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Developing Advanced Academic Degree Educational Profiles for Career Fields

Katherine J. Gentil

DEVELOPING ADVANCED ACADEMIC DEGREE EDUCATIONAL PROFILES FOR CAREER FIELDS

THESIS

Katherine J. Gentil, Major, USAF

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DEPARTMENT OF THE AIR FORCE
AIR UNIVERSITY

AIR FORCE INSTITUTE OF TECHNOLOGY

Wright-Patterson Air Force Base, Ohio

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Katherine J. Gentil, BS, MEd

Major, USAF

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Katherine J. Gentil, BS, MEd
Major, USAF

Approved:

_____	_____
Shane A. Knighton, Major, USAF (Chairman)	date
_____	_____
James T. Moore, PhD (Reader)	date

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Abstract

This research develops a career field's educational profile through use of the decision analysis approach of value-focused thinking (VFT). VFT is used to solicit the capabilities that the career field manager (CFM) desires its officers obtain from an advanced academic program. This process generates a value hierarchy and a focused set of alternatives (degree programs). The academic programs' content are evaluated against the hierarchy to determine how well it meets the values of the functional area. A rank-ordered list of degrees is produced and a portfolio of degrees is selected through the use of CFM-approved goal-setting criteria. The specific breakdown of the portfolio into percentages of the force that should attain each degree is then determined through the CFM's specified relative value increments of the goal-setting criteria. The resulting effort creates a guide for CFMs to communicate to their corps on the types of degrees to earn and provides justification for fully-funded degree slots.

To my husband, daughter, and son.
You are my life.

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Katherine J. Gentil

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DEVELOPING ADVANCED ACADEMIC DEGREE EDUCATIONAL PROFILES FOR CAREER FIELDS

I. Introduction

Background

The military has undergone significant reductions in personnel over the past decade and current force shaping policies continue to reduce the active Air Force, bringing the active duty officer inventory down by another 9.3% over the 2006 Fiscal Year Defense Plan (FYDP) (IDEAS, 31 Aug 06, and Brady, 2006:12). With these targeted cuts, there is an increasing need for a more synergistically and deliberately developed officer corps to not only lead and manage the personnel and programs within their career fields, but to expand their knowledge and gain experience and breadth in skill sets outside of, but related to, their core specialties. The demands placed on our officers to lead and manage varying programs across a wide array of knowledge bases requires well-rounded, highly educated professionals to meet these challenges with success. Advanced academic degrees (AAD) have always played an important role in the development of officers over the years, but only a limited number of degrees obtained were specifically driven by those officers' career field requirement. In general, most Line of the Air Force (LAF) officers choose what type of degree to study and when to embark on the process to achieve an advanced degree, if they decided to get one at all. However, with a smaller pool of officers in each career field, more focused direction in AAD selection is needed to ensure each career field has a core of officers with the needed skill sets.

Masters degrees are not mandatory for LAF officers, but highly encouraged. While removed from promotion board member review for LAF Major boards in 1996 and through LAF Colonel boards in 2005, advanced degrees earned by officers will be available for promotion board review beginning with boards starting in 2008, indicating senior leadership's emphasis on obtaining higher education as a critical piece of the education, training, and experience triad for officer development (Foley, 2006; Jumper, 2005; Wynne and Moseley, 2006). In fulfillment of the three areas of education, training, and experience within the development portfolio, technical training programs specific to each career field along with on-the-job training specific to each new position assigned contribute to the training piece of the development throughout their career. Various job assignments and deployment opportunities over time contribute to the valuable experience each officer needs to develop into a solid leader. As for pure academic education, all officers enter the military with a bachelor's degree at a minimum, but unless they take the initiative and opportunity to increase their level of academic education through an advanced degree, whether or not it is related to their specialty area, their development to lead their career field can become stifled. Their training and experience can support them to a certain extent, but without a focused higher-level academic education, the officer's development will be out of balance.

Force Development

The Air Force has always worked toward developing its officers to become the senior leaders of the future, but there was no standardized, strategic-level program to deliberately ensure the officer corps development process would create the resource pool

of skilled officers to meet the requirements at the tactical, operational, and strategic leadership levels. Therefore, the Chief of Staff created the Total Force Development program and outlined its initial goals and methods in AFI 36-2640, Volume 1, *Total Force Development (Active Duty Officer).* As part of this effort, Air Force career field senior leaders, as directed by the Chief of Staff of the Air Force through the formation of Development Teams (DT), have become intimately involved in determining the proper development for the officers within their career fields. The instruction established a hierarchy to ensure proper leadership, management, and implementation of the program through assigning Functional Authorities (FA), Functional Managers (FM), and Career Field Managers (CFM) for each Air Force Specialty (AFS). The CFMs are charged with not only ensuring the proper depth of development of officers within the career field, but to also develop their breadth through determining the best interdisciplinary skill sets their officers should possess to better handle broad-spectrum jobs that inherently come with increased rank. Officers gain both depth and breadth through the aforementioned trio of education, training, and experience. Under Force Development, the three levels of developmental education (basic, intermediate, and senior) are identified as significant pieces in supporting the officer's development needs and the Air Force is looking to advanced degrees to fulfill this critical piece (AFI 36-2640, para 2.8.10).

Current Practices

The current management of today's *required* AADs in the Air Force is based solely on a "bottom up" position-driven determination. Local commanders/division chiefs determine the manpower authorizations within their unit that require an AAD and request the AAD code be placed on the position. According to AFI 36-2302, *Professional*

Development (Advanced Academic Degrees and Professional Continuing Education), requests for AADs are submitted to the unit's major command (MAJCOM) and then collected at the Air Staff through USAF/A1 and forwarded to the Air Force Academic Specialty Monitor (ASM). The ASMs work with the Air Force Education Requirements Board (AFERB) to prioritize AADs for funding and work with AFPC to ensure those selected to attend an AFERB-funded academic program are then assigned to the authorized position that requires an officer with an advanced degree.

What is noticeably missing from this process is direction or guidance from the CFMs in determining the mix of degrees the pool of officers need within their career field. In the July 2001 AFI 36-2302, ASMs were charged to represent the Air Force-wide functional perspective for degree requirements. But, ASMs were not under any *formalized* direction from an overall career field manager. The January 2004 Force Development instruction established the formal hierarchy to have FAs be the official representative to the AFERB for their career fields on educational requirement opportunities (AFI 36-2640:2.3.9). This initiated the intent to identify AAD requirements from a top-down, strategic perspective to ensure the needs of the career field itself are met while still allowing for the bottom-up coordination from the unit commanders at the local level to ensure their needs are met. DTs, led by the FM and CFM, are the collective arm of the FAs to select officers to fulfill AAD requirements and provide input on the necessary degrees needed for the career field. A 2006 graduate research project (GRP) at the Air Force Institute of Technology (AFIT) proposed a new approach to the management of these AAD-coded positions in line with the Force Development strategic-level approach versus the current bottom-up approach (Staats, et al, 2006). In this

approach, the authors indicated the requirement to determine the correct mix of AADs for each career field to meet the capabilities required of the mission (Staats, et al, 2006:5-6). Without a top-down determination of AADs for the career field, their approach for managing the AAD inventory cannot be implemented.

Problem Statement

While some technical career fields have embarked on reviewing their degree requirements, they are still determining their degree programs based on the position-level review rather than as a composite career field perspective to develop their officers. The process for coding an authorization at the unit level has not changed and AAD-coded positions are outdated in many cases and do not truly reflect the career field's needs. Additionally, career fields have not identified their required mix of degree programs and desired educational profile from a strategic perspective using an analytical approach.

Research Objective

As the day-to-day representative for the FA, the CFMs are in the best position and authority to determine the AAD requirements for their career field from a strategic perspective. The objective of this research is to provide a repeatable framework that can be used by all CFMs to determine the best degree programs for their officers as well as the requirement levels along a development timeline. Using the decision analysis approach of value-focused thinking to elicit the CFM's academic strategic goal for their career field, the desired educational profile is built. Since this creates a multiobjective model, several degree programs are selected to build a portfolio of degree programs for the Air Force Specialty Code (AFSC). This approach is supported with a multiple

criteria model based on goal setting to select the best group of degree programs, and a mathematical approach based on the CFM's priorities to determine the proportion of the career field that should receive each of the degrees within the portfolio. Once the profile is developed, a review of the career field's current state in relation to the profile is assessed and provided as an input into the Advanced Academic Degree Inventory Management Model (AADIM) to determine the proper course in meeting that profile.

Research Scope

With 29 different functional areas that group career fields under the force development program, the scope of this research is limited to the LAF mission support career field of Manpower and Personnel, having the 37F AFSC. Since their missions are very diverse and a variety of degree programs are needed to develop their officers, this AFSC showcases the methodology presented in this thesis.

Another consideration for selecting this AFSC for the research is that most of the AFERB-funded degree programs go extensively to the technical specialties leaving relatively few opportunities for officers within mission support career fields to take advantage of full-time academic pursuits as offered through AFIT and the Naval Postgraduate School (NPS). Generally, mission support specialties have few positions that are designated as requiring an AAD at the unit level, but these officers and their career fields benefit from postgraduate education for development and advancement just as an officer within a technical field. Many officers within these AFSCs obtain advanced degrees on their own time to meet career advancement goals. The result of this study can aid in supporting a request for fully-funded quotas within the specialty as well as give direct guidance to officers pursuing degrees on their own.

While the focus of this thesis is on the active duty officer Air Force component, the methodology used within this research may be applied to civilians, enlisted, as well as the Air Reserve Component structure in the future to develop the total force picture.

The remainder of this document is broken down into four chapters. Chapter 2 provides a review of relevant research that has already been conducted in the area of advanced academic degree determinations along with pertinent information regarding the literature on the value focused thinking methodology that is used. Chapter 3 provides detailed information on the methodology, step-by-step, as the research is conducted. Chapter 4 displays the results of the analysis done with the process outlined in Chapter 3, and Chapter 5 provides discussion on recommendations based on the results as well as future research that can be done to further explore the issue.

II. Literature Review

Overview

Up to this point, there has been little published work on the topic of AAD programs for any specialized groups. Most studies have been accomplished within the military as research topics for theses or graduate research projects (GRP). While studies have been done to show that having an advanced degree is a common characteristic of those who become successful leaders, especially in high-technology firms, research on the specific types of degree programs and mix of degrees needed for an organization's leadership pool to succeed is virtually nonexistent (Barker and Mueller, 2002:787). Research has shown that top executives with advanced educations have greater cognitive complexity which leads to greater acceptance of innovative approaches to running an organization (Barker and Mueller, 2002:787). And while it certainly makes sense for a business person to earn a business degree or an engineer to earn an advanced degree in their engineering specialty, what about the leader of an organization that oversees a diverse work group across a wide-spectrum of capabilities? What specific types and numbers of degrees does this organization need its executives, or officers in the case of the military, to obtain in order to develop the capabilities needed to meet the mission? In a civilian organization, the company can hire an individual to laterally step into a job with education requirements in hand. But for the military, they must grow their own and develop the member's capabilities over time to ensure that the education level is there as the officer ascends vertically in the chain of command. Within the Line of the Air Force officer corps, the military cannot just hire from the civilian sector, a person to don the

rank of a senior grade such as colonel, with a specific degree already in hand to perform a mission. A LAF military officer enters at the grade of second lieutenant and must be developed over the course of his or her career to obtain the education, training, and experience needed to do the job. When the officer finally ascends to the higher ranks, it is the past development that will support that officer's ability to meet the mission at hand. Therefore, the career field needs to ensure that their officers obtain the degrees needed through the development process so that the career field grows the leadership needed for tomorrow's force, today. As outlined in the introduction, this need for determining these degrees is great; yet, the lack of published work on researching the best academic programs to which our government invests $27 million each year begs for a solid analytical approach to determining these degree programs (Thornhill, 5 Oct 2006). With the force drawdown, this amount of spending on education will drop by approximately $12.5 million to $14.5 million over the course of the 7-year Future Years Defense Program (Thornhill, 5 Oct 2006). This 46.3% reduction in support of advanced degrees and each officer's commitment of time, a critical resource, to earn these degrees, translates to an even greater need to ensure the Air Force sends its officers to get the right degrees to meet the mission requirements.

To this end, this chapter reviews the published work on the types of studies and their methodologies used on the general topic of AAD programs. Following this discussion is a description of the proposed decision analysis methodology of value-focused thinking (VFT) along with its supporting deterministic programming method to introduce the methodology that is covered thoroughly in Chapter 3. The remaining section contrasts the previous studies on AADs with the VFT approach.

Past Studies on Advanced Academic Degree Programs

As noted, only a handful of studies have been done on the topic of AADs. Within the military context of published work, the research has focused on either the feasibility of meeting the AAD requirements as defined within the manpower authorization structure, or it has focused on advocating a new approach to managing the inventory of those officers who obtain a degree. Several of the studies reviewed were conducted over 20 years ago, and none of the studies attempted to determine the right mix of degree programs for a specific career field. Given the redesigned structure of the Air Force, determining the right degree programs and managing those with critical technical skills is becoming even more important in meeting its mission. Recently, Secretary of the Air Force Wynne and Air Force Chief of Staff Moseley stated that with our reduced force posture, "it is essential that our Airmen have the knowledge and competency to accomplish our mission" noting that "one of the most effective ways to develop this knowledge is through advanced education" (Wynne and Moseley, 2006). Determining the right degree programs is essential to ensuring the Air Force develops the best airmen for each career field to meet the mission capabilities requirements.

The most recent studies regarding AADs for Air Force officers studied the way those who have AADs should be managed to fill required positions as well as determining the right timing to attend degree programs to fulfill a notional career field's educational profile for the position-based requirement. Jastrzembski (2005) focused on creating a model to determine the best management of officers earning AADs to "select, educate, and assign" officers to proper positions to gain the best use of their knowledge. He advocated a new inventory management process using a Markov model which he

applied to the Scientist and Analyst (61S) career field to ensure that flow into and out of fully-funded degree programs was feasible given career field manning requirements and that the degree requirements for the career field were met. The model he developed as identified in Chapter 1, AADIM, did not provide a methodology for determining whether or not the degree programs for the career field were the best mix, nor did it incorporate degrees earned through tuition assistance (TA). Sending officers to fully-funded academic programs removes them from the pool of officers available to fill vacant positions; therefore, only a select number of officers from each career field can be released each year to attend in-residence programs. Jastrzembski's model determines this feasibility for sending officers to obtain fully-funded degrees while maintaining assignment requirements in parallel (2005). Staats, Troxell, and Reynolds extended Jastrzembski's (2005) research and advocated a new management process to allow for AAD requirements to be tied to career development under the Force Development structure rather than just by position-based, bottom-up driven determination (2006). The GRP called for functional authorities to determine the degree programs required for its officers rather than just allowing each individual unit to determine whether or not a degree is required for a specific position. Inconsistencies across similar units and lack of an aggregate guidance create concern as to the true need for degree programs with the current bottom-up approach.

Two precursors to Jastrzembski's study to determine the best flow for officers to enter into a fully-funded degree program were completed by Brown in 1999 and Dietz in 1996. Dietz's research developed a Markov decision model coupled with a linear program to determine the steady state entrance flow for officers to get their masters and

PhDs (Dietz, 1996). Dietz examined this area in response to a decrease in quotas for students to attend AFIT, and AFIT's need to readjust its programs and size to fit the reduced quota allocations for fully-funded graduate student flow (Dietz, 1996). Dietz developed what is called the Quota Allocation Model (QuAM) in which Brown's efforts were to develop a user-friendly tool for the model, transferring it from FORTRAN 77 to Microsoft Excel. Brown's research also reviewed the necessary assumptions to use the Markov model and tested sensitivity on the input parameters of AAD requirements, attrition, and inventory factors (Brown, 1999).

In 1994, Beloyne completed a study on the usefulness of the Graduate of Space Operations (GSO) master's degree for those entering AAD required positions as well as determined the number of space operations officers that should enter the GSO program each year to meet the AAD position requirements. He used a survey methodology to collect data on 12 years of GSO graduates in determining the usefulness of the degree program. His methodology was based on a similar survey work that was done within the information resource management (IRM) degree program to determine the future needs of the IRM degree (Block, 1991). In order for Beloyne to determine the number of officers that should attend the GSO program each year, he used what he terms the "developmental approach" to determine a ratio of GSO officers to AAD billets (Beloyne, 1994:3-7). Under the 5-step developmental approach, Beloyne set out to 1) create a process flow model of officers entering the GSO program; 2) analyze the model—he determined it to be an open-ended system at steady state; 3) develop a formula that captures the model--he used a ratio of GSO officers to AAD positions; 4) determine the distribution that best fits the expected number of GSO officers needed to reduce the

empty AAD positions—he selected the normal distribution; and 5) run the model to find the ratio of GSOs to AAD positions (Beloyne, 1994:3-9 – 3-14). While his thesis did not determine if there were a better group of degree programs for space officers, it did highlight how poorly the AAD program was managed due to little justification for student selection rates, inferring the need for a more strategic review of AAD position management (Beloyne, 1994:1-3).

Kruthaupt and Roshto researched the factors that go into coding a position as requiring an AAD and derived a percentage of officers to fill the degree requirements essentially when there are not enough of the qualified officers to fulfill all the AAD positions (1981:7). They did their research specifically for the acquisition logistics field. To determine the positions that would require an AAD, they used Bloom's Taxonomy as the basis for their process and selected 10 key responsibilities from the logistics career field qualifications (Kruthaupt and Roshto, 1981: 19). They scored specific positions within a work center on the basis of 1) unique knowledge, 2) complexity, and 3) policy formulation (Kruthaupt & Roshto, 1981: 20). The 10 qualifications were weighted and each position scored, then the weighted averages were used to determine the overall score for the position (Kruthaupt & Roshto, 1981: 20). Using subject matter experts (SME), the authors determined the cut off scores for determining which positions would receive an AAD code and the ones below the cutoff score would not (Kruthaupt and Roshto, 1981: 21). While they could have used their method to incorporate determining the right degree for each position as well, they did not document if that effort was done nor did they attempt to determine that the degrees needed for each work center reflected an overall strategic level need for the logistics career field.

Subsequently, in 1982, Rish completed a study on developing an inventory model to determine the annual quotas to fulfill AAD requirements for the Civil Engineer (CE) career field. Using the CE AAD requirements and removing those who already had AADs and incorporating attrition rates for each grade of officer, he determined the demand for sending new officers to obtain degrees (Rish, 1982:20). He also studied whether or not receiving an AAD improved retention for CE officers (Rish, 1982:22). Rish did not study what degree programs were best for the CE officers, and he also assumed all AAD requirements were valid and reflected the career field's needs (Rish, 1982:24).

In 1983, Ranallo set out to update the Advanced Degree Requirements Information System (ADRIS), a now obsolete system that was the precursor to the current Graduate Education Management System (GEMS).

The determination of degree positions has not been an issue for the Air Force alone. Even as far back as 1975, the Army identified inconsistencies from subjective rather than objective methods and an overly bureaucratic process plagued their position validation process (Visscher, 1975). And while their career field specialties did submit AAD position validation requests in a manner similar to the Air Force's current process outline, the specific make up of board members reviewing the positions would highly influence the results of the board in favor of the specialties represented and to the detriment of those not present (Visscher, 1975:8). Visscher did not apply any specifically defined analytical model to present a new approach to the Army, but made a recommendation based on his perception of how the process should be improved.

The consistent theme in the AAD studies presented is that none attempted to determine if the degrees being pursued were the right mix for any specific career field. Additionally, they all approached fulfillment of AAD requirements through fully-funded program graduates only. Officers may earn degrees through TA or a partially funded program. Under the TA program, officers continue to work full time and pursue an advanced degree during their off duty time. Officers receive a percentage of funds to offset the cost of tuition. This is considered an unfunded graduate degree by the DoD even though TA funds are provided (DoDD 1322.10:2). Officers who obtain degrees in this manner are authorized to fill AAD positions bearing the same degree code earned (DoDD 1322.10:3). Under the partially funded program, officers are released to attend school on a full-time basis and still receive full pay and allowances commensurate with their grade, but they must pay for most of the course work and other degree program expenses from their own resources (DoDD 1322.10:6).

In the corporate sector, Staats conducted a sample review of 30 of the Fortune 500 companies' top executives (April 2006). The 30 companies selected contained a mix of business and technologically-based companies. This review determined the education profiles for the selected companies and found that 70% of the CEOs and 76% of its top executives held advanced degrees. When the list of 30 was narrowed to select technological corporations, the percentage of CEOs with advanced degrees jumped to almost 89% and those of its executives climbed to 83% (Staats, April 2006). Degrees held by the executives appeared to coincide with the type of position held, such as an advanced degree in accounting for the Chief Financial Officer at Boeing (Boeing, 2006). One could say that corporations are able to determine the mix of degrees held by their

executives deliberately, but they also have the luxury of direct hiring into the position where, as previously noted, the military must grow their own.

Hambrick, Black, and Fredrickson conducted a study to determine the characteristics of successful CEOs of high-technology firms versus those considered low-technology. While advanced degrees were not part of the original hypothesized set of variables, one pattern of significance they found in their analysis was that a successful CEO did hold an advanced degree, specifically an MBA (Hambrick, Black, and Fredrickson, 1992:12). The study did not explore other advanced degrees that senior executives hold, but made the statement that these CEOs succeed due to the ability to organize, analyze and integrate which is enhanced through the rigor of earning an MBA (Hambrick, et al, 1992:14). Additionally, they noted that these CEOs also need to compensate in the areas in which they are not educated with the selection of senior executives to complement their weaknesses (Hambrick, et al, 1992:4). It is this diversification of the right degree programs that officers within the Air Force must obtain to support the senior leadership. No one person can obtain all the knowledge needed to lead every facet of the organization, but the teamwork of those with the right degrees will enhance success.

In addition to the AAD studies noted, a recent study was done to evaluate academic programs to compare across universities utilizing decision analysis methodology (Keeney, See, and Winterfeldt, 2006). Their study focused on evaluating interdisciplinary programs, using the example of decision science programs, since these programs are more difficult to evaluate due to the cross-departmental nature of the program. The focus of their study was not to determine the best program for a particular

group as is this research, but highlights the flexibility of the decision analysis approach to evaluate alternatives through developing meaningful criteria for a variety of stakeholders.

The lack of published information related to determining the best degree programs does not necessarily mean there has not been a concerted effort by some career fields through their Development Teams to determine the types of degree programs they need their officers to earn, but past experience in this field indicates there is a lack of a formal, analytical approach to determine what degrees would best meet the mission and objectives of the career field. Therefore, there is a need to formalize a method and institute it as part of the Force Development program. The next section of this review outlines decision analysis.

Decision Analysis

Determining AAD programs for a career field is a decision problem for the Career Field Manager. Operations research (OR) lends itself quite readily in tackling decision problems since the raison d'être for operations research in general is to provide decision makers with a scientific method from which to base their decisions (Keeney, 1994, p.793). The decision analysis (DA) approach in OR provides a quantitative method to build objective functions to solve problems. With its methodology of applying quantitative methods to seemingly subjective decisions, DA methodologies are well suited for application to military problems, as analysts look to provide a more scientific basis for making hard decisions that often arise in the military structure.

