decision Technology: An Introduction to Computer-Based Modeling and Analysis*. The Wharton School, University of Pennsylvania, Philadelphia, 31 December 2001.

Kirkwood, Craig W. *Strategic Decision Making: Multiobjective Decision Analysis with Spreadsheets*. Belmont, CA: Wadsworth Publishing Company, 1997.

Lehmkuhl, Lee, David Lucia, and James Feldman. "Signals from Space: The Next-Generation Global Positioning System," *Military Operations Research*, 6: 5-18 (2001).

Leon, Orfelio G. "Value-Focused Thinking versus Alternative-Focused Thinking: Effects on Generation of Objectives," *Organizational Behavior and Human Decision Processes*, 80: 213-227 (1999).

McDaniels, Timothy and William Trousdale. "Value-Focused Thinking in a Difficult Context: Planning Tourism for Guimaras, Philippines," *Interfaces*, 29: 58-70 (July - August 1999).

Myatt, Clark E. "Vice President Al Gore's National Performance Review: Hammer Award Nomination." Department of the Navy, Naval Education and Training Professional Development and Technology Center, Pensacola, 30 June 1997.

Parnell, Gregory S., G. Edgar Bennett, Joseph A. Engelbrecht, and Richard Szafranski. "Improving Resource Allocation Within the National Reconnaissance Office," *Interfaces*, 32: 77-90 (May - June 2002).

Taylor, Vernon. Director of Voluntary Education, United States Marine Corps. Personal Correspondence. July 2001.

-----. Excerpt from United States Marine Corps Tuition Assistance Briefing. June 2002.

Winston, Wayne L. *Operations Research: Applications and Algorithms* (3rd Edition). Belmont, CA: Duxbury Press, 1994.

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14. ABSTRACT

The consideration of restructuring through a change in organizational architecture is often fiercely debated within an organization. The argument for restructuring to improve quality, customer service, and financial management is pitted against perceived lack of job security and historically poor results from previous restructuring initiatives. To balance all sides when considering a change in organizational architecture, the organization should use a method of evaluating potential architectures that assists in determining the best new architecture and generates support from those involved.

The objective of this research is to provide the Air Force Education Division with a defendable methodology for evaluating and selecting an organizational architecture. This thesis effort utilizes Value-Focused Thinking to develop a model that identifies the values associated with the management and execution of the Tuition Assistance (TA) program. The resulting value model is used to evaluate how well different organizational architectures perform with respect to these values.

The results of the analysis suggest the implementation of an organizational architecture in which a single office handles the payment of invoices and all enrollment and funding data is stored in a central database would best enable the TA program to fulfill its role in meeting the needs of the Air Force.

15. SUBJECT TERMS

Decision Analysis, Value-Focused Thinking, Multiobjective Decision Analysis, Decision Theory, Value Hierarchy, Operations Research, Organizational Structure, Organizational Architecture, Organizational Redesign

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