Indeed, OR is a decision support science with the intention of analytically researching the best solutions, while attempting to provide optimal solutions, to problems. DA provides tools and methodology for organizing the decision scenario into

a structure that can be analyzed (Clemen and Reilly, 1996:2). Decisions can be complex, involve uncertainty, and include multiple objectives. Multiple objectives can conflict with each other, requiring a DM to determine the tradeoff he is willing to make among the different objectives in making a final decision (Clemen and Reilly, 1996:2-3). The solution context depends on what the decision maker (DM) wants to achieve since a different perspective can lead to a different conclusion (Clemen and Reilly, 1996:3). These perspectives are called values and the goal is to determine the preferences of the DM. While the DA approach may be discounted by some quantitative purists as being too subjective in determining a solution, DA is one methodology that *requires* the DM's personal judgment or values since it is really the DM who makes the final decision and it must be based on what is important to the DM (Clemen and Reilly, 1996:5). Even in other quantitative approaches, such as linear programming, constraints are based on the DM's values such as how much they are willing to spend, what objective they want to optimize, etc.

According to Clemen and Reilly, the DA process is captured through the flow chart seen in Figure 1. It is an iterative process that the authors term a *decision-analysis cycle* (1996). One of the most critical and controversial steps in the process is step 1. While some analysts approach the process by identifying the problem and then directly identifying alternatives to provide a solution without regard to the true objectives involved, Keeney suggests that the determination of the DM's objectives through soliciting the DM's values, then looking for ways through "decision opportunities" (alternatives) to achieve the objectives is the most important part of the process (Clemen and Reilly, 1996:6). This argument is addressed in comparing alternative focused

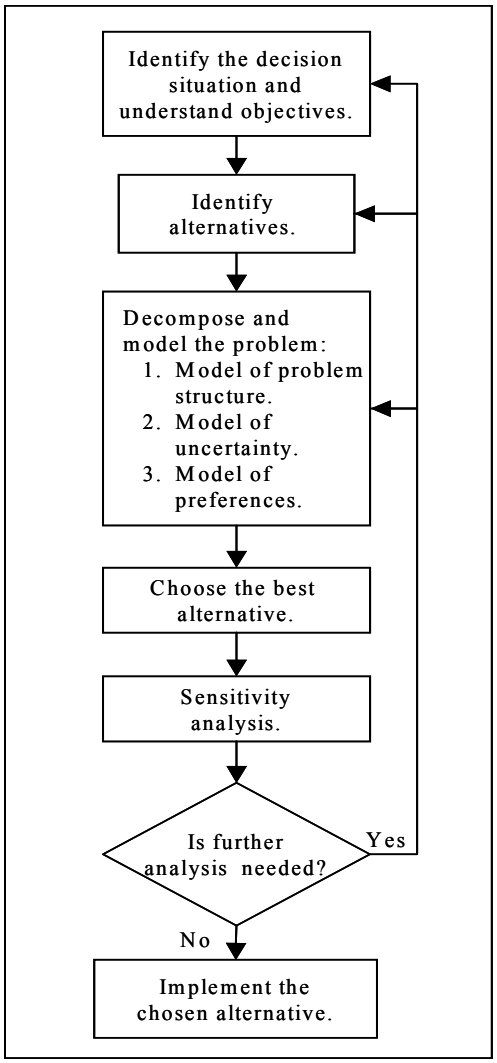


Figure 1. A decision analysis process flow chart (Clemen and Reilly, 1996:6)

thinking (AFT) versus value-focused thinking (VFT) which are two commonly used approaches in DA.

AFT is the traditional method for making a decision wherein a list of alternatives is generated and then analyzed to determine the best of the lot (León, 1999, p.213). But this method neglects to incorporate the DM's values in the alternative generation process, restricting the solution to the set of alternatives provided up front, when there could be a better solution not realized, save through the value determination of the DM (León,

1999:213-214). One goal of VFT is to create a list of alternatives that are better than those that initially appear to be viable solutions based on the DM's values in meeting the objectives laid out in the decision situation (Keeney, 1988:149). In León's comparison study of two groups using VFT and AFT, results showed with statistical significance that the general characteristics of VFT produce "a more complete, more operational, equally concise, and more understandable" model than AFT (León, 1999:225). DMs rated the VFT process as creating more innovative alternatives with a greater range of possibilities and more predictable results, supporting Keeney's claims. Keeney describes AFT as "backwards" in that it produces the set of alternatives before ever understanding what the values of the DM are to ensure the objectives are met (Keeney, 1996:537). He proposes "values first" which is the methodology selected for this research study. The next section discusses the VFT approach to decision making in more detail.

Value-Focused Thinking

According to Ralph Keeney, "You cannot do operations research (OR) without values" since they are the foundation from which we generate and evaluate possible alternatives (Keeney, 1994:793). That is not to say that alternatives are not important. They are very important - they are the means to achieve objectives and the goal of any decision situation is to select the best alternative from those that are available. In the AAD review, the alternatives are the list of degree programs that are scored against the values of the decision makers. But, there are thousands of different degree programs available across the academic institutions in the country, so in order to ensure you select the best set of alternatives for the objectives, you need to know the objectives of the decision maker in order to *generate* the best list of alternatives. By determining the

values of the DM, the researcher can then search for alternatives that best meet both a single value as well as those that would in general contribute to meeting several values. By selecting alternatives based first on the values, requires a more thorough, directed, search for alternatives that meet specific values, rather than just accepting an initial list without regard to the DM's values. Without knowing the DM's values, an excellent alternative could be left off the list by errantly thinking it would not be worth considering due to old paradigms. Without values, determining a list of alternatives considered a good representation of possible outcomes is hampered by what Kirkwood describes as the "associative process" (1997:43). Under the associative process, people tend to view new situations based on their past experiences that seem relevant and can fail to consider new alternatives since they have no association with them (Kirkwood, 1997:43). In an unchanging environment, Kirkwood explains that associative reasoning is effective, but in a dynamic environment, it can be dangerous since there may be no connection or association from a previous experience to the new one being faced (1997:44). By selecting alternatives that worked in the past for this new situation, the analyst may fail to consider an alternative that may be better (Kirkwood, 1997:44). By using values to select alternatives rather than past experience, VFT overcomes this barrier and leads to uncovering alternatives that might not have been considered relevant. Information regarding the methodology of selecting alternatives is described in Chapter 3.

The VFT process quantitatively captures the DM's values through development of a value hierarchy and then applies them to the alternatives to score them in relation to each other to determine the best solution based on those values. The value model provides a view on the *consequences* of choosing different alternatives based on the DM's values

(Keeney, 1994:793). Many decision problems are extremely complex and those with strategic impact, such as the cost of educating our officer force in the right mix of specialties, require a thorough review of the alternatives to ensure the best are selected. This is important since it is the values of the consequences that drive the focus on the decision problem (Keeney, 1988:149). While a short comparison with AFT has been reviewed, a good synopsis of the benefits of using the VFT process is provided in Figure 2. The details of the process for this methodology are outlined in Chapter 3 of this study.

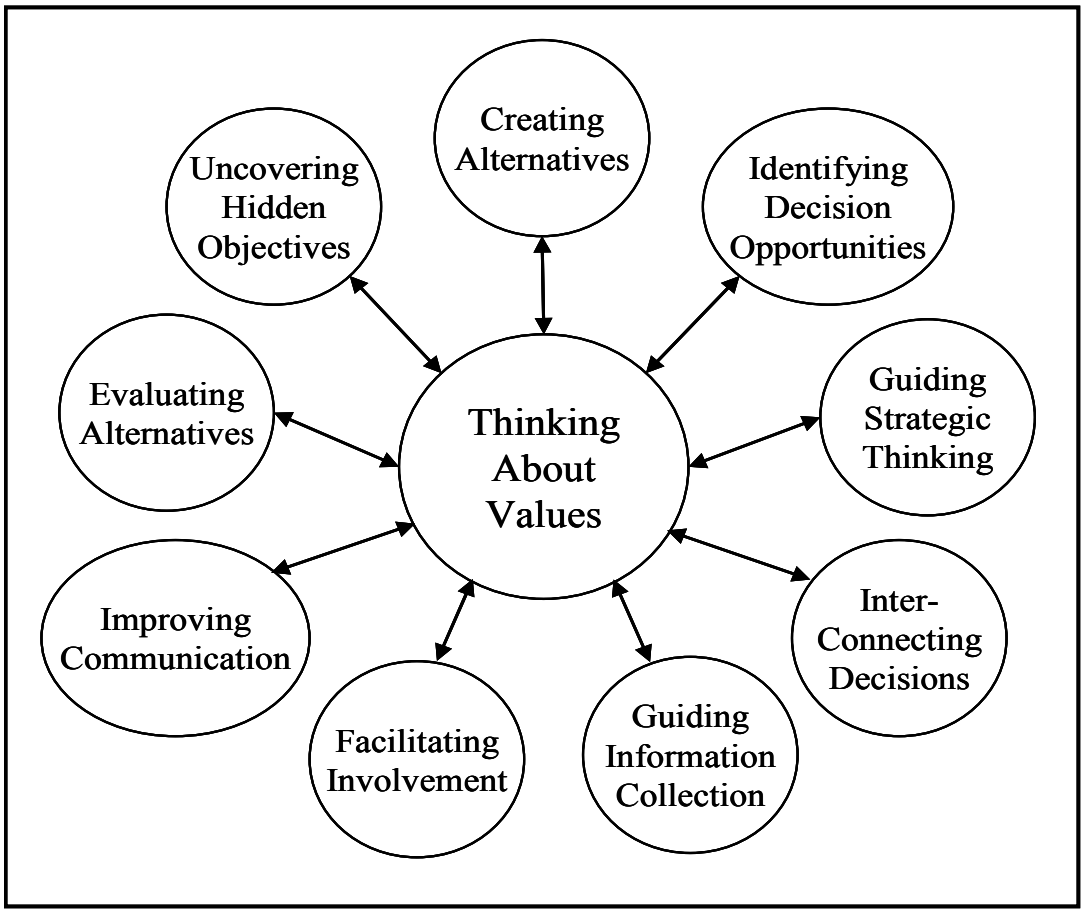


Figure 2. Benefits of Value-Focused Thinking (Keeney, 1992:24)

VFT is a flexible process that has been used in a variety of decision scenarios from determining the practicality of ground-sourced heat pumps (GSHP) for an Air Force base, the best wall structures in light of the environment, as well as academic course scheduling (Jeoun, 2005; Hassan, 2004; Knighton, 1998). These scenarios approach the use of VFT in different ways, highlighting its versatility. Jeoun uses VFT to develop criteria to compare the current method of environmental control through heating, ventilating, and air-conditioning (HVAC) systems to the GSHP (2005). In this case, he develops the VFT model to capture the DM's values in order to then compare the alternatives based on the scores each achieves from the value model (Jeoun, 2005). VFT was not used in this case to actually generate a list of alternatives but to ensure the DMs values were taken into consideration when one alternative had already been selected and a new one was challenging it. In Hassan's (2004) VFT model, he takes advantage of VFT's ability to consider multiobjective characteristics to evaluate building materials' effect on both exterior and interior environmental impacts where previous studies had only looked at external impacts. In Knighton's study (1998), he uses VFT to develop the objective function and its constraints for a scheduling problem.

Portfolio Selection – Multiple Criteria Goal Setting

In general, the main goal of going through the VFT process is to eventually rank order the alternatives generated to get an idea of their relative position in the standings. But, since the intent of this study is to determine not just a single degree program, but select the best group of degree programs to meet the values of the career field leadership, the result will not just be a rank-ordered list where one degree is selected as the program for the career field. Rather, the CFM will need certain percentages of the career field to

obtain certain degrees and others to obtain different degrees to develop the educational profile for the career field. Therefore, a portfolio of degrees needs to be selected to meet this objective.

To this end, once the alternatives are scored, a multiple criteria decision making (MCDM) approach to select the academic programs for the portfolio was used. The MCDM method of goal setting is used to determine what is called the "satisficing set" of alternatives that are acceptable to the decision maker (Yu, 1985:56). The DM determines a specific set of minimum criteria across the objectives, and degree programs that meet the criteria are allowed to enter the portfolio. Once the exact degree programs that are selected for the portfolio are determined, Kirkwood's value increment process to create a piecewise linear value function is used to determine the percentages for each of the degree programs (1997:62). The methodology for this process is described in Chapter 3. The resulting percentage for each degree program can be a rough goal for the career field but is not hard and fast due to the fluid nature of personnel within the career field via accessions and separations that constantly occur.

Officers may select degree programs from the best mix of degrees generated from the value hierarchy process. Officers are not bound through the TA program to select a certain degree, but this process provides the career field's guidance to the field on the valued degree programs, encouraging officers to select degrees from the list in order to succeed in their field and meet the career field's mission requirements. Additionally, if programs that best meet the values of the career field are from service-specific institutions such as AFIT or the Naval Postgraduate School (NPS), then this could provide justification for fully-funded quotas.

Summary

Not only is this research groundbreaking in that no other published study has attempted to determine the right degree mix for its senior leadership population, but it uses the analytical technique of value-focused thinking which other AAD studies have not used. Kruthaupt and Roshto used SMEs to help determine AAD position requirements, but this was not based on the degrees required to meet the career field's needs. This research fills this gap and provides DMs with results based on their values.

Advanced education within the officer corps is a critical piece in developing an officer to become a better leader to meet the needs of a dynamic Air Force. Within each specialty, different degree programs support the mission capabilities. With the drawdown of the Air Force's most valuable resource, its personnel, future leaders will need every tool in their arsenal to meet the mission with reduced manpower to make it happen. The critical thinking and analytical skills to effectively manage a dynamic mission require that officers receive the best education applicable to the job they are given. This research assists in determining these degree programs from a top-down, strategic approach to ensure the career field needs as a whole are met, not just the degree required for a specific position at a particular duty station.

The following chapter details the analytical approach of value-focused thinking used to make this determination. Then, Chapter 4 analyzes the results of this methodology as it is applied, and Chapter 5 covers some conclusions and recommendations for future research.

III. Methodology

Overview

This chapter outlines the methodology used to determine the best advanced academic degrees for an AFSC. For this study, the selected career field, Manpower and Personnel, is used as the example for the method. The value-focused thinking process along with its supporting multicriteria analysis method is detailed. The Educational Profile for the Manpower-Personnel hierarchical model is constructed throughout the chapter as the process steps are described.

Value-Focused Thinking Model Development

There are slightly different approaches to actually performing the VFT process. Both Keeney and Kirkwood are considered experts in VFT process development, and their methods have some slight differences as to the actual approach in getting the model developed along with terminology differences. Prior research on the core facets of their approaches led to the development of a 10-step outline initially published by Shoviak in 2001 and generalized by Tharaldson in 2006 (Shoviak, 2001:63; Tharaldson, 2006:13). This 10-step process is the basis for the model development within this research and is provided in Figure 3. It has been adapted to incorporate portfolio development into the process in step 9. This process assists in information collection and facilitates communication between the analyst and the decision maker. The DM is intimately involved in the foundation of the building of the model to ensure that it adequately reflects his or her preferences. The process allows for returning to previous steps if something needs to be readdressed. The following paragraphs detail the process.

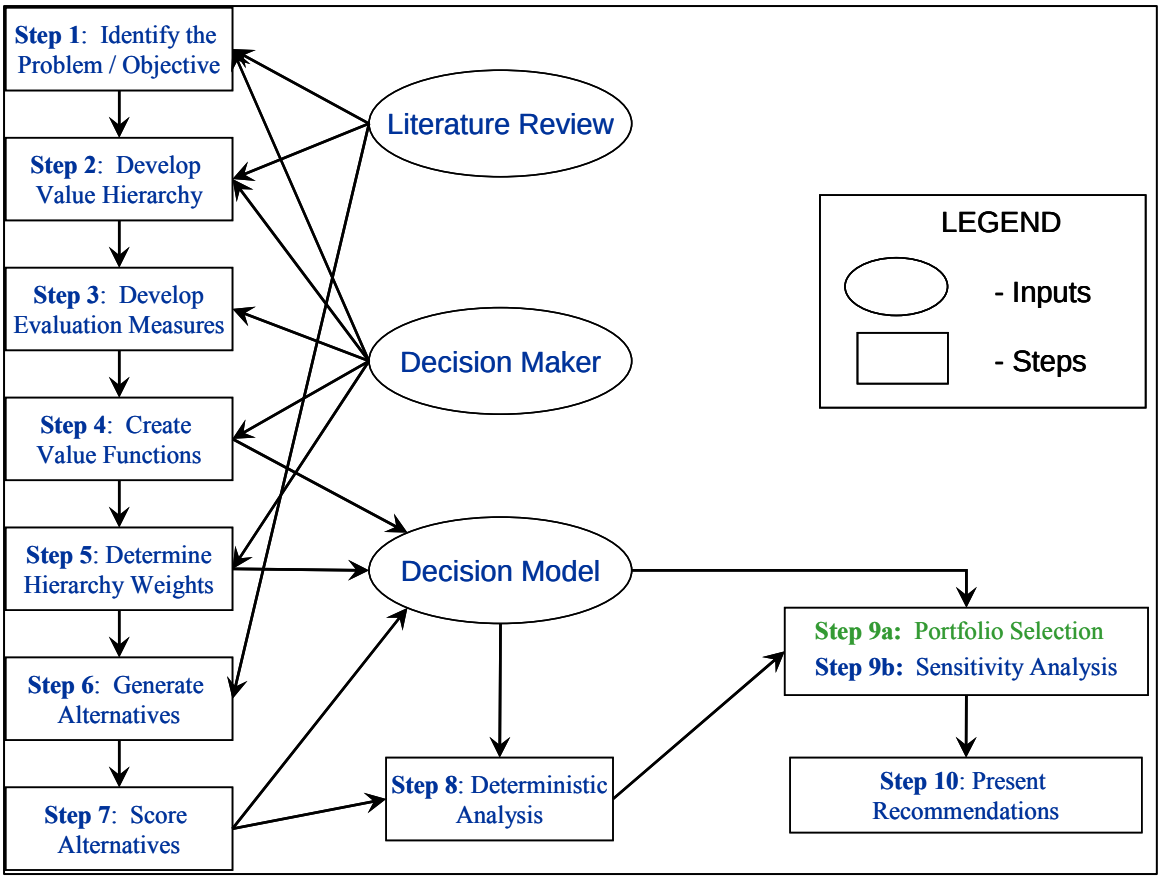


Figure 3. Adapted 10-Step Value Focused Thinking Process (Tharaldson, 2006:13)

Step 1: Identify the Problem.

To ensure the process starts off with the right direction, the VFT process requires that the analyst and decision maker determine the decision to be made through identifying the objective or problem to solve – this step is the corner stone for building the model. This first step is not novel in that most problem solving approaches indicate that identifying the root problem or issue at hand is critical from the beginning, but with VFT, it is much more than just tackling a problem. VFT is used to make a decision in a situation based on a goal or objective to be reached. "Without clear objectives, it is difficult to make defensible decisions" (Kirkwood, 1997:11). As was indicated in Chapter 1 of this research, career fields have not identified their required mix of degree

programs and desired educational profile from a strategic perspective using an analytical approach. Therefore, the objective of this research is to determine the best educational portfolio and profile, detailing the type of advanced degrees by percentage of the career field based on the values of the career field's leadership.

Step 2: Develop the Hierarchy.

The determination of the values within the hierarchy is ultimately provided by the decision maker. In order to develop a value hierarchy, the analyst solicits from the DM, through brainstorming or other idea solicitation techniques, the values that support the overall fundamental objective. In the brainstorming process, the analyst asks the DM "what do you want or value?" In this research, the fundamental objective is to determine the competencies an advanced degree program can provide to develop a Manpower-Personnel officer at the Lt Col level. The Lt Col level was selected to represent the development level a successful officer can expect to attain and is the grade where the officer holds more strategic and operational responsibilities. The officer at this grade is generally responsible for developing and implementing the strategic goals of the career field while understanding its tactical implications. The educational background of this grade level will have already been completed so the career field needs to determine what that educational portfolio should be *prior* to officers attaining this grade. As of October 2006, 235 of 237 (99.16%) Lt Cols within the Manpower-Personnel career field had already attained their advanced degree (IDEAS, 2006), validating that AAD capabilities (i.e., the mix of degree programs) should be attained prior to reaching this grade.

Once the initial list of ideal values is created, the analyst and DM proceed to affinity group (combine related or like items) the detailed objectives under a single,

higher-level value. These single values that group like objectives reflect the most important values of the DM and are used as the top tier values within the hierarchy. These top tier values are then subdivided into more detailed objectives, creating a tree-like structure with layers or tiers until an objective that can be measured is created (Kirkwood, 1997:12-13). These measurable objectives are referred to as "means objectives" (Keeney, 1992:34). These lowest tier objectives enable the DM to create evaluation measures to score alternatives that can contribute to achieving the fundamental objective (Keeney, 1992:35).

There are some considerations that need to be taken into account when developing the value hierarchy. Kirkwood outlines the five main characteristics of a well-developed hierarchy which are overviewed as follows (Kirkwood, 1997:16-19):

1. *Completeness (collectively exhaustive)* - The lowest tier evaluation considerations taken together as a whole at each level need to sufficiently represent the objectives that are important to the decision maker so that the analyst only needs to evaluate alternatives with respect to the lowest tier evaluation considerations. An additional requirement is that the lowest tier evaluation measures "adequately measure the degree of attainment of their associated objectives" (Kirkwood, 1997:16). If this is done, then the lowest tier evaluation considerations will meet all the evaluation requirements for scoring alternatives. The property of completeness does not necessarily mean that every single objective that can be considered is included in the hierarchy, but that every objective that is of importance to the DM is included.

2. *Nonredundancy (mutually exclusive)* – To ensure that an additive value model can be employed to add up the alternative scores and not double count values, each item within a tier of the hierarchy needs to be "mutually exclusive" so that none of the value measures overlap. Since each subvalue within a hierarchy divides up the value above it, as long as the analyst ensures that each value on each tier is nonredundant, then the subvalues should also be nonredundant, creating a mutually exclusive bottom layer.

3. *Decomposability (independence)* – The values associated with the evaluation measures should not influence each other – they should be *preferentially* independent meaning that a change in one measure's value should not affect the shape or result of another measure's value function. For example, if a value for one attribute is selected, it should not change the value of a second attribute. This is required to ensure an additive value function of the form $v(x) = \sum_i w_i v_i(x_i)$ is maintained. More information on this value function is provided later in this chapter.

4. *Operability* – For a hierarchy to be considered operable, it must be understood by all who intend to use it including the stakeholders who have an interest in the outcomes of the model since its results should facilitate communication with them, and not be so complex that it is too difficult to understand.

5. *Small size* – To ensure that it can be communicated easily to stakeholders and other interested parties, the hierarchy needs to be relatively small in size and simple to understand. This characteristic also aids in reducing the resources necessary to

score alternatives against the evaluation measures. The analyst needs to balance the degree of completeness with its accompanying detail along with the need to keep the hierarchy small. This ensures that the key, critical values must be considered while keeping the analysis at a practical, defendable level. To apply this, Kirkwood recommends Keeney and Raiffa's "test of importance" to ensure evaluation considerations are only added if the possible variations among the alternatives could actually change the preferred alternative (Kirkwood, 1997:19). For instance, if all alternatives receive the same exact score or are within a small range of each other for a particular evaluation measure so as to not impact the ranking of the alternatives, then there would not be a need to keep the evaluation measure in the hierarchy for mathematical reasons. The measures could then be removed, reducing the size of the model without impacting the final ranking of alternatives. However, if a DM wanted to retain the measure to show stakeholders it was considered and to communicate that it had little or no impact, it could be retained, but it would have no mathematical impact on the results of the analysis.

To develop the Manpower-Personnel Educational Profile Value Hierarchy (MPEPVH), the CFM for the 37F specialty, Col Michael Gamble, Chief, Strategic Plans Division, HQ USAF/A1XX, and members of his staff brainstormed values desired within an academic program for the 37F officers (13 Nov 2006). The values were grouped into like areas (affinity grouping) and the two areas that were deemed the most important to focus on were 1) developing leaders and managers with career field expertise and 2) developing an officer who is a critical thinker who can analyze issues, develop approaches to address them, and determine the best solution given constraints. Given this

discussion, the top tier values of the hierarchy became 1) Leader/Manager and 2) Critical Thinker. These values were then subdivided further using other values from their affinity groups that best represented the values of the career field and sufficiently captured the DM's desires.

The Leader/Manager value was subdivided into three values of 1) Strategic Advisor, 2) Lifecycle Manager, and 3) Change Management. It was important to the group that 37F officers have a strategic focus and be able to advise wing commanders on issues within the manpower-personnel mission. Additionally, with the dramatic changes that the force structure is currently undergoing, and continually encounters, it was important that officers understand and be able to communicate the impact of change on an organization and its people. These values of Strategic Advisor and Change Management were not further broken down, but Lifecycle Management was further subdivided into 1) Lifecycle Processes and 2) Lifecycle Systems. It is critical for a 37F officer to have expertise in human resources lifecycle processes and how to manage them since that is the mission of the career field. Additionally, a 37F officer needs to understand how the plethora of manpower and personnel systems support those processes and interact with other systems outside of the human resources mission. Without systems support, the manpower-personnel mission can not be completed.

The Critical Thinker value was subdivided into the values of 1) Decision Analysis; 2) Lifecycle Analysis; 3) Organizational Design; and 4) Resource Allocation. The DM wanted an academic program that could hone an officer's skills to organize data and tackle problems involving uncertainty and multiple objectives; therefore, Decision Analysis was selected as the value that encompassed these goals. Next, the group

determined that 37F officers will need the skills to perform analysis on lifecycle processes of accessing, training, assigning, retaining, promoting, and attriting a work force (the "faces" side of the manpower-personnel mission). In general, the Scientist and Analyst (61S) officers provide this capability, but with the force shaping cuts, there will be fewer of those officers available to perform the analysis and 37F officers will have to take on more of those duties themselves. Additionally, they determined that, in general, a 37F officer should understand the concepts of analysis so that this capability is not limited to a select population of the career field – it is beneficial across all positions in the career field. With this value, the academic programs that provide quantitative analytical capabilities, separate from the decision analysis courses to ensure nonredundancy, are highly valued. In this same realm, the programs that cover the organizational design which encompass the manpower mission areas are captured in that same titled value (this covers the "spaces" side of the manpower-personnel mission--the authorized positions that the "faces" fill). Since resources are scarce, proper management of those resources available need to be properly managed; therefore, resource allocation was included to complete the model. The resulting value hierarchy for this research is provided in Figure 4 and definitions for each of these values are found in Table 1.

The hierarchy meets the five criteria described above. For completeness, while there are many more values the DM would like to see within a Manpower-Personnel officer, he focused on the values that could be achieved through an advanced degree program. Other objectives desired could be attained through other areas such as assignment experience or the career field's technical training and were not considered for this value hierarchy. The definitions for each evaluation consideration in Table 1 provide

insight into the effort to keep the model mutually exclusive since some of the areas may appear to overlap on the surface, such as Lifecycle Processes versus Lifecycle

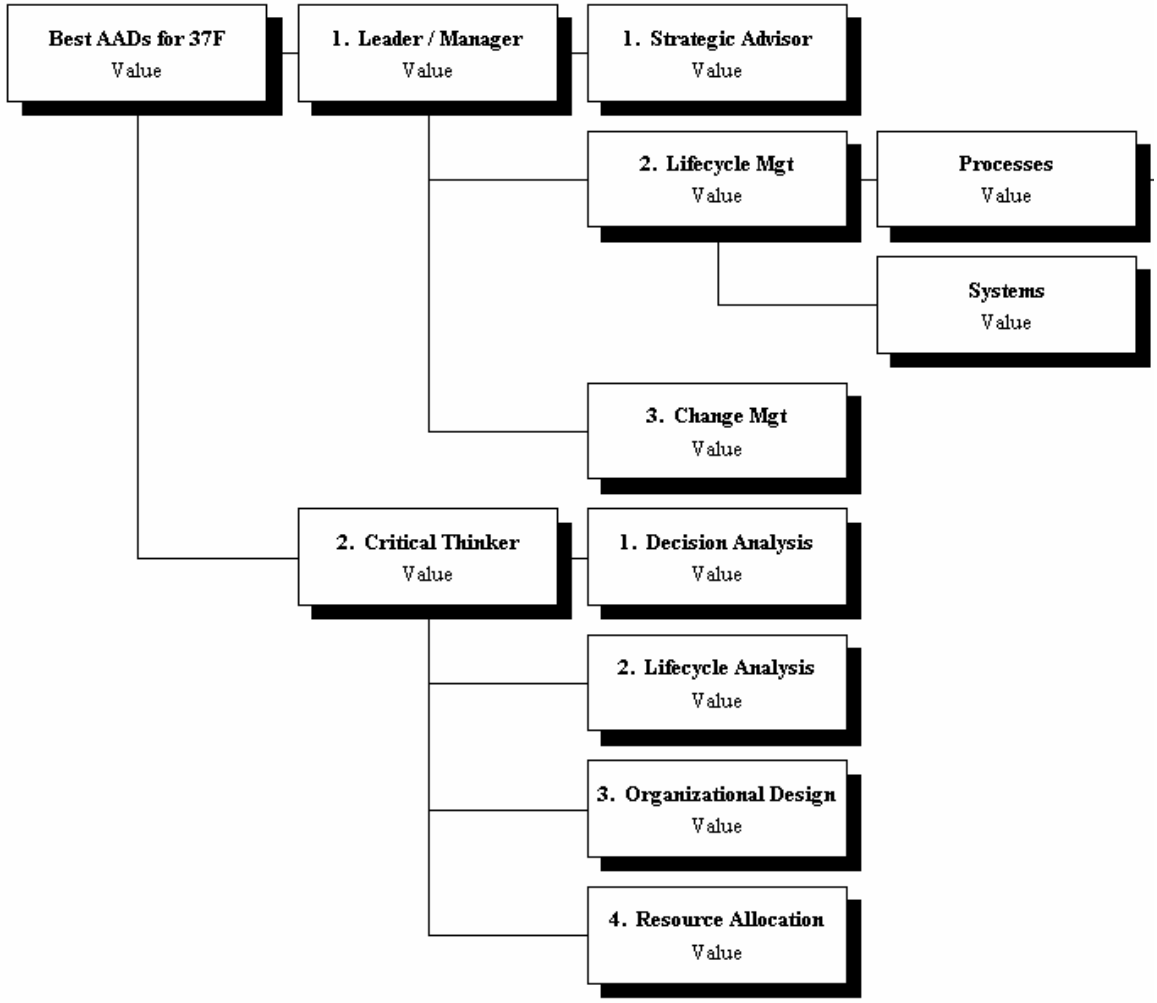


Figure 4. The Manpower-Personnel Educational Profile Value Hierarchy

Analysis. The DM's preferences for each value are independent – regardless of the score one value received, his preferences for the other values would not change. They hold up on their own merit, so the model is preferentially independent. To understand and develop an operable model to evaluate a degree program, the top tier values were subdivided into areas the DM valued and those values which the academic community

could support through various course work. It is a relatively small hierarchy with only eight values to consider for scoring alternatives. The small size reduces the number of measures to compare degree course content against. Adding too many measures could increase the time required to determine the best value each course contributes.

Table 1. Definitions for Means Objectives within MPEPVH

Value	**Definition**
Strategic Advisor	Courses that support high level view to see how the little pieces form the big picture and advise on issues that impact the mission. Focus is on learning to gain a strategic perspective rather than the "in the weeds" knowledge.
Lifecycle Management	Courses that focus on specific HR management abilities of lifecycle programs and lifecycle systems that support them.
Lifecycle Management Processes	Subdivision of lifecycle management: courses that focus on HR process management, specifically on the concepts involving how to access, train/educate, assign, retain, promote, force shape, separate/retire a work force.
Lifecycle Management Systems	Subdivision of Lifecycle Management: courses that focus on HR systems including hierarchical systems and information resource management courses. The intent is to gain knowledge on how to apply systems to manage HR lifecycle processes but not necessarily being able to technically develop an HR system.
Change Management	Courses that focus on effectively analyzing decisions that impact change - recognize impacts of change through assessing the environment and effectively communicating those decisions.
Decision Analysis	Courses that focus on understanding how to integrate data from across the organization and synthesize into meaningful data to support decisions through assessing/analyzing risk/uncertainty and decision maker's goals.
Lifecycle Analysis	Courses that provide the quantitative analysis tools needed to perform personnel lifecycle analysis. Separate from lifecycle management, it involves the development of the skills to actually do the analysis using applied quantitative approaches versus managing the programs through using the analysis.
Organization Design	Courses that provide the tools to determine the optimal design of an organization based on the mission, training requirements, force capabilities, and available force staffing.
Resource Allocation	Courses that foster the development of managing limited resources to include program budgets. The emphasis should be on management of a limited resource in a strategic environment and understanding how tradeoffs may have to be made to meet the strategic perspective.

Step 3: Develop Evaluation Measures.

Once the values are formed into a meaningful hierarchy, the DM and analyst need to determine the best measures for the lowest tier of means objectives and ensure those measures reflect the values from the top tier. The types of evaluation measures are classified as either *natural* or *constructed* and either *direct* or *proxy* (Kirkwood, 1997:24). Definitions for each of these classifications is provided Table 2 below.

Table 2. Types of Measures (Kirkwood, 1997:24)

Type of Measure	***Definition***
Natural	One that is in general use with a common interpretation by everyone
Constructed	One that is developed for a particular decision problem to measure the degree of attainment of that objective
Direct	Directly measures the degree of attainment of an objective
Proxy	Reflects the degree of attainment of an associated objective (*does not directly* measure the objective)

Based on these types of measures, there are four possible combinations to classify the measures: 1) Natural/Direct, 2) Natural/Proxy, 3) Constructed/Direct, or 4) Constructed/Proxy. Examples of these combinations are presented in Table 3:

Table 3. Examples of Measure Classification

	Natural	**Constructed**
Direct	Military end strength Bandwidth per second Miles per gallon	Olympic diving score Tornado strength category
Proxy	Gross National Product (economic growth) Number of seats (vehicle size)	Promotion Recommendation (officer's potential) Student Grades (Student learning)

Once an evaluation measure is determined, the evaluation measure scale is developed. This scale provides the range of values that an alternative is evaluated against

and should be developed with the decision maker's preferences for best and worst values in mind as these are translated into single dimensional value functions in the next step in order to be able to compare all evaluation measures together on the same value scale.

For the Manpower-Personnel Educational Profile Value Hierarchy, the values of Leader/Manager and Critical Thinker form the top tier. These values were then dissected into more detailed objectives resulting in eight means objectives described previously under step 2. It is these bottom tier means objectives that require the development of evaluation measures. As the measures are developed, the attributes are identified by $\boldsymbol{X} = (X_1, X_2, \ldots, X_n)$ where $\boldsymbol{X}$ identifies the entire set of evaluation measures for the decision problem, and attribute scores are identified by x_i (Kirkwood, 1997:227). Since scoring an academic degree program against a value involves some subjective judgments, it is not a direct evaluation; therefore, the types of measures selected were either constructed proxy or natural proxy. In developing the measures, it is important to construct them in such a way that the attribute scores would be monotonic, either always increasing or always decreasing. The reasoning for this construct is addressed in the step 4 discussion. For the measures developed, all value functions created are monotonically increasing since more contribution of the academic program to the value is considered better. Table 4 shows the means objectives (attributes) and their corresponding evaluation measures for the hierarchy.

In determining the range of values considered for the measures, the DM was asked to state the low and high end values where the lowest value represents the worst score for an alternative and it would receive no value, indicated by x_i^0, and the highest score that

would represent the best or ideal attainment of that value, indicated by x_i^*. Reference Table 5 for the range of preferences for the Manpower-Personnel model measures.

Table 4. Evaluation Measures for MPEPVH

Means Objective	Attribute (X)	Evaluation Measure	Type
Strategic Advisor	X_1	Level of focus on strategic perspective (categorical)	Constructed Proxy
Lifecycle Management Processes	X_2	Number of credit hours on HR processes	Natural Proxy
Lifecycle Management Systems	X_3	Number of credit hours on systems management/design	Natural Proxy
Change Management	X_4	Number of credit hours on change management	Natural Proxy
Decision Analysis	X_5	Number of credit hours of decision analysis courses	Natural Proxy
Lifecycle Analysis	X_6	Number of credit hours of scientific-based analysis courses	Natural Proxy
Organization Design	X_7	Number of credit hours on organizational design	Natural Proxy
Resource Allocation	X_8	Number of credit hours of resource allocation courses	Natural Proxy

Table 5. Preference range for Evaluation Measures

Attribute X	x_i^0	x_i^*
X_1	Low	High
X_2	0	30
X_3	0	20
X_4	0	30
X_5	0	18
X_6	0	30
X_7	0	30
X_8	0	21

In reviewing the measures created, for attribute X_1, the DM chose to evaluate the level of strategic perspective for a program as low, medium, or high due to its subjective nature. During the scoring process, an alternative is evaluated through the content of its

courses contributing to the degree that involve a strategic-level approach. The analyst makes an assessment as to the overall program's level and assigns a high, medium, or low score. For the remaining attributes, specific amounts of course credit hours were determined to evaluate academic programs based on the DM's value of the ideal.

Once these evaluation ranges were determined, normalizing these varied levels into comparable assessments needed to be done. Kirkwood refers to this process as "returns to scale" and it is done through creating single dimensional value functions for each evaluation measure (Kirkwood, 1997:60). The next step in the VFT process highlights this methodology.

Step 4: Create Value Functions.

To create the single dimensional value functions (SDVF), a function needs to be developed such that the individual scores that each alternative achieves are translated to a value in a range from 0 to 1, where the least preferred score receives a value of 0 and the most preferred score receives a value of 1 (Kirkwood, 1997:61). This process allows the analyst to evaluate each measure on the same range of values so that they are comparable. To do this, each evaluation measure's preferences must be monotonic to ensure a standard transformation process can be applied. Kirkwood explains that preferences over the attributes are monotonic when higher levels are always more preferred, or always less preferred (1997:228). To perform the transformation, each possible alternative score that falls into the decision maker's range of least preferred to most preferred is represented along the x-axis and the translated value is represented along the y-axis of a coordinate system. The y-axis is indicated as a value of x, noted as $v(x)$ in general or $v_i(x_i)$ to identify each individual attribute's value. An SDVF can then be developed only if

$v(x') > v(x'')$ if and only if $x' \succ x''$, where x' and x'' are specified but arbitrary levels of x and where the symbol $\succ$ indicates "preference over" rather than "greater than" since in some cases a lower value could be preferred over a larger value (Kirkwood, 1997:229). As long as $v(x')$ gives the same rank ordering as $v(x'')$, then the value functions are strategically equivalent and can be applied to all alternatives scored. Since each measure is mutually exclusive and preferentially independent, this allows an additive value function to be created for the attributes such that

$$v(x) = \sum_i w_i v_i(x_i) \tag{1}$$

where w_i represents the weight of the evaluation measure. Hierarchy weights are discussed in the next step (Kirkwood, 1997:230). The weights should sum to 1 across all the evaluation measures; therefore, with this additive value function, an alternative that scored at the most preferred level on every evaluation measure would receive an overall value of 1 for the value function (Kirkwood, 1997:61). Likewise, an alternative that scored at the least preferred level for every evaluation measure would receive an overall value of 0 for the value function (Kirkwood, 1997:61).

Since there are different types of values, either a discrete or continuous function needs to be developed, depending on the type of measure. For discrete measures, categorical values are used. The decision maker determines the value of each possible category. For scores that can range along a continuous line with no break points, an exponential curve is generally used to represent the values for the scores attainable. This function has been shown to be a reasonable, and even conservative, continuous function for determining tradeoff in an additive value function (Kirkwood, 1997:65). In the case

where values fall into a range that can be continuous but have specific break points where the DM values one score over another, then a piecewise linear value function can be created.

For the Manpower-Personnel value model, the DM determined that in order to score an academic degree program, each core and selected specialty course within the program should be reviewed. To develop a quantifiable approach to measuring a program, for most values, the total number course hours in the program that contribute to a value would be used. The course description is reviewed to determine whether or not it contributes to any specific value, and its course hours could then be added to the total of hours the program contribute to specific values. Therefore, for all the values except the Strategic Advisor value, the total credit hours that contributed to a value made up the x-axis values for the SDVF to be developed. A note to point out is that some programs are quarter-hour based and others are semester-hour based. To maintain consistency, the SDVFs were developed based on a quarter-hour program. Any semester-hour based programs considered are converted to quarter-hour equivalents using a conversion multiple of 1.5 (Hart, 2006). Since the number of credit hours considered could be fractional due to the conversion factor, a continuous function SDVF is used to translate the raw score. For the Strategic Advisor value, the DM was interested in the entire makeup of the program and its strategic focus. As noted from its definition in Table 1, the DM wanted an overall assessment of courses that support a strategic, high-level view to see how the little pieces form the big picture and advise on issues that impact the mission scored against a categorical measure of high, medium, or low level strategic focus. This was the only categorical scale developed for the evaluation measures.

For the continuous measures, the methodology used to develop the continuous function is for the DM to determine the range from low to high for least and most preferred, and then select the exponential constant, identified by the Greek letter ρ (rho), to determine the shape of the curve (Kirkwood, 1997:65). When higher values of x are more preferred, the *v(x)* would then be found by the equations (Kirkwood, 1997:65):

$$v(x) = \frac{1 - \exp[-(x - Low)/\rho]}{1 - \exp[-(High - Low)/\rho]}, \rho \neq Infinity \quad (2)$$

$$v(x) = \frac{x - Low}{High - Low}, otherwise \quad (3)$$

Since the range of the measures were already developed, to determine the shape of the curve, the DM was asked what x-axis score would have a 50% value. For some measures, he determined the curve through visual acceptance and then verified the results through interpreting the 50% value. For others, he specifically selected a single score value result to determine the curve. For example, for the Lifecycle Systems measure, he determined that one course of 3 credit hours would score a value of 0.50. Once that value was submitted, he reviewed and approved the resulting curve. The resulting SDVFs are provided in Appendix A and are summarized in Table 6.

Step 5: Determine Hierarchy Weights

To use the additive value function identified in Equation (1), the decision maker needs to determine the global weights for each evaluation measure. Global weights indicate the amount of weight that each value within the hierarchy contributes to the overall fundamental objective. The global weights for the means objectives (lowest tier values) should add up to 1, i.e., $\sum_i w_i = 1$. Each measure in the hierarchy is generally not

of the same importance to the decision maker; therefore, the DM must weight their importance relative to each other so that the global weights add up to 1. The analyst must solicit the weights for each evaluation measure from the DM. To simplify the approach in determining these weights, it is often easier for a DM to determine "local" weights within each tier of the hierarchy. The local weights are the amount of weight across a lower tier of values that contribute directly to a single value above it. The local weights across the evaluation measures under a single value should add up to 1. Once the local weights are determined, the analyst can then calculate the resulting global weights and check back with the DM to ensure that the relative weights reflect his or her level of importance across all the measures. This approach of determining the local weights was used. The resulting hierarchy with local weights is shown in Figure 5 and the resulting global weights are listed in Table 6 along with a synopsis of the SDVFs.

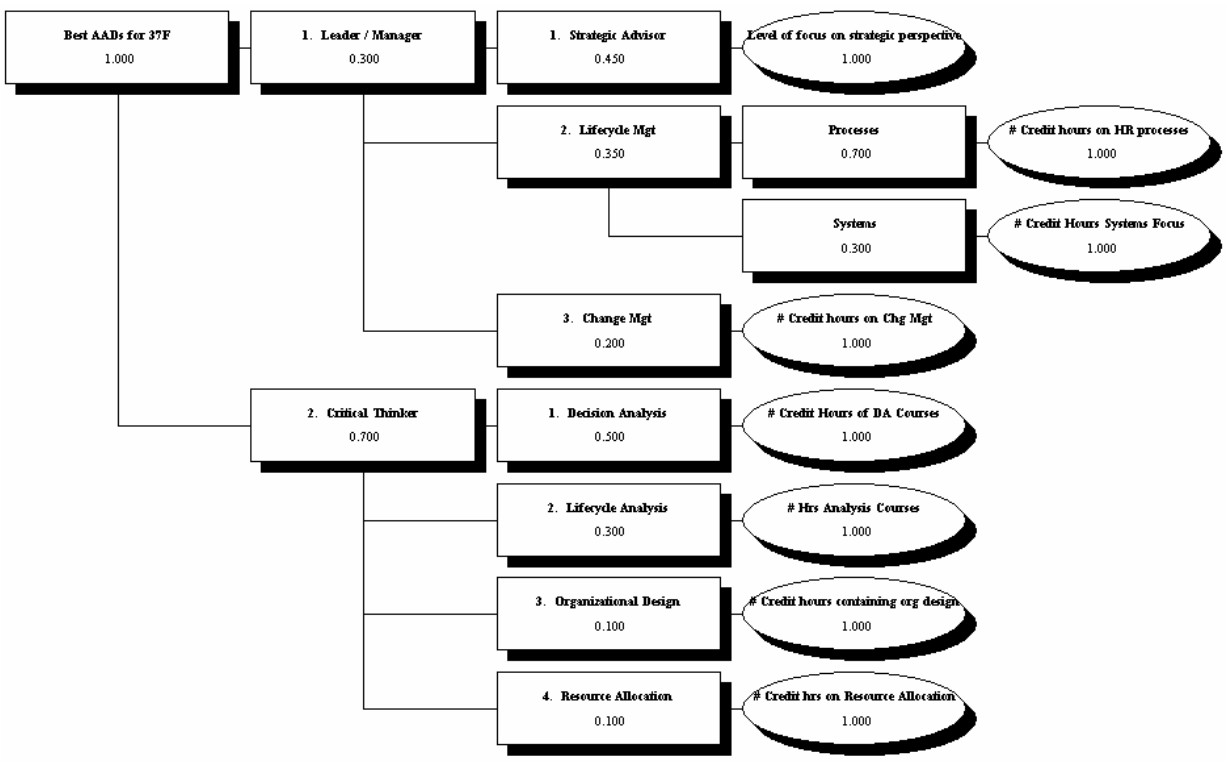
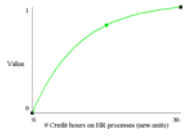
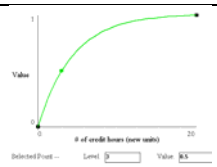
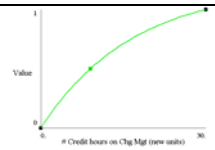
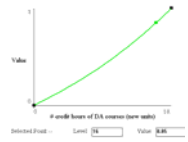
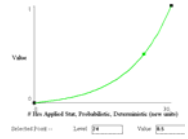
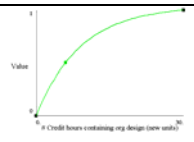
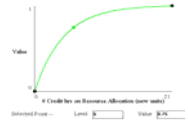


Figure 5. MPEPVH with Local Weights

Table 6. SDVFs and Weights for MPEPVH

Attribute X	SDVF	x_i^0	x_i^*	Global Weight	Units
X_1		Low	High	0.135	Low, Medium, High
X_2		0	30	0.0735	Quarter Credit Hours
X_3		0	20	0.0315	Quarter Credit Hours
X_4		0	30	0.06	Quarter Credit Hours
X_5		0	18	0.35	Quarter Credit Hours
X_6		0	30	0.21	Quarter Credit Hours
X_7		0	30	0.07	Quarter Credit Hours
X_8		0	21	0.07	Quarter Credit Hours

Step 6: Generate Alternatives.

Due to the hundreds or even thousands of different advanced academic degree programs available from across the country, determining the portfolio of programs to score becomes a huge combinatorial problem. The Air Force's Military Personnel Data System (MilPDS) categorizes over 1500 different degree programs using 4-character codes, highlighting the myriad of degree programs available to submit to the system. Therefore, the initial approach to determining the alternatives that would form the right degree mix starts with identifying individual degree programs to score against the value hierarchy.

There are many different ways that a list of alternatives can be generated. By using the values from the hierarchy to specifically determine alternatives, the list generated should be the best available. This theory is based on the thought process that an alternative that performs well against any individual evaluation measure essentially contributes to the overall fundamental objective and associated values (Keeney, 1992:204-205). Seeking alternatives that would contribute to meeting the values should result in the best list of alternatives. Without the values as guidance, alternatives selected ad hoc or based on a preconceived notion as to what the alternatives should be, may or may not contribute to the overall objective and cause the analyst to miss alternatives that could potentially score higher than the ad hoc list. Additionally, alternatives selected without regard to the values of the DM could be a waste of time for the analyst to collect data on the alternative and score it.

For this study, the alternative generation process focused on finding degree programs whose course requirements along with certain specialty tracks would score well

in individual evaluation measures. Once an initial list was developed for this narrowly-focused approached, then a broader approach was taken to look at programs that could potentially score well across multiple values. These programs may not score the top value within any single measure, but may have the potential to have at least some value across many measures. Additionally, a broad range of degree programs crossing different specialties was considered to ensure a broad net was cast. One degree program, Humanities, was selected for review to assist in validating the model. This program should not score well due to its curriculum not containing courses that contribute to the values within the model. Additionally, there were specific degree programs that the decision maker wanted to ensure were reviewed and those were included in the alternative list.

Since each academic institution can tailor their programs as the faculty deems appropriate, certainly the choice of academic program could impact the score. Due to the infeasibility of scoring thousands of different programs, selected institutions were chosen. Each institution is accredited, and therefore, accepted as applying a required standard in meeting the objectives of an advanced degree program. Since the mix of degree plans is to support Air Force officers, the programs at the military service institutions of AFIT and NPS were reviewed and selected first. Additional programs were selected from accredited universities near an Air Force installation. Other respected and accredited institutions not in close proximity to a military base were also selected to represent a standard program for a particular discipline. Additionally, any unique, specialized degree programs found during the search that appeared to meet specific values in the model were included to determine their viability for the career field. Various online search engines

such as Google and MSN, as well as institutional catalog listings of degree programs were utilized in searching for programs that could perform well in the scoring phase. The resulting list of alternatives is presented in Table 7. Some core programs such as Operations Research, Strategic Leadership, and MBA, were selected more than once to evaluate for differences among specialties or concentrations. Institution catalogues along with their program and course descriptions were reviewed to determine which programs and their specialty concentrations would best meet the values of the hierarchy to earn selection as an alternative.

An important note to make is that additional MBA programs from different institutions were also selected to test the model and determine standardization of the degree programs across universities. The assumption was that they should score relatively close to each other depending on the specialty track chosen and highlight the value of one specialty track over another. The Executive MBA from NPS was selected since the career field is considering using this program for its IDE students if AFIT no longer retains the Integrated Strategic Leadership programs. Significant score differences could provide justification for one program over another.

Table 7. Alternatives for Manpower-Personnel Value Hierarchy

Alt (a_i)	Graduate Degree	Specialty Track	Institution	Primary Attribute
a_1	Operations Research	Decision Analysis (DA)	AFIT	X_5
a_2	Operations Research	Applied Statistics (AS)	AFIT	X_6
a_3	Integrated Strategic Leadership (ISL)	Financial Management (FM)	AFIT	X_1/X_8
a_4	ISL	Information Leadership (IL)	AFIT	X_1
a_5	Logistics Management	OM/AL*	AFIT	X_1
a_6	Information Resource Management	Strategic Information Management	AFIT	X_3
a_7	Operations Analysis	12-month IDE	AFIT	X_5
a_8	Computer Science	Database Systems	AFIT	X_3
a_9	Manpower Systems Analysis		NPS	X_2/X_3
a_{10}	Master of Business Administration (MBA)	Defense Systems Analysis	NPS	X_3
a_{11}	Program Management		NPS	X_8
a_{12}	MBA	Executive	NPS	X_8
a_{13}	MBA	Leadership/ Change Management	DePaul University	X_4/X_1
a_{14}	Human Resource Management (HRM)	Information Systems (elective)	George Washington University	X_2
a_{15}	Organizational Management		GWU	X_7
a_{16}	MBA	HRM	GWU	
a_{17}	Political Science	Public Policy	GWU	X_1
a_{18}	Organizational Change Management		Milano University	X_4
a_{19}	Human Resource Development		University of Tennessee	X_2
a_{20}	Human Resources and Labor Relations		University Wisconsin-Milwaukee	X_2
a_{21}	MBA	Management, Innovation, and Change	Wright State University (WSU)	X_1
a_{22}	Public Administration		WSU	X_1
a_{23}	Education Admin	Leadership	WSU	X_1
a_{24}	Psychology	Industrial/ Organizational	WSU	
a_{25}	Humanities	History/Music	WSU	

*OM/AL = Operational Maintenance/Acquisition Logistics

Step 7: Score Alternatives.

Data Collection.

In order to score alternatives, data on each individual alternative needs to be collected and organized in an appropriate manner depending on the value model. For the Manpower-Personnel value hierarchy, data on each academic degree program listed in Table 7 needed to be gathered into a standardized format. Using each institution's online catalogues and course descriptions, each program's core required courses were separated out and then representative courses for any specialty track were selected. If a specialty track was not selected, then a representative elective was selected to balance the program hours. Since it is not practical to score the combinatorial options of electives within programs, and students are free to select their own electives, most electives were not considered for scoring, and therefore, the total hours considered for scoring were less than the required number of hours to graduate. Additionally, some programs (such as AFIT and NPS) require more hours to meet graduation requirements than others. These programs may have had more hours scored if the program identified more specific required courses. This imbalance is legitimate, since more *required* hours could potentially satisfy more values or apply more courses to a specific value and be considered a better program. The individual programs and their course descriptions are available in Appendix B.

Scoring Process.

To score each program against the evaluation measures, each required course description along with the minimum required courses for a particular specialty or concentration was evaluated to determine if it supported any of the values. If the course

description provided content supporting the concept of the value, the course credit hours were applied to that value. Since it is not possible to determine the amount of a course that contributes to an evaluation measure, all course hours were applied if it contributed to only one value. For example, if a 4-credit hour course was reviewed and determined that it contributed to the value of Decision Analysis, all 4 credit hours were applied to the score for that measure. If a course contributed to more than one value, then the number of course hours was divided among the values. For example, if a 4-hour course contributed to both Change Management and Organizational Design values, then 2 hours were attributed to Change Management and 2 hours were allotted to Organizational Design. This was done to ensure a course was not double counted for values. For the strategic level focus evaluation measure, the overall program was reviewed for its strategic focus. A rule of thumb used as a guide was that if no courses or only one course contained course content with a strategic focus, then the program received a "Low" score. If the program had two or three courses with a strategic focus, then it received a "Medium" score. If a program had four or more courses, then it received a "High" score. No program would receive a value of 0 since the DM determined that most advanced degree programs contribute to a more strategic perspective on issues as a whole. Since this was an evaluation of the overall program, in looking at individual courses, if it was determined that a course contributed to the Strategic Focus value, its course hours could also be considered for the other value measures.

The actual scores were input into the Logical Decisions for Windows, Decision Support Software (2000). The software contains the value hierarchy and its associated SDVFs and converts the raw score into the value score for the model and uses the

additive value function to provide an overall score for each alternative. Results and discussion are provided in Chapter 4.

Step 8: Deterministic Analysis

The Logical Decisions Software Suite uses the additive value function to calculate the total weighted value score based on the raw scores submitted for the alternatives into the software model. It translates the raw score into its scaled value score between 0 and 1, then multiplies the value score by the weight for the given value. The total weighted value score for each alternative is compared and the result is an overall rank-ordered listing of the alternatives in descending order. The results for this deterministic analysis are provided in Chapter 4.

Step 9a: Multiple Criteria Determination and Portfolio Selection

Once the results of the scoring process were completed, the problem then became how to select the best portfolio of degree programs to recommend to the decision maker. While the VFT results provide a rank-ordered list of degree programs, just taking the top four or five may not be the best solution as some degree programs that may have scored lower might be needed for selected members of the career field in order to meet specific mission needs. Therefore, in order to determine the makeup of degree programs for selection in the portfolio, the DM determines minimum scores for various weighted value scores or combinations of weighted values from the VFT model. Programs that meet the minimum desired level for the values or combination of values are entered in the portfolio. This is called a goal-setting approach, as discussed by Yu (1985), and is used to identify the "satisficing set S" such that if an alternative meets DM-selected criteria, it

becomes an element of the set S, the set that satisfies the DM. This set is considered optimal for the decision maker (Yu, 1985:56). Using an example from Yu, if selecting a basketball player for a team, a coach could define the qualities of quickness and shooting accuracy as two valued characteristics to evaluate players (1985:58). The coach determines that any player that scores a 9 on a scale from 0-10 for either quality is eligible for selection. But, a player is also considered if he/she obtains an added score of 15 for the two qualities, such that scores of 7 and 8 for the two qualities would satisfy the DM's criteria to enter the set S and would earn a spot on the team. Players that do not meet the minimum criteria do not enter the set S and are not considered optimal for selection on the team. Reference Figure 6 which displays the optimal set S.

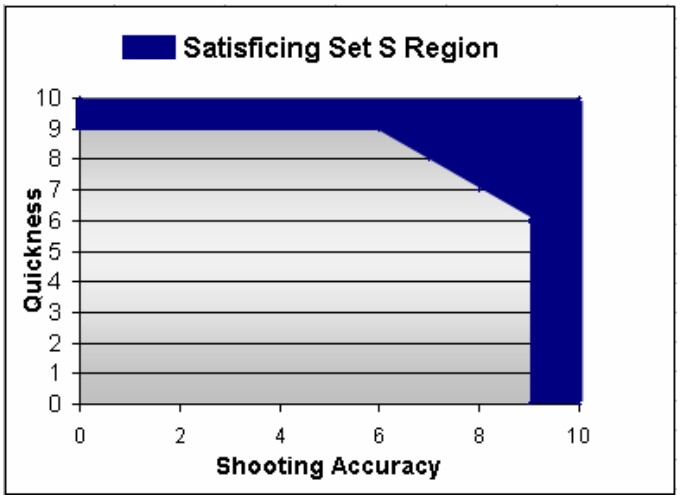


Figure 6. Sample Satisficing Set Region

This concept of identifying the satisficing set S is applied to the selection of degree programs. The criteria considered to evaluate the programs are the eight different values from the VFT model. A degree program is selected if it meets a DM-determined minimum level for the values. For this model, the DM determined that meeting minimum criteria for a single value alone would not suffice for entrance into the

portfolio, but that multiple values needed to be considered. To relate it back to the basketball example, any level of quickness alone would not be good enough to earn a spot on the team. Therefore, the decision was made to consider all possible combination of sums of weighted value scores for pairs, triples, quadruples, etc., through all eight values. This creates a combinatorial check on the different combinations of comparisons for the values. While one program may not be the best for any of the individual values, it may be sufficient over multiple values to earn a spot in the portfolio.

To start this process, the DM determines the criteria for each combination level based on the weighted values scores from the VFT model. While subjective, the DM can review the various weighted value scores, review the best scores available and then set the criteria at a level to ensure that even the best program for a single value must also contribute to another value to enter the portfolio. Once determined, the criteria for each combination sum along with the weighted value scores from the VFT hierarchy are written into a computer program that then calculates all the possible combinations of sums for the levels of criteria. The highest criteria level that a degree program meets becomes its "bucket" for consideration in determining the percentage of the force to pursue that degree. For example, if the highest criteria that a degree program meets is for the sums of all possible combinations of six of the eight values, then it is placed in "bucket" six. For this study, Matlab (2004) code was written to perform the calculations for all possible combinations. Due to the nature of Matlab, the weighted value scores were entered as a matrix and the individual scores used in the sums were referenced through matrix notation. The Matlab code and output is provided in Appendix C. Once this analysis is run, the DM reviews the final degree programs that meet the criteria.

Sensitivity analysis on the criteria can show potential changes in the portfolio. This process and sensitivity analysis is discussed in Chapter 4.

Once the portfolio is developed, the next step is to determine the percentage of the career field that should receive each specific degree. The priority ranking approach as described by Kirkwood in developing a piecewise linear value function is used to contrast the different combinations of sums of the weighted value scores (1997:62). The DM determines different values for each of the different levels that the sums of the combinations can achieve and assigns a priority level. The smallest value increment is assigned a symbol such as *x*. The DM then determines the relationship of the remaining value increments in relation to the *x* value. For example, the next increment is twice as important as *x*, the third is 3 times as important as *x*, etc. To aid the DM, the approach to determine the priorities can be similar to that of developing a SDVF. If meeting the lower-level criteria (e.g., for the sums of pairs and triples) is less important to the DM than meeting the higher-level criteria (e.g., for sums of 7 or 8 of the values), then the increase in priority is lower between criteria for sums of 2 or 3 values and higher for sums of 7 and 8 values. Even though discrete points are determined, a line can be drawn through the points to show the trend curve which reflects the values of the DM. So for our first example, if the DM places less importance on achieving the criteria of fewer sums, then this creates a convex curve as shown in Figure 7. Other approaches to determining the priority level could be linear if the increase in priority level is consistent throughout each level as shown in Figure 8, concave if it is more important to get fewer sums (Figure 9), or any variety of S-curve to indicate mid-range jumps in sums have priority (Figure 10). This approach provides a visual tool for the DM to see how the

priority rises as a degree program meets more of the established criteria. For this study, the DM selected a concave "curve" approach and selected the priorities listed in Table 8.

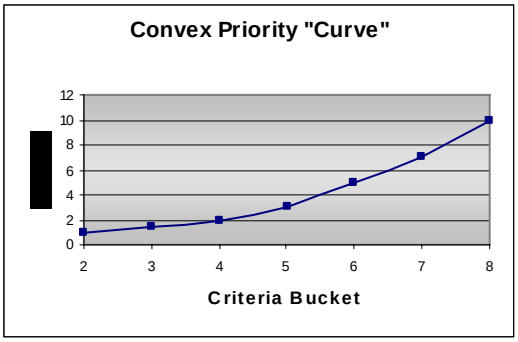


Figure 7. Convex Priority Curve

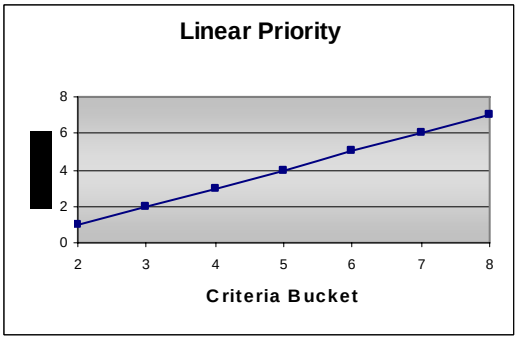


Figure 8. Linear Priority

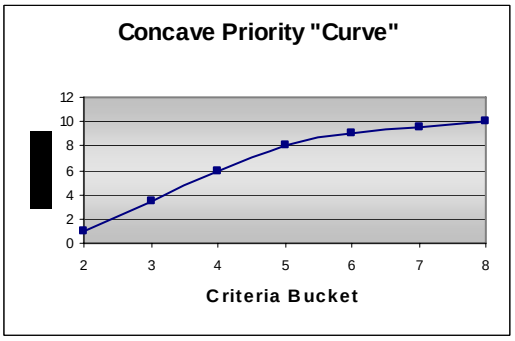


Figure 9. Concave Priority Curve

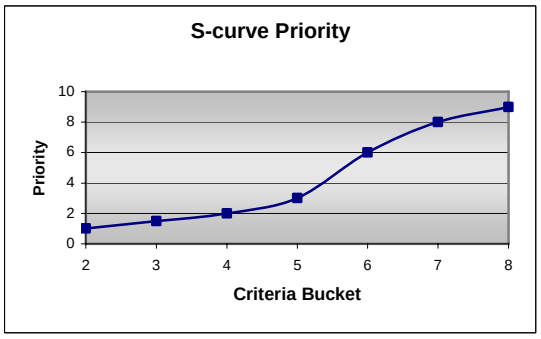


Figure 10. S-curve Priority

Once the increments are decided upon, simple algebra is used to determine the percentages for the degree programs that fall into the various categories. The increment values are summed to equal 100 and the analyst solves for x. Based on the DM-determined priority levels, and letting b_i indicate the number of degree programs that fall within a bucket i, where i indicates the number of combined sums, the resulting equation to solve becomes:

$$b_2 \times x + b_3 \times 1.5x + b_4 \times 2x + b_5 \times 3x + b_6 \times 5x + b_7 \times 7x + b_8 \times 10x = 100 \qquad (4)$$

The results of these processes are provided in Chapter 4.

Table 8. Goal Criteria for Portfolio Selection

Criteria	Satisficing Minimum	Bucket	Possible Combinations	Priority Level
Sums of possible pairs	c_2	b_2	$\binom{8}{2}=28$	x
Sums of possible triples	c_3	b_3	$\binom{8}{3}=56$	$1.5x$
Sums of possible quadruples	c_4	b_4	$\binom{8}{4}=70$	$2x$
Sums of possible quintuples	c_5	b_5	$\binom{8}{5}=56$	$3x$
Sums of possible sextuples	c_6	b_6	$\binom{8}{6}=28$	$5x$
Sums of possible septuples	c_7	b_7	$\binom{8}{7}= 8$	$7x$
Sums of possible octuples	c_8	b_8	$\binom{8}{8}= 1$	$10x$

Step 9b: Sensitivity Analysis.

Sensitivity analysis is completed on the weights within the hierarchy to determine if changing any weights would result in a different degree program being selected for the portfolio. Sensitivity analysis on the SDVFs themselves is not completed since it is impractical due to the vast combinatorial options available. The continuous curves could take on an infinite number of shapes, altering the value score each alternative would achieve. Even if one SDVF is changed and the rest remain the same, mathematically, a program that is more preferred to this value will still receive a higher value score than a less preferred program. Since the value scores for the remaining SDVFs did not change, the overall ranking would not be altered. Therefore, the scope of the sensitivity analysis is based solely on the weights. The results are provided in Chapter 4.

Step 10: Present Recommendations.

Final recommendations based on the results of Chapter 4's analysis are provided in Chapter 5 along with model uses, impacts, and future research suggestions.

IV. Results and Analysis

Overview

This chapter covers the results of the Manpower-Personnel Educational Profile Value Hierarchy model and subsequent portfolio selection analysis. The hierarchical model calculates the input scores and results in a rank-ordered list of the 25 alternatives selected for the study. While additional alternatives may be added at any time in order to view the ranking amongst the previously selected alternatives, the results of this study are limited to the alternatives selected. The portfolio selection and percentage breakout processes are conducted along with sensitivity analysis on the criteria. Finally, sensitivity analysis on the weights determined for the hierarchy is reviewed and additional portfolio impacts are discussed.

Results of Alternative Analysis

As discussed in Step 6 of the VFT process outlined in Chapter 3, 25 advanced degree program alternatives were selected for entrance into the model. These alternatives were broken down into their credit-hour programs and reviewed and scored as described in Step 7 of the VFT methodology. The raw scores for each program are provided in Table 9. Specific scores on which credit-hour programs contributed to each measure are provided in Appendix D. These raw scores were entered into the Logical Decisions software package. It calculated the results to determine the value scores [$v(x)$] for each alternative with respect to each measure which are presented in Table 10. The software then applied the weights to each evaluation measure and the results are presented in Table 11. These weighted value scores were then added up to provide an overall VFT score

Table 9. Raw Scores for Alternatives

		Measure and Raw Score							
Alt a_i	**Program**	**Strat Focus**	**# Hrs HR Process**	**# Hrs Systems**	**# Hrs Chng Mgt**	**# Hrs DA**	**# Hrs Analysis**	**# Hrs Org Design**	**# Hrs Resource Alloc**
a_1	AFIT: OR-DA	Low	0	0	0	10	30	0	0
a_2	AFIT: OR-AS	Low	0	0	0	0	39	0	0
a_3	AFIT: ISL-FM	High	6	3	3.5	1.5	9.5	1.5	16
a_4	AFIT: ISL-IL	High	6	15	3.5	1.5	9.5	1.5	4
a_5	AFIT: Log Mgt	Med	0	3	4	4.5	18.5	2	14
a_6	AFIT: IRM-SIM	High	0	16	3.5	0	12	3.5	0
a_7	AFIT: Ops Anal	Low	0	0	0	5.5	26.5	0	3
a_8	AFIT: CS-DBS	Low	0	30	0	0	6	0	0
a_9	NPS: MSA	High	2	4	3	4	20	11	15
a_{10}	NPS: DSA	High	0	8	3	1.5	9.5	4	40
a_{11}	NPS: Prgm Mgt	Med	0	4	2	0	0	5	22
a_{12}	NPS: Exec MBA	High	0	0	4	3	3	3	29
a_{13}	DePaul: MBA-LCMgt	High	4	4	8	4	8	0	8
a_{14}	GWU: MBA-HRM	High	18	3	0	4.5	3	0	10.5
a_{15}	GWU: HRM (MA)	Med	18	4.5	0	0	4.5	4.5	4.5
a_{16}	GWU: Org Mgt	Med	0	4.5	18	4.5	4.5	4.5	4.5
a_{17}	GWU: Pol Sci	High	0	0	0	0	0	0	0
a_{18}	Milano: OrgChgMgt	Med	0	4.5	18	6.75	2.5	4.5	9
a_{19}	UT: HRD	Med	18	2.25	9.5	0	0	5	2.25
a_{20}	UWM: HR&LR	Med	11.25	0	13.5	0	4.5	0	2.25
a_{21}	WSU: MBA-Inv&Chng	High	0	4	6	8	0	2	8
a_{22}	WSU: PubAdmin	Med	4	0	0	4	0	0	4
a_{23}	WSU: EdAdmin	Med	0	4	0	0	8	4	4
a_{24}	WSU: Psych	Low	4	0	4	0	16	0	0
a_{25}	WSU: Humanities	Low	0	0	0	0	0	0	0

for each alternative as defined in Equation (1). The alternatives are rank-ordered in descending order based on the results of the additive value function. The rank-ordered list of alternatives and their corresponding overall weighted value score is provided in Figure 11. The stacked bar chart is broken down into the two main 1st tier values of Leader/Manager and Critical Thinker so that the analyst and reader can determine how much of its total score was provided from each 1st tier area. In reviewing these results, it

Table 10. Value Scores for Alternatives

		Measure and Value Score [*v(x)*]							
Alt a_i	Program	Strat Focus	# Hrs HR Process	# Hrs Systems	# Hrs Chng Mgt	# Hrs Dec Anal	# Hrs Life-cycle Anal	# Hrs Org Design	# Hrs Resource Alloc
a_1	AFIT: OR-DA	0.333	0	0	0	0.46601	1	0	0
a_2	AFIT: OR-AS	0.333	0	0	0	0	1	0	0
a_3	AFIT: ISL-FM	1	0.49023	0.766908	0.227	0.05854	0.07132	0.15722	0.981847
a_4	AFIT: ISL-IL	1	0.49023	0.977383	0.227	0.05854	0.07132	0.15722	0.601538
a_5	AFIT: Log Mgt	0.667	0	0.5	0.25571	0.18676	0.25632	0.20415	0.966484
a_6	AFIT: IRM-SIM	1	0	0.984158	0.227	0	0.10603	0.33048	0
a_7	AFIT: Ops Anal	0.333	0	0	0	0.23305	0.66952	0	0.497889
a_8	AFIT: CS-DBS	0.333	0	1	0	0	0.03622	0	0
a_9	NPS: MSA	1	0.19891	0.60393	0.19742	0.1643	0.30899	0.72707	0.975033
a_{10}	NPS: DSA	1	0	0.846979	0.19742	0.05854	0.07132	0.36819	1
a_{11}	NPS: Prgm Mgt	0.667	0	0.60393	0.13552	0	0	0.4377	1
a_{12}	NPS: Exec MBA	1	0	0	0.25571	0.12071	0.01516	0.29065	1
a_{13}	DePaul: MBA-LCMgt	1	0.35991	0.60393	0.45683	0.1643	0.05462	0	0.844317
a_{14}	GWU: MBA-HRM	1	0.8881	0.5	0	0.18676	0.01516	0	0.915426
a_{15}	GWU: HRM (MA)	0.667	0.8881	0.647671	0	0	0.02483	0.40389	0.645185
a_{16}	GWU: Org Mgt	0.667	0	0.647671	0.79128	0.18676	0.02483	0.40389	0.645185
a_{17}	GWU: Pol Sci	1	0	0	0	0	0	0	0
a_{18}	Milano: OrgChgMgt	0.667	0	0.647671	0.79128	0.29359	0.01228	0.40389	0.877659
a_{19}	UT: HRD	0.667	0.8881	0.40497	0.52063	0	0	0.4377	0.403173
a_{20}	UWM: HR&LR	0.667	0.726	0	0.66519	0	0.02483	0	0.403173
a_{21}	WSU: MBA-Inv&Chng	1	0	0.60393	0.3623	0.35725	0	0.20415	0.844317
a_{22}	WSU: PubAdmin	0.667	0.35991	0	0	0.1643	0	0	0.601538
a_{23}	WSU: EdAdmin	0.667	0	0.60393	0	0	0.05462	0.36819	0.601538
a_{24}	WSU: Psych	0.333	0.35991	0	0.25571	0	0.18566	0	0
a_{25}	WSU: Humanities	0.333	0	0	0	0	0	0	0

is important to note the elevated ranking of the Operations Research—Decision Analysis degree from AFIT. While its scores were limited to just three of the eight measures, it ranked second to the top. This was due to the large amount of global weight the Decision Analysis and Lifecycle Analysis measures carried. The OR-DA degree received the highest scores among all the alternatives for these measures. Of further note, the MBA-related degree programs ranked relatively close together as well as near the top third of

Table 11. Weighted Value Scores for Alternatives

		Weighted Value Scores [*wv(x)*] (Pre-sensitivity Analysis)							
Alt a_i	Program	Strat Focus	# Hrs HR Process	# Hrs Systems	# Hrs Chng Mgt	# Hrs Dec Anal	# Hrs Life-cycle Anal	# Hrs Org Design	# Hrs Resource Alloc
a_1	AFIT: OR-DA	0.04496	0	0	0	0.1631	0.21	0	0
a_2	AFIT: OR-AS	0.04496	0	0	0	0	0.21	0	0
a_3	AFIT: ISL-FM	0.135	0.03603	0.02416	0.01362	0.02049	0.01498	0.01101	0.068729
a_4	AFIT: ISL-IL	0.135	0.03603	0.03079	0.01362	0.02049	0.01498	0.01101	0.042108
a_5	AFIT: Log Mgt	0.09005	0	0.01575	0.01534	0.06536	0.05383	0.01429	0.067654
a_6	AFIT: IRM-SIM	0.135	0	0.031	0.01362	0	0.02227	0.02313	0
a_7	AFIT: Ops Anal	0.04496	0	0	0	0.08157	0.1406	0	0.034852
a_8	AFIT: CS-DBS	0.04496	0	0.0315	0	0	0.00761	0	0
a_9	NPS: MSA	0.135	0.01462	0.01902	0.01185	0.0575	0.06489	0.0509	0.068252
a_{10}	NPS: DSA	0.135	0	0.02668	0.01185	0.02049	0.01498	0.02577	0.07
a_{11}	NPS: Prgm Mgt	0.09005	0	0.01902	0.00813	0	0	0.03064	0.07
a_{12}	NPS: Exec MBA	0.135	0	0	0.01534	0.04225	0.00318	0.02035	0.07
a_{13}	DePaul: MBA-LCMgt	0.135	0.02645	0.01902	0.02741	0.0575	0.01147	0	0.059102
a_{14}	GWU: MBA-HRM	0.135	0.06528	0.01575	0	0.06536	0.00318	0	0.06408
a_{15}	GWU: HRM (MA)	0.09005	0.06528	0.0204	0	0	0.00521	0.02827	0.045163
a_{16}	GWU: Org Mgt	0.09005	0	0.0204	0.04748	0.06536	0.00521	0.02827	0.045163
a_{17}	GWU: Pol Sci	0.135	0	0	0	0	0	0	0
a_{18}	Milano: OrgChgMgt	0.09005	0	0.0204	0.04748	0.10276	0.00258	0.02827	0.061436
a_{19}	UT: HRD	0.09005	0.06528	0.01276	0.03124	0	0	0.03064	0.028222
a_{20}	UWM: HR&LR	0.09005	0.05336	0	0.03991	0	0.00521	0	0.028222
a_{21}	WSU: MBA-Inv&Chng	0.135	0	0.01902	0.02174	0.12504	0	0.01429	0.059102
a_{22}	WSU: PubAdmin	0.09005	0.02645	0	0	0.0575	0	0	0.042108
a_{23}	WSU: EdAdmin	0.09005	0	0.01902	0	0	0.01147	0.02577	0.042108
a_{24}	WSU: Psych	0.04496	0.02645	0	0.01534	0	0.03899	0	0
a_{25}	WSU: Humanities	0.04496	0	0	0	0	0	0	0

the rank-ordered list, indicating that MBA programs are standardized across different universities and also that the scoring process was consistent. Additionally, due to their high ranking in the hierarchy, each of the MBA specialty tracks selected meets the desires of the career field by focusing on different values in the model. However, the NPS Executive MBA program did not score as well as the AFIT ISL programs. These issues are further analyzed through sensitivity analysis on the weights.

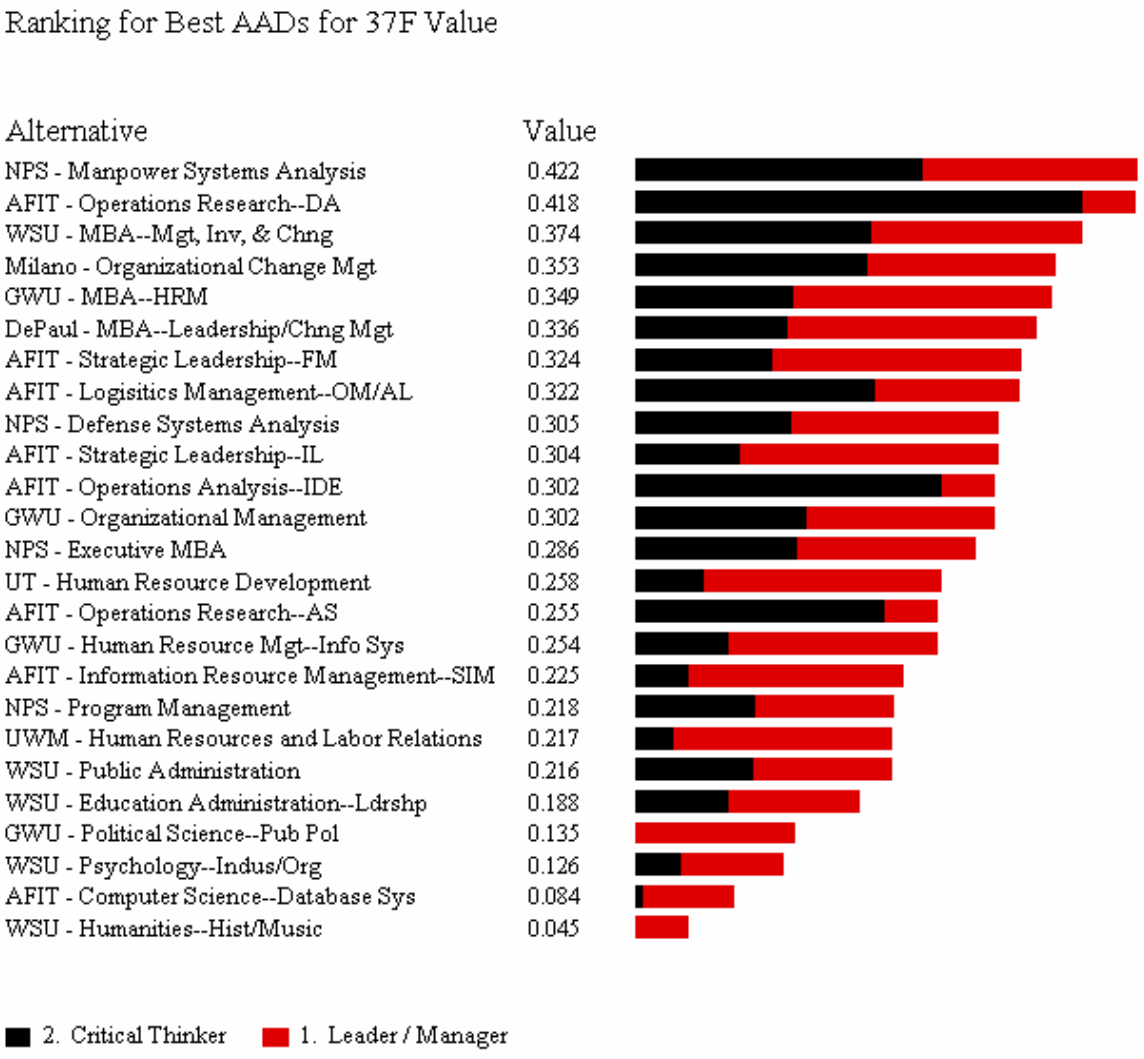


Figure 11. Stacked-bar Ranking Results for MPEPVH

Based on the rank-ordered listing and the large amount of weight the OR-DA program achieved, the DM decided to relook at the 1st tier weights for the model prior to proceeding on with the portfolio selection. Therefore, sensitivity analysis on these weights was looked at first to see if a change could be made that reflected the DM's desires to emphasize the Critical Thinker value without creating pure dominance of the value. The process for performing sensitivity analysis is presented next.

Sensitivity Analysis for Rank-Ordered Listing

Sensitivity analysis is conducted on the weights for both the 1st tier values as well the means objectives since it is common for the weights to be a matter of disagreement among stakeholders for a specific decision (Kirkwood, 1997:82). The difficulty in conducting sensitivity analysis is that if one weight is changed, the remaining weights must be readjusted in order for the resulting sum of the weights across the same tier of measures to equal 1. As supported by Kirkwood (1997), manually performing sensitivity analysis can become too time consuming and opens the analysis up to potential errors, so the Logical Decisions software package was used to conduct the calculations for the analysis. It automatically recalculates the weights with the approach that when one weight is changed, the weights across the remaining evaluation measures under the same value are kept at the same ratio as in the base analysis. This relationship is expressed by the equation identified by Kirkwood: "multiply 1 minus the weight that is being varied by the ratio of the base case value for the weight being considered to the sum of the base case weights for all the weights except the one that is being manually varied" (1997:84). An example algebraic formula for deriving the new weights for one of the values (Strategic Advisor) while varying the weight for Change Management is presented in Equation (5). The weights are indicated by w_{sa} for Strategic Advisor, w_{lm} for Lifecycle Management (which is broken down into w_{lp} for Lifecycle Processes and w_{ls} for Lifecycle Systems), w_{cm} for Change Management, w_{da} for Decision Analysis, w_{la} for Lifecycle Analysis, w_{od} for Organizational Design, and w_{ra} for Resource Allocation. The new weight for Strategic Advisor is determined by:

$$w_{sa} = (1 - w_{cm}) \times \frac{(w^o_{sa})}{(w^o_{sa} + w^o_{lm} + w^o_{da} + w^o_{la} + w^o_{od} + w^o_{ra})} \quad (5)$$

The new weights for w_{lp} and w_{ls} are based on the ratio of the weights under the new w_{lm} (set at 0.70 and 0.30 locally). The superscript, w^o, indicates the base case weights for the noted subscript-values (Kirkwood, 1997:82-83). When changing weights at the 1st tier level between Leader/Manager (w_{ldr}) and Critical Thinker (w_{crt}), since there were only two top tier values, the relationship between them is indicated by 1 minus the weight of the other, i.e., if the weight for Critical Thinker (w_{crt}) is changed, then the w_{ldr} = 1- w_{crt}. But as these weights change, the global weights for each of the subvalues also change based on the local weights on each lower tier that were determined in the hierarchy build process and shown in Figure 5.

To make sensitivity analysis easier to view, line charts are created which plot each alternative's weighted value score across the possible range of weights from 0 to 1. A vertical line is provided which indicates the level of the base weight and the lines for each alternative show their relationship to each other along the x-axis if the weight were to move up or down the axis from its current value.

Analysis was first conducted on the 1st tier weights of Leader/Manager versus Critical Thinker since these weights impact the remaining values underneath them and effectively impact all eight global weights at one time rather than initially tinkering with each individual weight. This approach was used since the relatively large span between the two values of the 1st tier created large global weight differences between their respective sub-values. Recall that the local weight for the Leader/Manager value was 0.30 and for Critical Thinker, 0.70. With these weights, the results as shown in Figure 12

highlight the close competition between the NPS-Manpower Systems Analysis and AFIT's Operations Research-Decision Analysis programs. A slight shift in this weight impacts these top two ranked items as well as the overall top 15-ranked items which can become a critical issue when looking at the portfolio selection. The top 15 alternatives are displayed.

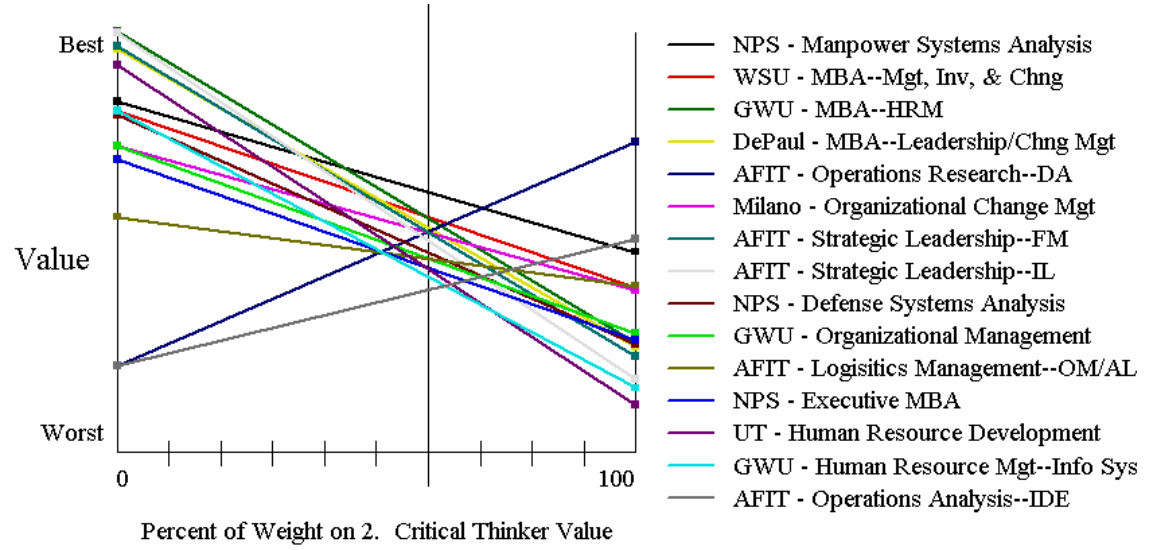


Figure 12. Sensitivity Chart for Critical Thinker Value

Since there are only two values at this level, the results for the sensitivity on Leader/Manager are just the reverse of the Critical Thinker. Based on this sensitivity, a set of revised rank-ordered listings for changing the weights on Critical Thinker from 0.70 to 0.65, 0.60, and 0.55 were provided to the decision maker. After reviewing these results and looking at the change in the global weights for each evaluation measure, the DM elected to change the weights for the 1st tier so that Critical Thinker value now has a weight of 0.60 and Leader Manager has the weight of 0.40. Due to the change, the global weights for each of the lowest tier values subsequently changed. These new global

weights are shown in Table 12. This created new weighted value scores which are depicted in Table 13 and an accompanying revised rank-ordered list which appears in Figure 13 broken down by each measure.

Table 12. Revised Global Weights for Hierarchy

	Strat Adv	Lifecycle Processes	Lifecycle Systems	Change Mgt	Decision Analysis	Lifecycle Analysis	Org Design	Res Alloc
Global Weight	0.18	0.098	0.042	0.08	0.30	0.18	0.06	0.06

Table 13. New Weighted Value Scores for Alternatives

		New Weigthed Value Scores [*wv(x)*]							
Alt a_i	**Program**	**Strat Focus**	**# Hrs HR Process**	**# Hrs Systems**	**# Hrs Chng Mgt**	**# Hrs Dec Anal**	**# Hrs Life-cycle Anal**	**# Hrs Org Design**	**# Hrs Resource Alloc**
a_1	AFIT: OR-DA	0.05994	0	0	0	0.1398	0.18	0	0
a_2	AFIT: OR-AS	0.05994	0	0	0	0	0.18	0	0
a_3	AFIT: ISL-FM	0.18	0.04804	0.03221	0.01816	0.01756	0.01284	0.00943	0.058911
a_4	AFIT: ISL-IL	0.18	0.04804	0.04105	0.01816	0.01756	0.01284	0.00943	0.036092
a_5	AFIT: Log Mgt	0.12006	0	0.021	0.02046	0.05603	0.04614	0.01225	0.057989
a_6	AFIT: IRM-SIM	0.18	0	0.04133	0.01816	0	0.01909	0.01983	0
a_7	AFIT: Ops Anal	0.05994	0	0	0	0.06991	0.12051	0	0.029873
a_8	AFIT: CS-DBS	0.05994	0	0.042	0	0	0.00652	0	0
a_9	NPS: MSA	0.18	0.01949	0.02537	0.01579	0.04929	0.05562	0.04362	0.058502
a_{10}	NPS: DSA	0.18	0	0.03557	0.01579	0.01756	0.01284	0.02209	0.06
a_{11}	NPS: Prgm Mgt	0.12006	0	0.02537	0.01084	0	0	0.02626	0.06
a_{12}	NPS: Exec MBA	0.18	0	0	0.02046	0.03621	0.00273	0.01744	0.06
a_{13}	DePaul: MBA-LCMgt	0.18	0.03527	0.02537	0.03655	0.04929	0.00983	0	0.050659
a_{14}	GWU: MBA-HRM	0.18	0.08703	0.021	0	0.05603	0.00273	0	0.054926
a_{15}	GWU: HRM (MA)	0.12006	0.08703	0.0272	0	0	0.00447	0.02423	0.038711
a_{16}	GWU: Org Mgt	0.12006	0	0.0272	0.0633	0.05603	0.00447	0.02423	0.038711
a_{17}	GWU: Pol Sci	0.18	0	0	0	0	0	0	0
a_{18}	Milano: OrgChgMgt	0.12006	0	0.0272	0.0633	0.08808	0.00221	0.02423	0.05266
a_{19}	UT: HRD	0.12006	0.08703	0.01701	0.04165	0	0	0.02626	0.02419
a_{20}	UWM: HR&LR	0.12006	0.07115	0	0.05322	0	0.00447	0	0.02419
a_{21}	WSU: MBA-Inv&Chng	0.18	0	0.02537	0.02898	0.10718	0	0.01225	0.050659
a_{22}	WSU: PubAdmin	0.12006	0.03527	0	0	0.04929	0	0	0.036092
a_{23}	WSU: EdAdmin	0.12006	0	0.02537	0	0	0.00983	0.02209	0.036092
a_{24}	WSU: Psych	0.05994	0.03527	0	0.02046	0	0.03342	0	0
a_{25}	WSU: Humanities	0.05994	0	0	0	0	0	0	0

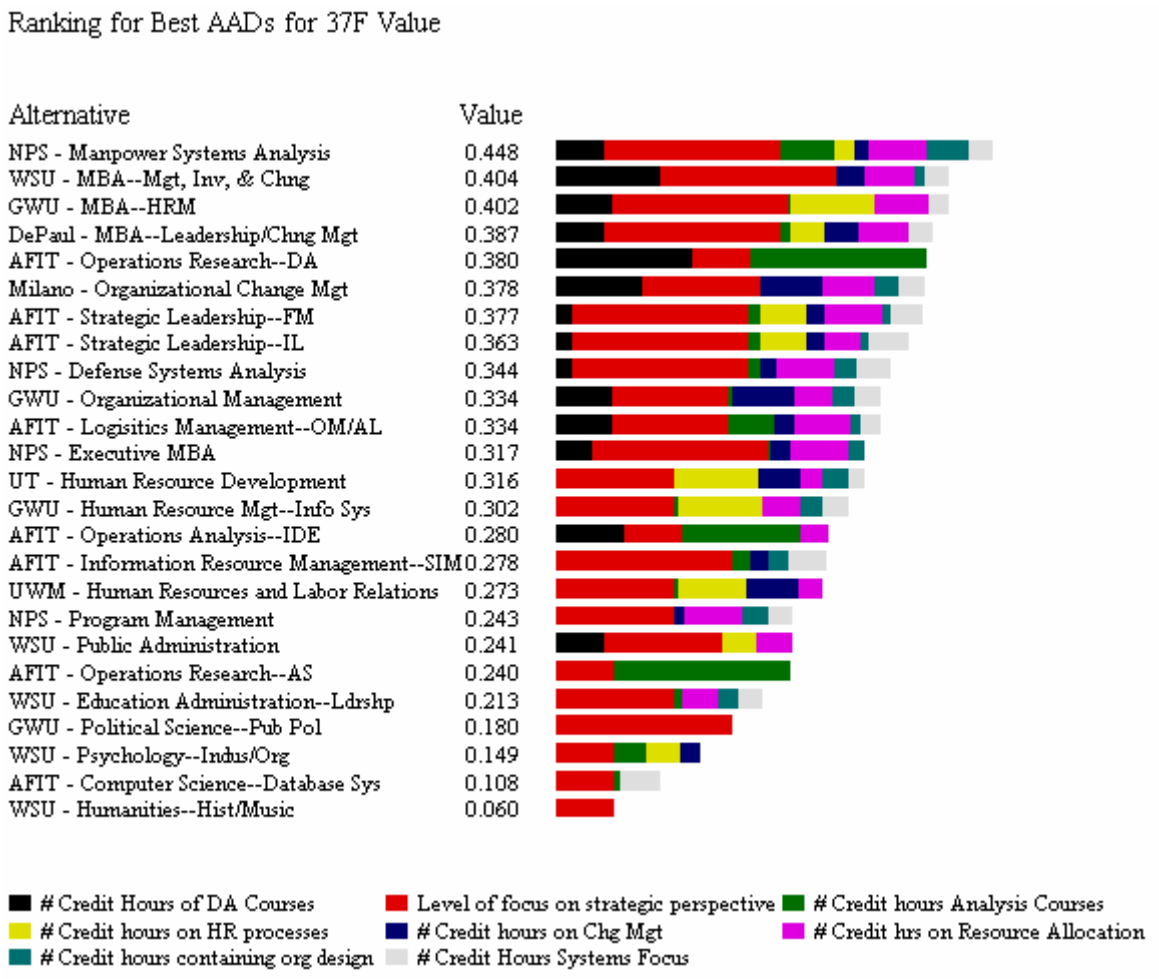


Figure 13. New Rank-order Results for MPEPVH

The DM determined that the new global weights were more in line with his desires and the resulting rank-ordered listing reflected the values he was pursuing. Based on this approval, progression to the portfolio selection process is undertaken to select the degrees that the career field should attain as well as the percentages for each degree. Once the portfolio selection process is completed, then the sensitivity analysis is done on the lower tier means objectives to determine any impact on the portfolio results.

Portfolio Selection Results

Once the rank-ordered listing was approved by the DM, in order to develop the portfolio, the satisficing criteria for the possible combination of sums as outlined in Chapter 3 needed to be determined. After reviewing the weighted value scores for the programs, the DM approved the selected criteria shown in Table 14. A factor to determine the criteria was based on his desire to have a tighter, more restrictive approach to allowing an alternative to enter the portfolio since he wanted fewer rather than more degree programs. Using this criteria, the weighted values scores were entered into the Matlab code and the results of which degree programs met the highest level criteria are seen in Figure 14. Each alternative is displayed along with the highest level or "bucket" (as defined in Chapter 3) of criteria it satisfied. Nine degree programs are identified as meeting the criteria for the combinatorial sums.

Table 14. Goal Criteria for Portfolio Selection

Criteria	Satisficing Minimum
Sums of possible pairs	c_2=0.24
Sums of possible triples	c_3=0.27
Sums of possible quadruples	c_4=0.31
Sums of possible quintuples	c_5=0.34
Sums of possible sextuples	c_6=0.37
Sums of possible septuples	c_7=0.40
Sums of possible octuples	c_8=0.43

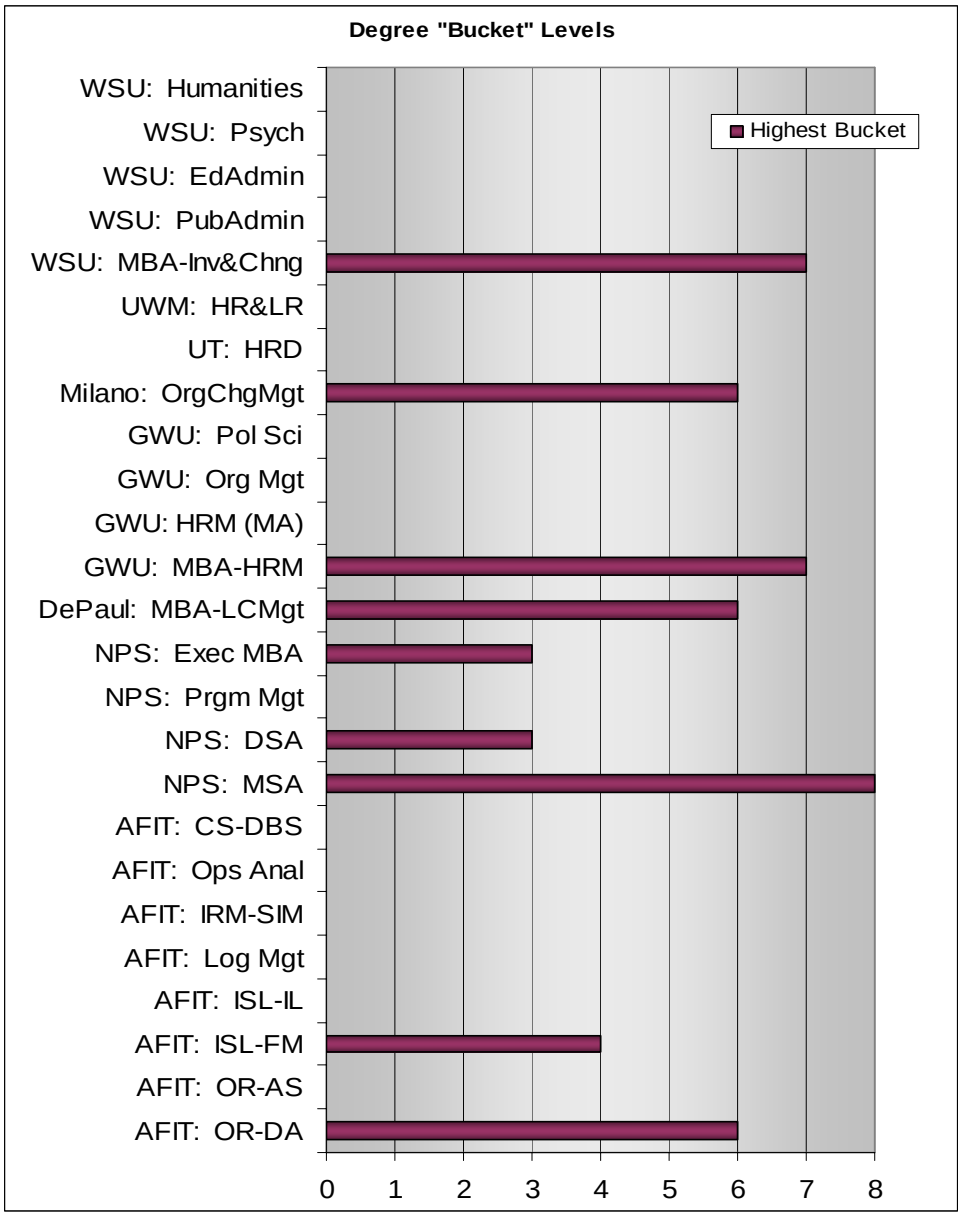


Figure 14. Bucket Levels for Each Alternative

With the number of degree programs in each bucket determined, Table 15 displays the b_i values to substitute into Equation (4).

Table 15. Bucket Numbers for Portfolio

Bucket	b_2	b_3	b_4	b_5	b_6	b_7	b_8
# of Degrees	0	2	1	0	3	2	1

Now that the degree programs are selected, buckets determined, and retrieving the priority levels for each criteria that were presented in Chapter 3, Table 8, the algebraic method as discussed in Chapter 3, Equation (4) is applied. This equation takes into account the number of degrees within each bucket [which were indicated by b_i in Equation (4)]. That way, the total percentage for the bucket is divided evenly among the total number of degree programs. The resulting equation to solve becomes:

$$2 \times 1.5x + 1 \times 2x + 3 \times 5x + 2 \times 7x + 1 \times 10x = 100 \quad (6)$$

Solving for $x = 2.27$ and applying to each degree bucket gives the percentages per degree indicated in Table 16.

Table 16. Portfolio and Percentage Results

Alt	Degree	Bucket	Percent
a_1	AFIT OR-DA	6	11.36
a_3	AFIT ISL-FM	4	4.55
a_9	NPS MSA	8	22.73
a_{10}	NPS DSA	3	3.41
a_{12}	NPS Exec MBA	3	3.41
a_{13}	DePaul MBA-Ldr/Chng/Mgt	6	11.36
a_{14}	GWU MBA-HRM	7	15.91
a_{18}	Milano Org Change Mgt	6	11.36
a_{21}	WSU MBA-Inv Change Mgt	7	15.91

The results from Table 16 were presented to the DM and he was pleased and accepted the portfolio and percentage breakout. A sample sensitivity analysis on the criteria is reviewed next to show intuitively that if the criteria were looser, more degree programs would enter the portfolio.

Sensitivity on Criteria for Portfolio Selection

Sensitivity on the criteria is intuitive in that looser criteria such as lowering the requirement for the sums, allows more degree programs to enter while tighter criteria would restrict the number of degrees. When additional degrees are allowed to enter, this spreads the percentages out amongst more degree programs so percentages are lower. An example of looser criteria results are shown in Table 17. The criteria levels used are provided in Table 18. Three additional degree programs enter the portfolio. The DM specifically selected tighter criteria to limit the number of programs.

Table 17. Portfolio Results with "Loose" Criteria

Alt	Degree	Bucket	Percent
a_1	AFIT OR-DA	6	9.17
a_3	AFIT ISL-FM	6	9.17
a_4	AFIT ISL-SIM	5	5.5
a_5	AFIT Log Mgt	2	1.83
a_9	NPS MSA	8	18.35
a_{10}	NPS DSA	4	3.67
a_{12}	NPS Exec MBA	4	3.67
a_{13}	DePaul MBA-Ldr/Chng/Mgt	6	9.17
a_{14}	GWU MBA-HRM	7	12.84
a_{16}	GWU Org Mgt	2	1.83
a_{18}	Milano Org Change Mgt	6	9.17
a_{19}	UT HRD	3	2.75
a_{21}	WSU MBA-Inv Change Mgt	7	12.84

Table 18. Criteria Used for Results in Table 17

Criteria	c_2	c_3	c_4	c_5	c_6	c_7	c_8
Level	0.17	0.24	0.29	0.32	0.35	0.39	0.41

With the criteria determined, sensitivity analysis was done to highlight any potentially sensitive weights in the model and their impact on the portfolio.

Sensitivity on Means Objectives

What is important to keep in mind while conducting the sensitivity analysis on the lowest tier values is that this process in general is used to find out if a small change in global weight for a value would change the rank-ordered list of programs. But, due to the fact that this study is focusing on developing a portfolio of programs rather than selecting the single best degree program, a change in the rank order is not necessarily going to change the degrees selected for the portfolio. Changing a global weight does have an impact on the overall value score for a degree program, which impacts the sums of scores used in the criteria selection and eventually impacting the percentage of officers to receive a degree. Therefore, in order to determine if a weight change would impact the portfolio, the DM made a determination that if a program's weighted value score rose above or fell below 0.310 based on a change in weight for a means objective, further analysis on this weight would be conducted to determine if the portfolio would change. The focus of the sensitivity is to determine a range of stability for the degree programs that remain in the final portfolio. While weighted value scores are used to rank-order the alternative results, the sensitivity about this value for portfolio selection is what is being looked at rather than sensitivity on the top ranked alternative. Therefore, the selection of 0.310 is used as a benchmark to provide further analysis. The 0.310 value was selected based on the portfolio results and the values of the degree programs that were close to entering the portfolio.

For the current global weights, the determined value included over half of the alternatives reviewed (13 out of 25), providing a wide range to check for sensitivity. To determine if a program could potentially enter the portfolio, as the weight for a value is

moved up or down within a suitable range, if a degree program's score climbed above 0.310 if previously under, or dipped below 0.310 if previously over, then sensitivity on that value is considered. Once a value weight is determined to be sensitive, the portfolio selection process is conducted to determine if there is any resulting change in the portfolio. This analysis is performed after reviewing the sensitivity of all of the value weights.

To begin the analysis, Figure 15 displays the sensitivity for the Strategic Advisor value. NPS – MSA dominates the alternatives over most of the range of weights. While a slight drop in weight for this value could change the rank-ordered listing, the trend follows a mostly parallel structure for the alternatives and the top 11 degrees remain the same for a 0.05 drop in weight below the current level of 0.18. Little to no change in rank ordering is seen if the weight is increased. One important note to make is that just a slight drop of 0.01 (the global weight becomes 0.17) would delete two programs from consideration for the portfolio due to their overall score dropping below the 0.310 minimum criteria. At just 0.17 weight, the NPS Executive Management program score drops to 0.309, and at 0.1625, the UT HRD program drops from consideration with a score of 0.309. It would have to drop significantly down to 0.1175 for any other degree program to drop from consideration. But, since this weight was increased from the original 0.135 global weight before changing the 1st tier weights, sensitivity on decreasing this weight is not considered for review since it would be reversing a prior decision to increase it.

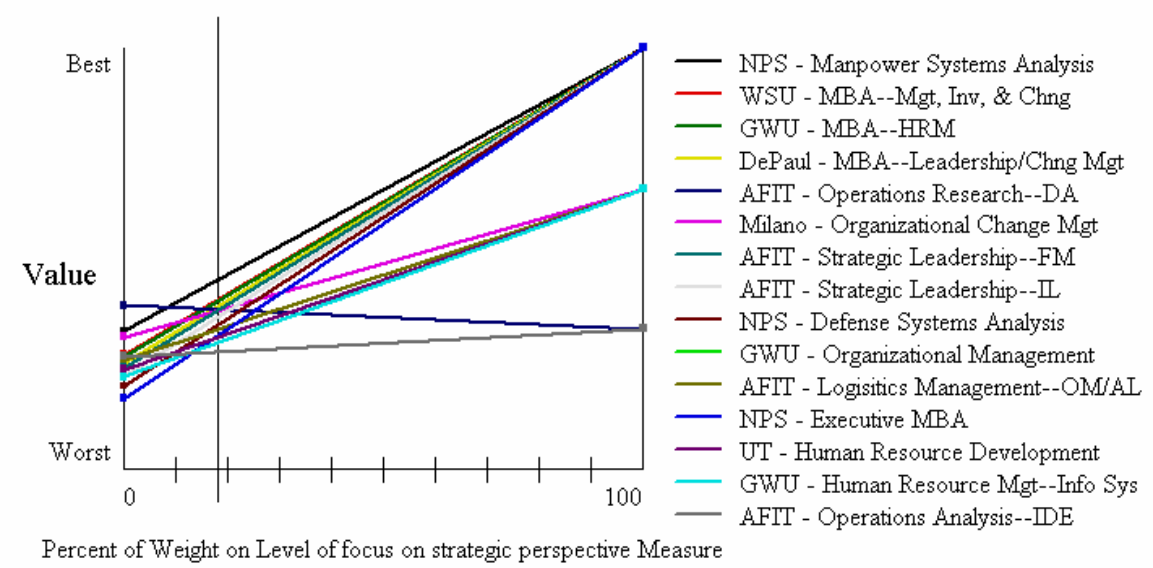


Figure 15. Sensitivity for the Strategic Advisor Value

The next chart depicts the sensitivity range of the Lifecycle Management value (Figure 16). Since this value was broken down into the measures of Lifecycle Processes and Systems, their sensitivity charts are provided. Currently, this value's global weight is set at 0.14 with the subvalue of Lifecycle Processes contributing 0.098 (70 percent of 0.14) and Systems contributing 0.042 (30 percent of 0.14). As noted in Figure 16, NPS-MSA is dominant up through a weight change to approximately 0.22 before a rank-ordered shift occurs at the top (an increase of 0.08), but the stability of the top-ranked programs remains consistent. GWU's Human Resource Management, does meet the minimum cutoff score of 0.310 if this value is changed by just a slight increase to 0.155 (a small 0.015 increase in weight). Any further increase in the weight does not impact the types of programs eligible for selection. The specific chart for Lifecycle Processes is seen in Figure 17 and Lifecycle Systems is shown in Figure 18. Since these measures are at a lower level than the remaining evaluation measures, any increase in weight for the Lifecycle Management value increases both weights for each of its subvalues.

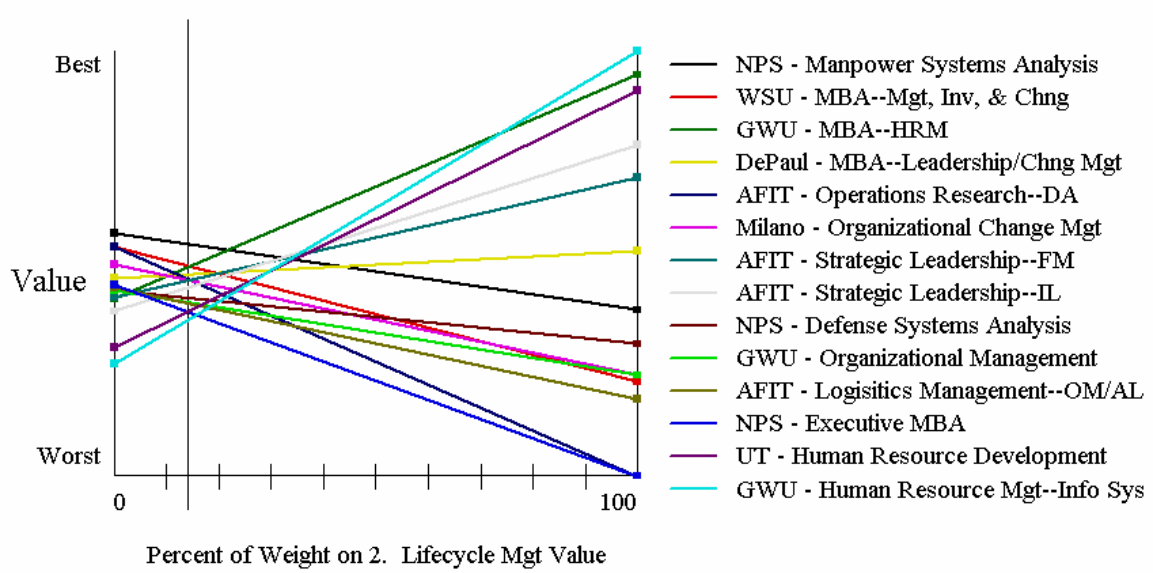


Figure 16. Sensitivity Chart for Lifecycle Management Value

Looking at the subvalues independently, consistent with the 0.015 increase in weight for Lifecycle Management, if Lifecycle Processes value is increased by 0.015, then the GWU HRM program enters consideration for the portfolio. For the Lifecycle Systems weight, an increase of 0.023 would also include the same HRM degree and an increase of 0.043 (to 0.085) would inlude AFIT's IRM program for consideration due to its heavy systems perspective. But an increase to 0.085 would more than double Lifecycle Systems current weight, so the change in weight is not as sensitive. Already at the low end of weighted values, dropping the Lifecycle Systems' weight does not produce much impact. Since this value was of lesser importance to the DM (Systems has the lowest weight in the model), focus on the Lifecycle Processes is of more interest to the DM. From this review, an increase in the Lifecycle Processes global weight is reviewed for its impact on portfolio selection and is provided after reviewing the remaining evaluation measures for sensitivity.

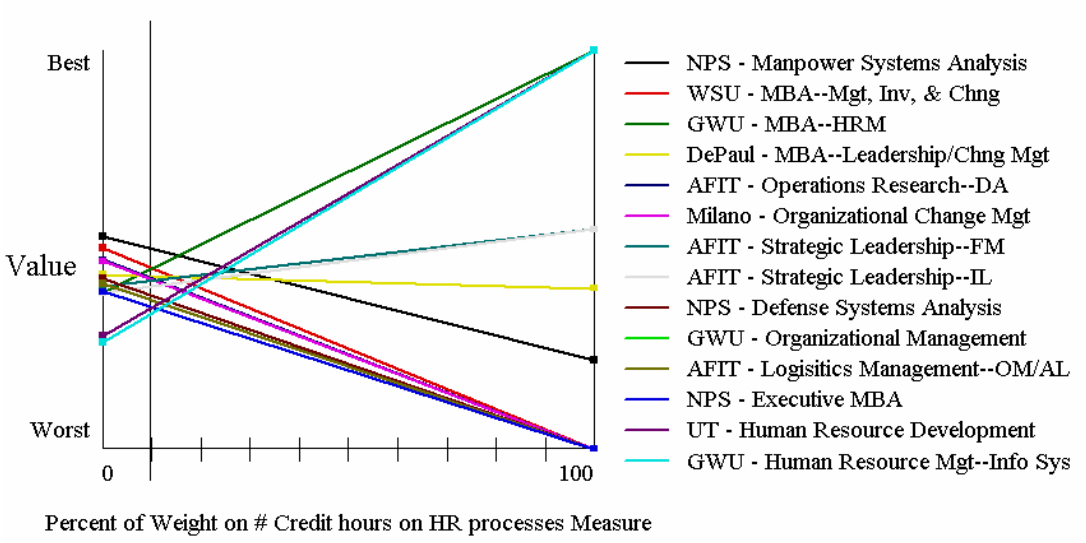


Figure 17. Sensitivity Chart for Lifecycle Processes Value

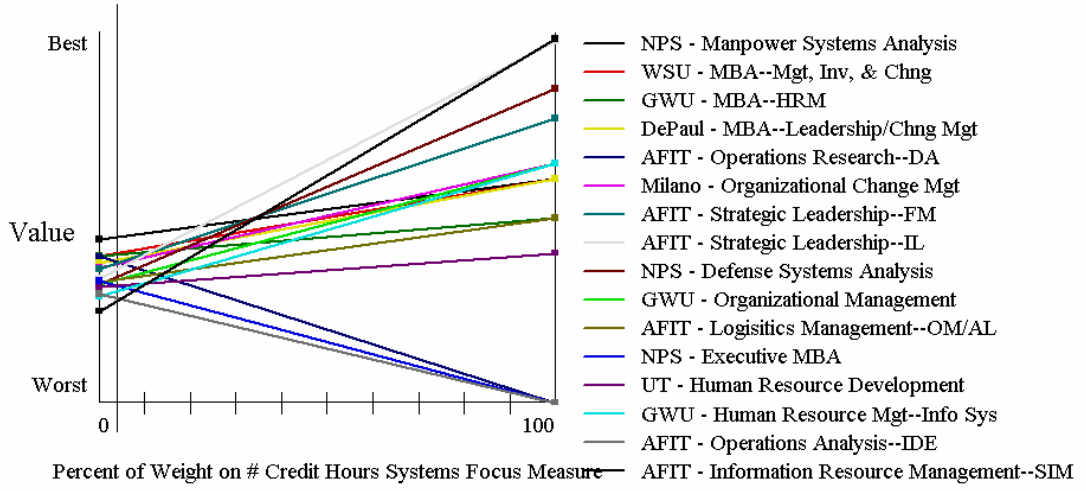


Figure 18. Sensitivity Chart for Lifecycle Systems Value

The sensitivity for the Change Management value was reviewed and while there was some jockeying of positions in the mid-ranked degree programs, no new programs entered portfolio consideration within an increase of 0.085 to 0.165 (Figure 19). The Milano Organizational Change Management ranking increased and overtakes NPS MSA degree when the global weight reaches 0.1775, or an increase of over double where it

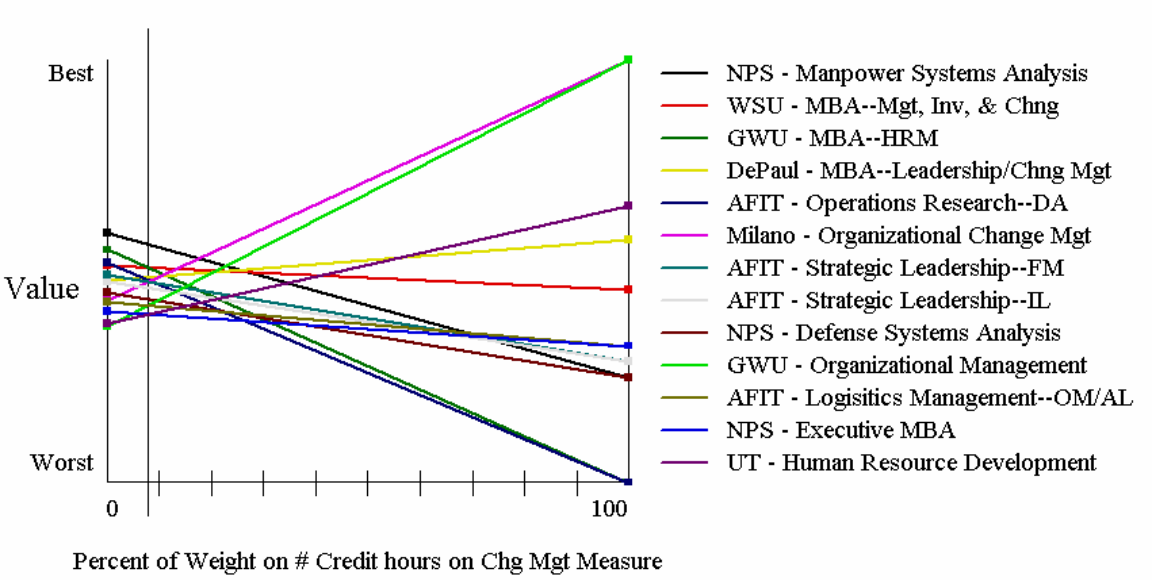


Figure 19. Sensitivity Chart for Change Management Value

currently resides at 0.08. It would have to drop down to 0.045 (a 43.75 percent decrease in current weight) before any degree program was dropped from consideration (UT's HRD program). Therefore, this weight is not deemed very sensitive.

The next weight reviewed was on the value for Decision Analysis (Figure 20). The global weight on this value is lofty at 0.30 since it was the key value the DM wanted to focus on in developing the 37F officers. As noted in the chart, most programs followed a similar slope for value except for the AFIT OR-DA program which focuses on Decision Analysis. If its weight were to drop by just 0.02, then the HRM degree would enter the eligibility pool for portfolio selection, but it would have to be dropped by 0.08 (down to 0.22), a significant decrease from its current level, in order for another program to enter eligibility – AFIT's IRM program. An increase in the weight results in the AFIT OR-DA program increasing in rank while also dropping the NPS Executive MBA and UT's HRD below the 0.310 mark. Since it is already at such a large weight, an increase

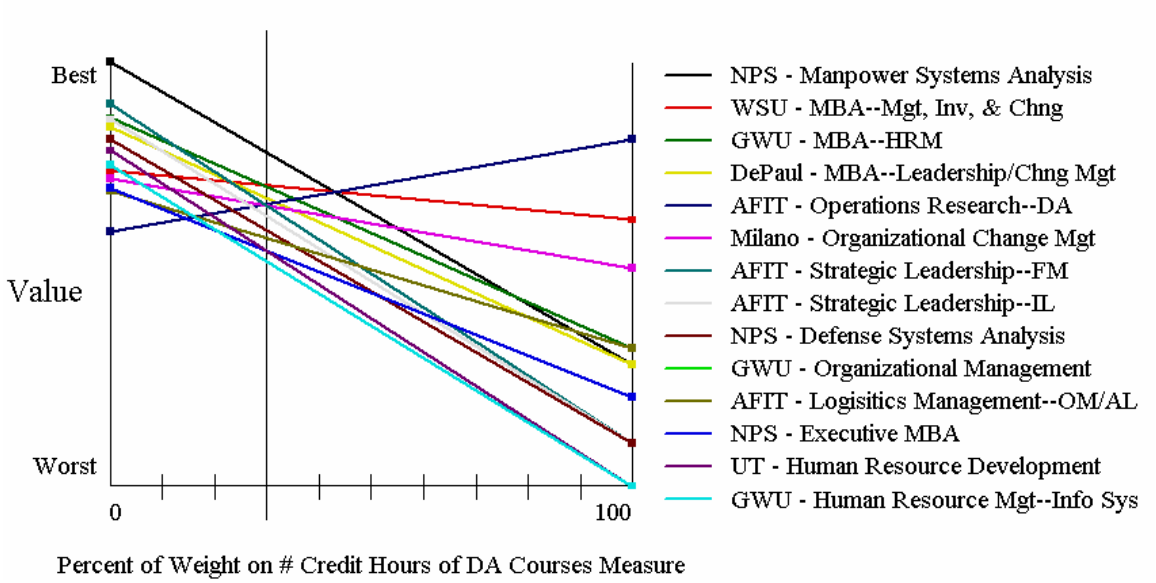


Figure 20. Sensitivity Chart for Decision Analysis Value

is not appropriate. Its weight was decreased when the 1st tier value weights were changed. The results for a decrease in this weight are studied in the portfolio sensitivity process later in this chapter.

Similar to the Decision Analysis evaluation, Lifecycle Analysis shows a general trend downward for most programs with the exception of the AFIT OR-DA degree (Figure 21). Again, a decrease from the current weight of 0.18 by 0.025 (down to 0.155) would result in the HRM degree entering the portfolio consideration level. It would have to be increased by 0.0625 in order for the Operations Analysis (IDE) degree to enter consideration, but this increase would drop the Executive MBA and HRD programs from the list. As with the Decision Analysis weight, an increase is not considered due to the lowering of these weights from the change in the Critical Thinker weight in the model; therefore, only a decrease in this weight is submitted for further study.

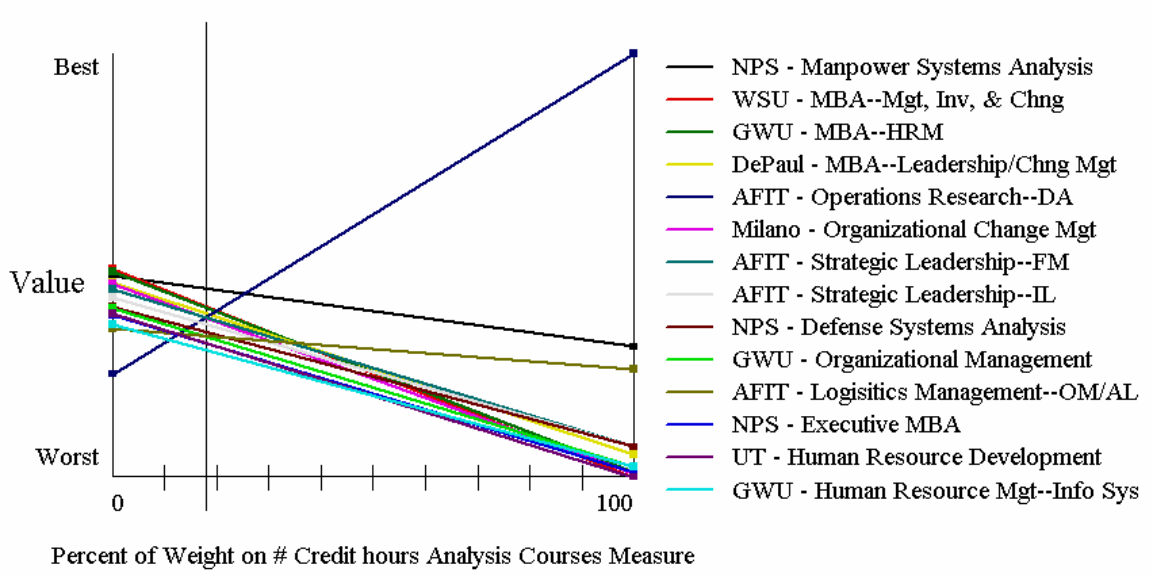


Figure 21. Sensitivity Chart for Lifecycle Analysis Value

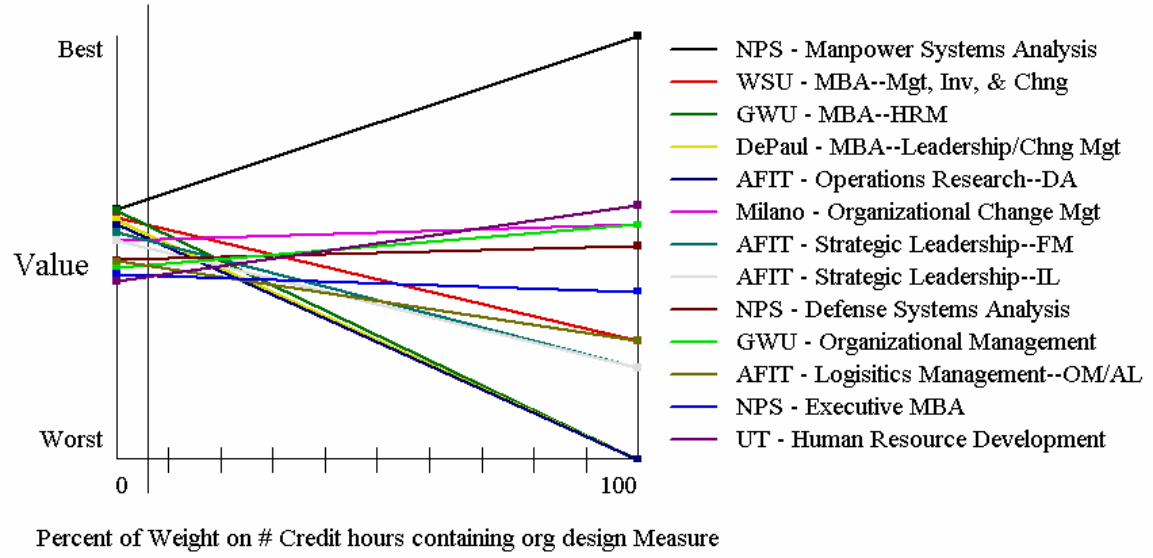


Figure 22. Sensitivity Chart for Organizational Design Value

In looking at the Organizational Design value (Figure 22), other than the NPS-MSA degree, most degree programs follow a downward, or at best, level slope so an increase in this value's weight would only separate the MSA degree further from the

pack. MSA clearly dominates the alternatives. As for potential changes in portfolio selection, it would have to be raised from its current global weight of 0.06 to 0.1325 (over double the weight increase) in order for the HRM degree to enter consideration. Since it is already at a low weight, reducing it does not impact the portfolio eligible pool although slight rank-order changes do occur.

As seen in Figure 23, the remaining value of Resource Allocation shows a very stable, almost parallel trend for most of the degree programs considered except for the OR-DA program which drops in value. But, even an increase of more than double its current weight of 0.06 does not delete the OR-DA program from consideration. A decrease only increases the OR-DA rank level, but the rank level of the other programs remain relatively stable for either an increase or decrease in weight. This weight is not sensitive.

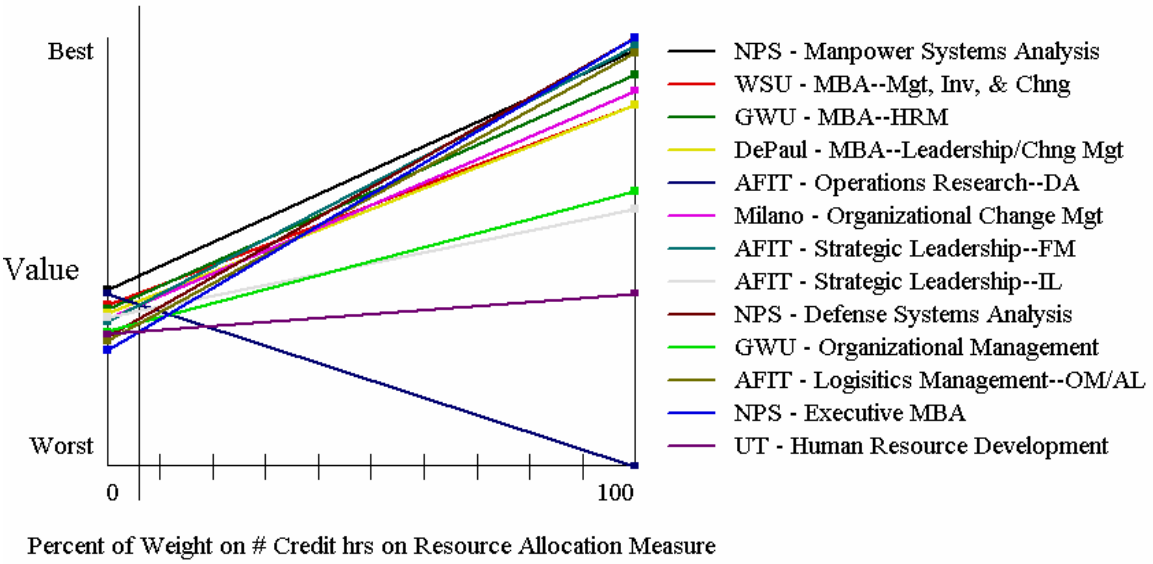


Figure 23. Sensitivity Chart for Resource Allocation Value

Based on the sensitivity analysis for each of the evaluation measure weights, the main areas to conduct further analysis on are the effect of an increase in the Lifecycle Processes weight or decreases in either the Decision Analysis or Lifecycle Analysis weights. Selected weights are given and then the portfolio selection process is run to determine if there is a change in portfolio selection, and if so, a resulting percentage change in the degree programs. It is important to recall that the global weights for each of these values had already been increased for Lifecycle Processes and decreased for Decision Analysis and Lifecycle Analysis through the change in the 1st tier weights.

Given the sensitivity of the weights for Lifecycle Processes, Decision Analysis, and Lifecycle Analysis, selected changes in these weights were reviewed to determine any impact on the portfolio selection. It is important to note the assumption that the original goal setting criteria for the sums of combinations of values to enter the portfolio consideration remain the same. Understanding that as the weights are changed, the DM could determine that the given goal setting criteria no longer apply to the new weighted value scores and the minimum criteria could change. These potential changes were not made during this assessment.

First, the Lifecycle Processes weight was increased from 0.098 to 0.128 (a 30.6 percent increase in global weight). Running the new weighted values through the Matlab code with the original criteria for combinatorial sums shows a change for the resulting degree programs, dropping two of the lower-seated degree programs from the portfolio (NPS DSA and Executive MBA programs) and lowering the level for three other programs (AFIT OR-DA, Milano Org Change Mgt, and WSU MBA). The results are provided in Table 19. Even though the HRM degree had earned the minimum criteria to

enter consideration, it did not meet the criteria for the sums to get selected into the portfolio and the resulting change in global weights affected the criteria levels that the remaining programs could meet. The largest change in percentage for a degree program was for the NPS MSA program which increased by 6.68 percent. With fewer degrees in the portfolio, percentages increased for the degrees that met the same criteria level, but dropped slightly for those that met lower criteria levels.

Table 19. Portfolio Results from Change in Lifecycle Processes Weight

Alt	Degree	Bucket	Δ Bucket	Percent	Δ Percent
a_1	AFIT OR-DA	5	-1	8.82	-2.54
a_3	AFIT ISL-FM	4	-	5.88	+1.33
a_9	NPS MSA	8	-	29.41	+6.68
a_{13}	DePaul MBA-Ldr/Chng/Mgt	6	-	14.71	+3.35
a_{14}	GWU MBA-HRM	7	-	20.59	+4.68
a_{18}	Milano Org Change Mgt	4	-2	5.88	-5.48
a_{21}	WSU MBA-Inv Change Mgt	6	-1	14.71	-1.20

Next, results of changing the Decision Analysis weight from 0.30 down to 0.25 is reviewed. This weight change reflects a 16.67 percent decrease or 28.5 percent decrease from the original global weight of 0.35 prior to sensitivity on the 1st tier weights. After entering the weighted values in the Matlab code, there are moderate changes in the portfolio. Two degrees enter the portfolio and four degrees increase their bucket levels. The AFIT OR-Applied Sciences and ISL-Information Leadership programs are the newest entrants into the portfolio by meeting the c_2 and c_5 criteria levels, respectively. The results of the changes are provided in Table 20. The largest increase was the newly added program of AFIT ISL-IL which came in at a surprisingly high level considering it was previously not in the portfolio. Its higher value score for Lifecycle Processes as well

as Lifecycle Systems boosted its entrance in the model when the DA weight was dropped. And the AFIT OR-AS degree entered the model due to less focus on the DA weight, increasing the weight for the Lifecycle Analysis value through the weight proportioning process. Given that it was a significant weight and the OR-AS program had a perfect value score, it was enough to meet the minimum criteria for portfolio entrance.

Table 20. Portfolio Results from Change in Decision Analysis Weight

Alt	Degree	Bucket	Δ Bucket	Percent	Δ Percent
a_1	AFIT OR-DA	6	-	9.346	-2.014
a_2	AFIT OR-AS	2	+2	1.869	+1.869
a_3	AFIT ISL-FM	6	+2	9.346	+4.796
a_4	AFIT ISL-IL	5	+5	5.607	+5.607
a_9	NPS MSA	8	-	18.69	-4.04
a_{10}	NPS DSA	4	+1	3.738	-0.328
a_{12}	NPS Exec MBA	3	-	2.804	-0.606
a_{13}	DePaul MBA-Ldr/Chng/Mgt	7	+1	13.08	+1.72
a_{14}	GWU MBA-HRM	7	-	13.08	-2.83
a_{18}	Milano Org Change Mgt	6	-	9.346	-2.014
a_{21}	WSU MBA-Inv Change Mgt	7	-	13.08	-2.83

The last weight to check is the reduction of the Lifecycle Analysis value. This weight was reduced from 0.18 to 0.15 (a 16.67 percent reduction from its already adjusted weight or 28.57 percent reduction from its original global weight of 0.21). Again, recalculating the global weights for the remaining values and entering the weighted values into Matlab, one degree entered the portfolio, AFIT's ISL-IL program, at a mid-level bucket of 4. Only two other programs in the portfolio changed bucket levels each by 1 level down or up. The results are provided in Table 21. By decreasing the weight for the Lifecycle Analysis value, the other values increased, boosting the ISL-IL

program into the portfolio. With only one new degree entrant and little change in the bucket levels for the remaining programs, there was little change in the percentage breakouts for the retained degree programs except for a 4.69 percent drop for the AFIT OR- DA program which is expected with a drop in the analysis value weight.

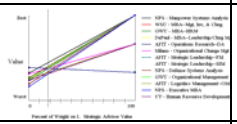
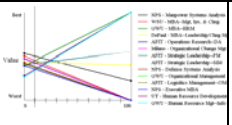
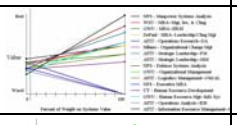
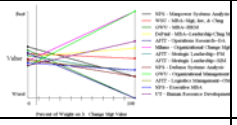
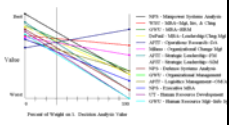
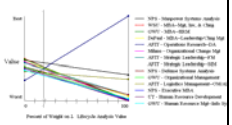
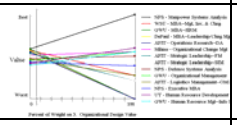
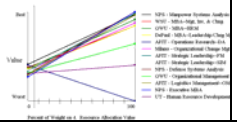
Table 21. Portfolio Results from Change to Lifecycle Analysis Weight

Alt	Degree	Bucket	Δ Bucket	Percent	Δ Percent
a_1	AFIT OR-DA	5	-1	6.67	-4.69
a_3	AFIT ISL-FM	5	+1	6.67	+2.12
a_4	AFIT ISL-IL	4	+4	4.44	+4.44
a_9	NPS MSA	8	-	22.22	-0.51
a_{10}	NPS DSA	3	-	3.33	-0.08
a_{12}	NPS Exec MBA	3	-	3.33	-0.08
a_{13}	DePaul MBA-Ldr/Chng/Mgt	6	-	11.11	-0.25
a_{14}	GWU MBA-HRM	7	-	15.56	-0.35
a_{18}	Milano Org Change Mgt	6	-	11.11	-0.25
a_{21}	WSU MBA-Inv Change Mgt	7	-	15.56	-0.35

Based on the results of the sensitivity analysis, if the DM wanted to go with a more restricted degree program listing, he could increase the Lifecycle Processes weight, but this would heavily focus the career field on the NPS MSA degree and the various MBA programs listed. Retaining the current weight provides at least a slight diversity in the portfolio programs suggested to the career field.

Overall, the types of degrees within the portfolio appear to be stable. Minor changes in the percentages do occur with variation in weight on specific values which is to be expected. A summary chart showing the value and its sensitivity range is provided in Table 22. Medium or High levels of sensitivity in the table give the range point at which a new degree program's score climbs above or dips below the trigger value of 0.310 to indicate that a check on the resulting portfolio contents is needed based on the

Table 22. Summary Table for Sensitivity Analysis

Attribute (X_i)	Sensitivity Chart	Global Weight	Sensitivity Level (Range) to Decrease	Sensitivity Level (Range) to Increase	Result on Portfolio
X_1 Strategic Advisor		.18	High* (-.01)	Low	Not reviewed
X_2 Lifecycle Processes		.098	Low	High (+.015)	NPS DSA and Exec MBA drop out
X_3 Lifecycle Systems		.042	Low	Medium (+.023)	Not reviewed
X_4 Change Mgt		.08	Low	Low	Not reviewed
X_5 Decision Analysis		.30	High (-.02)	Low	AFIT ISL-IL and OR-AS enter portfolio
X_6 Lifecycle Analysis		.18	High (-.025)	Low	AFIT ISL-IL enters portfolio
X_7 Org Design		.06	Low	Low	Not reviewed
X_8 Resource Alloc.		.06	Low	Low	Not reviewed

* As noted, while this sensitivity for a decrease in Strategic Advisor is high, since its weight was raised from sensitivity on 1st tier weights, a decrease is not reviewed.

weight change. Sensitivity level depends on a relative ratio of how much it would have to decrease or increase based on the current global weight. For example, a drop of 0.025 is small if the global weight is at 0.30 (an 8.3 percent decrease). This indicates the weight is very sensitive. Yet, if a change required a drop of 0.025 when the global

weight is 0.08 can be considered only moderately sensitive since the weight had to decrease by 31 percent to effect a change. Sensitivity determined at the low end is not accompanied by a weight where a change may occur. Recommendations regarding the results of this model along with future research that could be continued in this area are provided in Chapter 5.

V. Conclusions and Recommendations

Summary of Analysis

The VFT process was used to determine the best degree programs for the officers within the 37F, Manpower-Personnel career field. The decision maker, the 37F Career Field Manager, and his staff identified the key values needed from advanced degrees. The value hierarchy was built and the DM determined the weights for each value. Once the model was developed, alternatives were generated that would best meet the values solicited. The alternatives were scored, scores were submitted to the model, and the alternatives were rank-ordered. Initial sensitivity analysis showed some opportunities to tweak the 1st tier weights which the DM decided to do. Once this was done, the multiple criteria decision making technique of goal setting was used to develop the portfolio based on the DM-determined criteria. Next, the percentages were determined through soliciting the DM's relative value increments in meeting the criteria. These processes resulted in a list of degree programs valued by the career field management for its officers to obtain. The selected programs and their resulting percentage breakouts for the career field are shown in Table 23 in descending order of percentages.

The NPS program of Manpower Systems Analysis dominated the results and achieved the highest percentage for the career field. This program is a great fit for the career field and was expected to perform well in the model. What was interesting was the solid performance of the MBA programs. Every MBA program considered was selected for the portfolio indicating this type of degree is highly valued for the career field as long as the specialty tracks of either HRM or Change Management are selected.

Table 23. Results of VFT Model and Portfolio Selection Process

Alt	Degree	Bucket	Percent
a_9	NPS MSA	8	22.73
a_{14}	GWU MBA-HRM	7	15.91
a_{21}	WSU MBA-Inv Change Mgt	7	15.91
a_1	AFIT OR-DA	6	11.36
a_{13}	DePaul MBA-Ldr/Chng/Mgt	6	11.36
a_{18}	Milano Org Change Mgt	6	11.36
a_3	AFIT ISL-FM	4	4.55
a_{10}	NPS DSA	3	3.41
a_{12}	NPS Exec MBA	3	3.41

Even the NPS DSA program is MBA-based and the Milano Organizational Change Management program has MBA at its root. The most surprising entrance in the portfolio, however, was the Operations Research with Decision Analysis specialty degree. Generally speaking, personnel officers in the past were not expected to earn scientific degrees. The need has existed for manpower officers in limited numbers, but the percentage level of the OR-DA program within the portfolio supports the CFM's desires to push for more critical thinkers among the 37F officers. These officers will have to assume more analytical roles and apply their critical thinking skills in all of their duties and this degree program highlights this need.

Since this process is not necessarily intended to have each officer go to these specific institutions (unless fully-funded quotas are provided), but rather for officers to attend similar programs and get degrees where available, similar programs in the portfolio can be combined to streamline the results. Noting this, the DePaul MBA and the WSU MBA both focus on similar tracks and were both included in the model to check for standardization of programs. Therefore, one of these degrees could be deleted and percentages readjusted accordingly. Table 24 shows the adjusted portfolio if the

DePaul program is removed. This impacts the overall percentage spread for the remaining degree programs.

Table 24. Results of Portfolio After Removing DePaul MBA

Alt	Degree	Bucket	Percent
a_9	NPS MSA	8	25.64
a_{14}	GWU MBA-HRM	7	17.95
a_{21}	WSU MBA-Inv Change Mgt	7	17.95
a_1	AFIT OR-DA	6	12.82
a_{18}	Milano Org Change Mgt	6	12.82
a_3	AFIT ISL-FM	4	5.18
a_{10}	NPS DSA	3	3.85
a_{12}	NPS Exec MBA	3	3.85

In comparison to civilian HR executives, five top civilian technical companies were reviewed and the advanced degrees held by their HR executives noted. Three out of five of their Human Resources executives held MBA degrees (reference Table 25). While the traditional HRM degree did not make the cut, its lack of analytical courses showed that the MBA with HRM emphasis is of more value to the career field.

Table 25. HR Executives Advanced Degrees

Company	Top HR Executive Advanced Degree Held
Boeing	MS, Computer Science; MBA – pending (http://www.boeing.com/companyoffices/aboutus/execprofiles/stephens.html)
Cisco	MBA (http://newsroom.cisco.com/dlls/tln/exec_team/bios.html)
Raytheon	Holds an AAD but not specified (http://www.raytheon.com/newsroom/stellent/groups/public/documents/legacy_site/cms01_047190.pdf)
Northrup-Grumman	Masters in Industrial and Labor Relations (http://www.northropgrumman.com/who_we_are/ziskin.html)
Texas Instruments	MBA (http://www.ti.com/corp/docs/company/history/whitaker.shtml)

Impacts

Getting from current state to desired state can be computed by the AADIM model as discussed in the literature review in Chapter 2 based on Jastrzembski (2005) and Staats, Reynolds, and Troxell's (2006) work. As a reference, Table 26 shows the 37F inventory and the current Masters degrees, equivalent professional, or higher as well as the number of officers yet to attain an advanced degree. From this table one can see that

Table 26. Current 37F Academic Levels as of 31 Jan 07 (IDEAS, 2007)

DEGREE LEVEL	ACADEMIC DISCIPLINE (MOST RECENT)	# w/ Degree
BA/BS	Total	851
MA/MS	ACCOUNTING / ECONOMICS / FINANCE	16
	AIRPOWER STUDIES	100
	BIOLOGY	2
	BUSINESS ADMINISTRATION / MANAGEMENT	265
	COMPUTER SCIENCE	10
	CRIMINAL JUSTICE	1
	ENGINEERING TECHNOLOGY	9
	ENGLISH	9
	FOREIGN LANGUAGES	2
	GENERAL STUDIES	1
	HUMAN RESOURCES MANAGEMENT	168
	HUMANITIES	86
	LOGISTICS MANAGEMENT	5
	MATH	5
	OTHER	96
	PHYSICAL SCIENCES	3
	POLITICAL SCIENCE	53
	PRE MED	19
	PSYCHOLOGY	85
	SOCIAL SCIENCES	21
	TOTAL	956
PHD	BUSINESS ADMINISTRATION / MANAGEMENT	1
	ENGLISH	3
	HUMANITIES	2
	PHYSICS	1
	TOTAL	7
PROF DEG	HUMANITIES	1
	LAW	4
	OTHER	1
	PRE MED	1
	TOTAL	7
UNKNOWN	Total	52

the 37F career currently has 1,873 officers with 970 holding a Master's degree or above. The career field can start to ensure that the remaining 851 at the bachelor's (and 52 with unknown levels—not yet entered in system) receive the guidance on the types of degree programs to pursue while also advising its new accessions it receives each year so that it can grow into its desired educational profile. The level of the Operations Research-Decision Analysis degree program will be tough for the career field to fulfill with its current population since only four of its current officers that do not yet have an advanced degree hold a math undergraduate degree. The career field generally does not have a specific requirement for undergraduate degrees for entrance, but in order to fulfill the OR degree requirement, the career field will have to access personnel with scientific/math-based undergraduate degrees (e.g., mathematics, industrial engineering, or operations research). The high value placed on analytical skills shows the career field's need toward self-supporting analysis capabilities and will require accessing the appropriately educated officers to obtain the advanced analytical degrees desired.

Also of note for accession requirements, MBA programs generally require extensive business undergraduate courses for entrance, so selecting officers with appropriate business-related undergraduate degrees would eliminate additional time needed to obtain the prerequisites to begin an MBA program.

Model Assumptions and Points of Discussion

Assumptions made when selecting programs and scoring the required courses for a degree include that the career field has the officers qualified to enter the degree programs and that the prerequisites for the program are met ahead of time. Additional assumptions as noted in Chapter 4 include that the criteria levels would not change when

performing sensitivity analysis. Due to the combinatorial issues in the selection of criteria and priority ranking increments, a general philosophical approach reflecting the DM's desires was used. While this can be looked upon as another subjective input into the process, it is a valid method of determining constraints if it reflects the decision maker's philosophy since it is the DM who approves the model and its results.

Scoring the degree programs is a subjective judgment process for the analyst. A different analyst may score the programs differently, determining that courses may or may not contribute to a value. To reduce potential inconsistencies among analysts in the scoring process, it is critical that the values be specifically defined when using this process to aid in ensuring that the course content matches the intent of the value. Furthermore, inconsistencies across academic institutions in their course descriptions can cause problems with scoring. Many descriptions were in-depth, allowing more information for determining the contribution of a course to a value, while other descriptions were anemic, providing limited information about the course, making it more difficult to determine if a course contributed to a value.

Model Strengths and Contributions

The VFT process captured the decision maker's values which created results that were consistent, even with minor changes in weights. The process is repeatable and can be updated over time to reflect any changes that develop in the career field's values. The resulting programs were eye opening yet made sense given the career field's direction in its future support of the Air Force. While the career field may not be able to completely structure itself into the percentages determined as officers continue to obtain their own degrees, it can be used for justification to obtain fully-funded quotas and provide

guidance to its officers on the types of degrees it values. Additionally, if officers wish to obtain different degrees, they could compare the program content to the values in the model and determine if it meets the intent.

Additionally, it would be encouraging if all career fields were to provide guidance on the degree programs of value to them to aid their officers in selecting an appropriate degree for development. The degree program lists for each career field could be available to promotion boards for board members to evaluate if an officer's degree earned was meeting the intent of his or her career field desires. This could encourage officers to obtain an appropriate degree rather than simply finding a convenient program to complete without regard to whether or not it supports the officer's development in the career field.

Future Research

In addition to completing this process for all career fields in the Air Force, further research on developing an optimal portfolio selection process could be done. Automating the sensitivity analysis through joining the VFT ranking and criteria results and percentages so results in the portfolio and percentages could be seen instantaneously as weights are changed, would facilitate future uses of the model. Currently, the VFT results are separate, requiring transfer from one software application to another, but development of a tool within a single piece of software could support this analysis. Microsoft Excel VBA could be a good candidate since a VFT package already exists in Excel with an add-in developed by Weir (2006). Adding the portfolio selection code in VBA vice Matlab and percentage determination could be brought together in a single package.

Conclusion

In closing, this research quantifies the career field's values and can be used to provide guidance to its officers, support justification for fully-funded academic quotas, and lead to determining requirements for specific positions to best utilize officers capabilities. Value-focused thinking provides a quantitative basis for decision making and provides a repeatable, analytical framework to evaluate alternatives to support the decision maker's vision for the career field.

Appendix A. Single Dimensional Value Functions

Figure 24. Level of Focus on Strategic Perspective Value Function

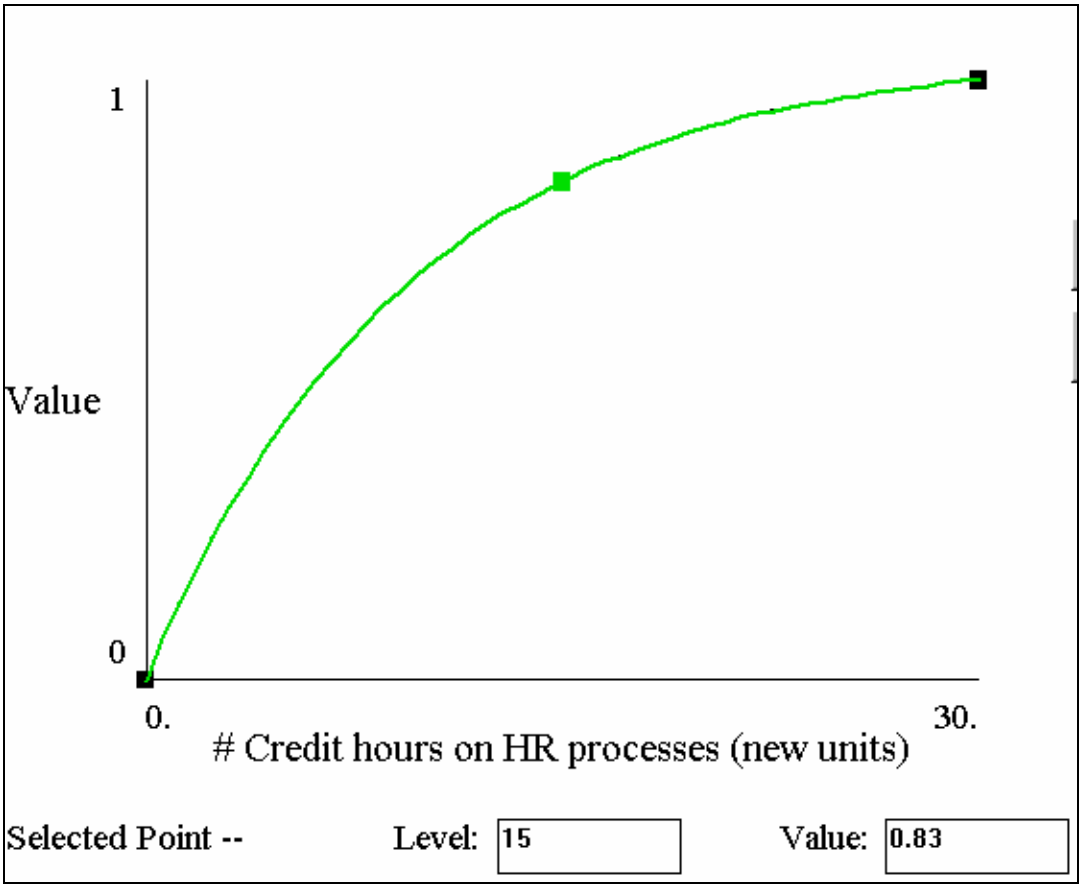


Figure 25. Number of Credit Hours on Lifecycle Processes Value Function

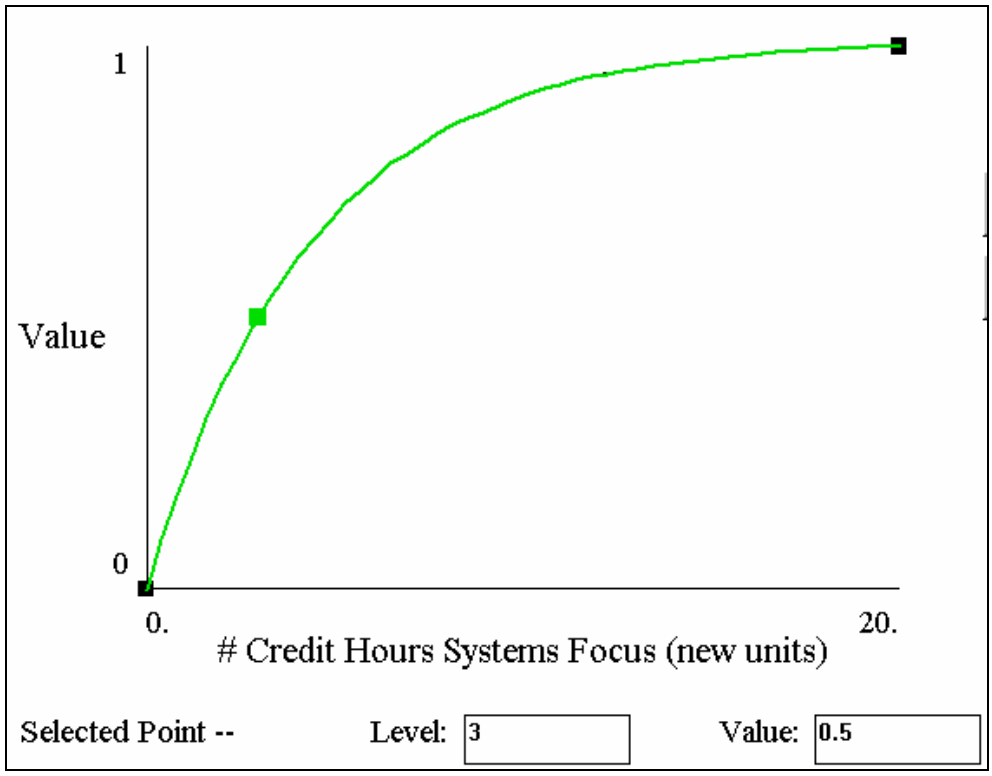


Figure 26. Number of Credit Hours on Systems Value Function

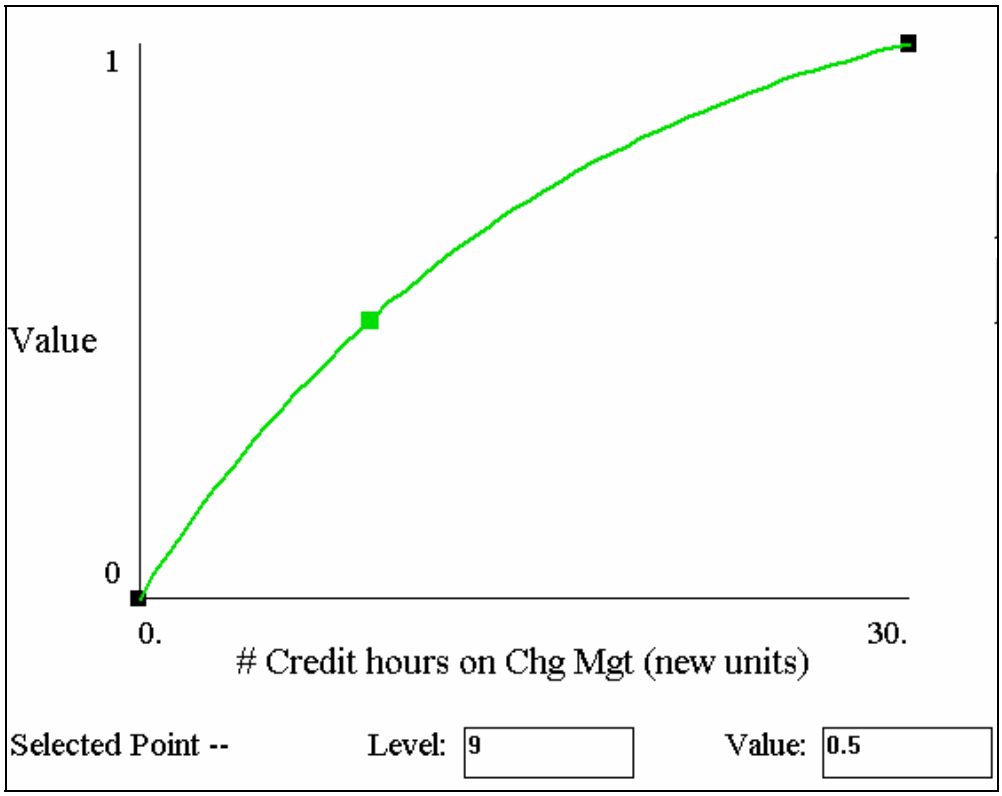


Figure 27. Number of Credit Hours on Change Management Value Function

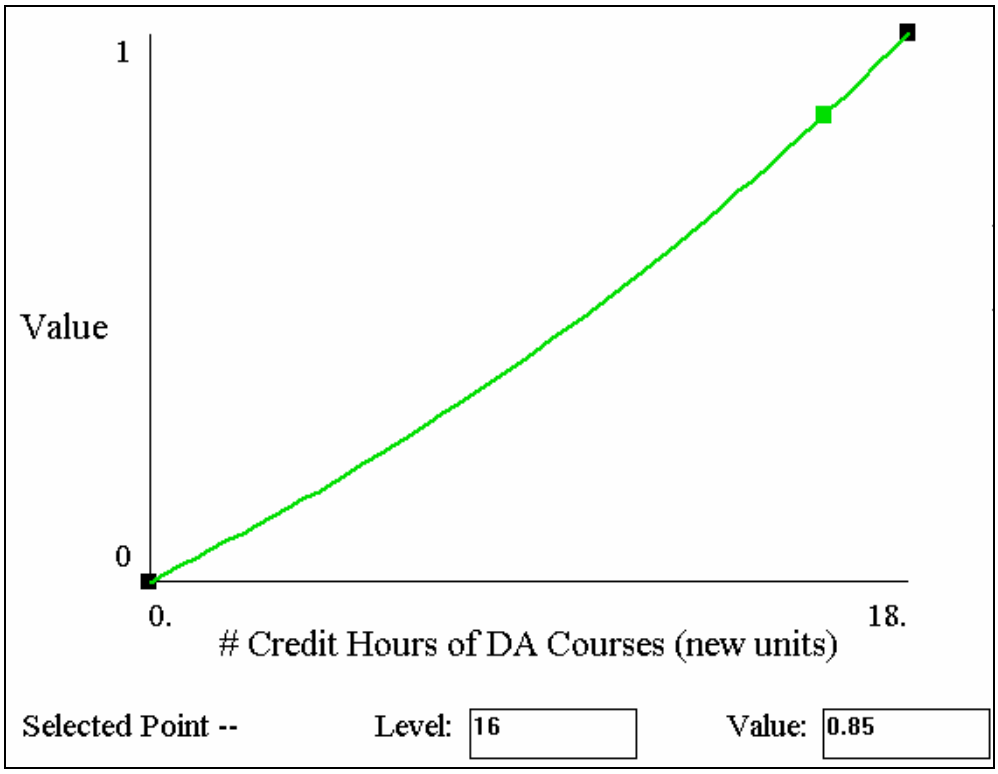


Figure 28. Number of Credit Hours on Decision Analysis Value Function

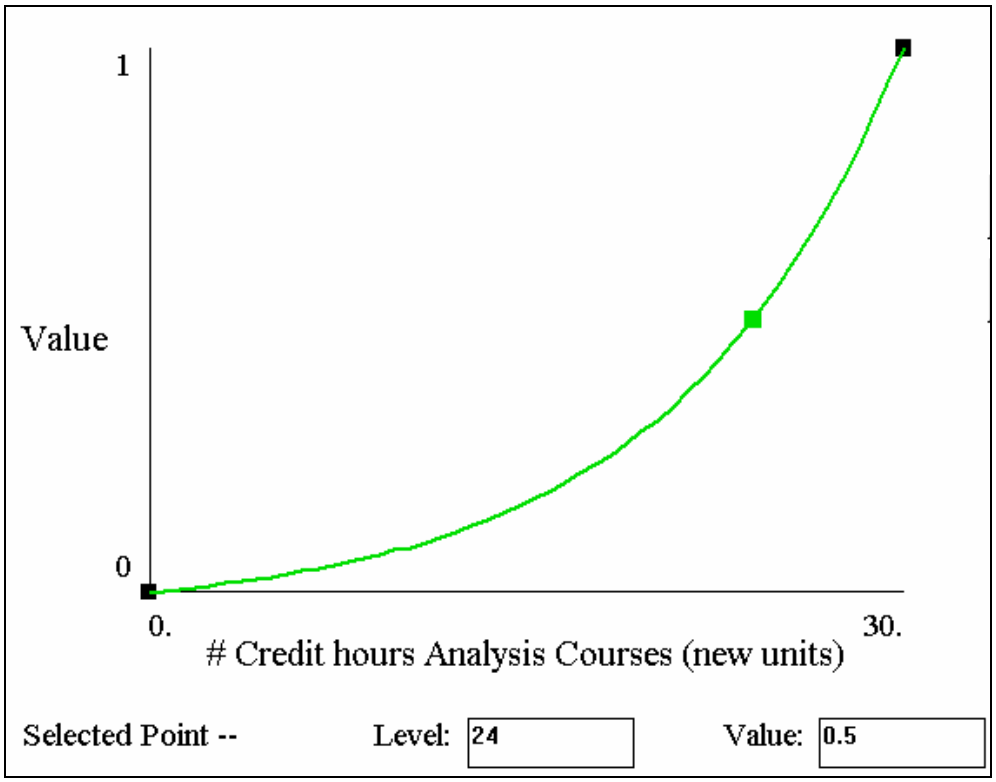


Figure 29. Number of Credit Hours on Analysis Courses Value Function

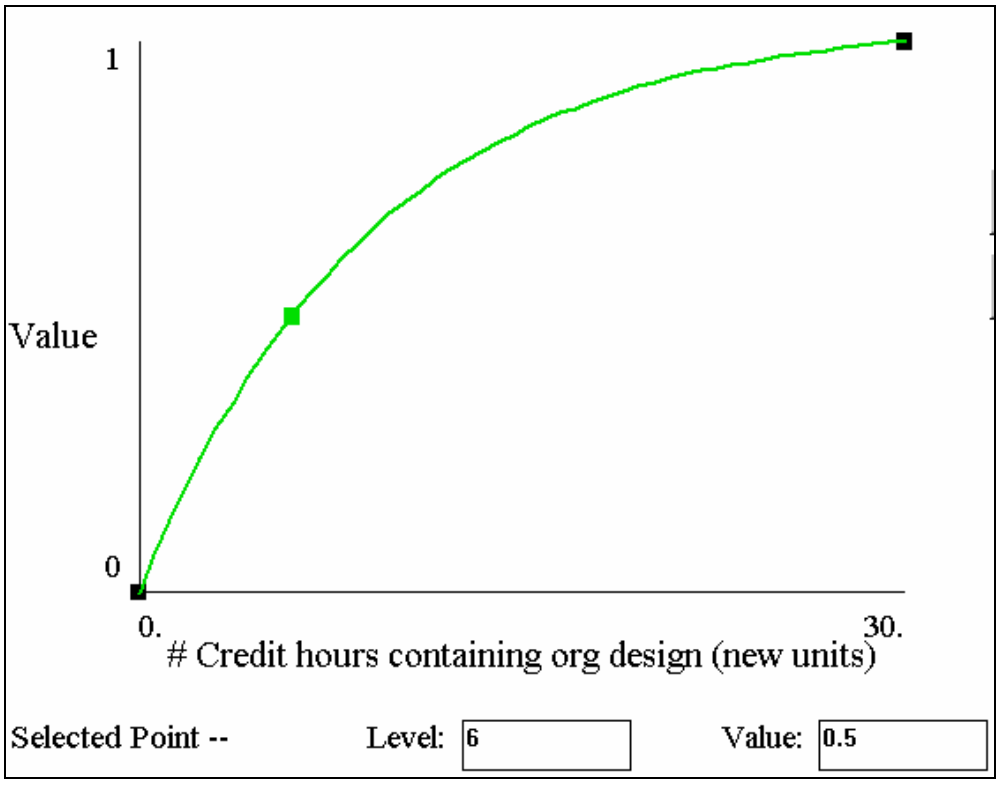


Figure 30. Number of Credit Hours on Organization Design Value Function

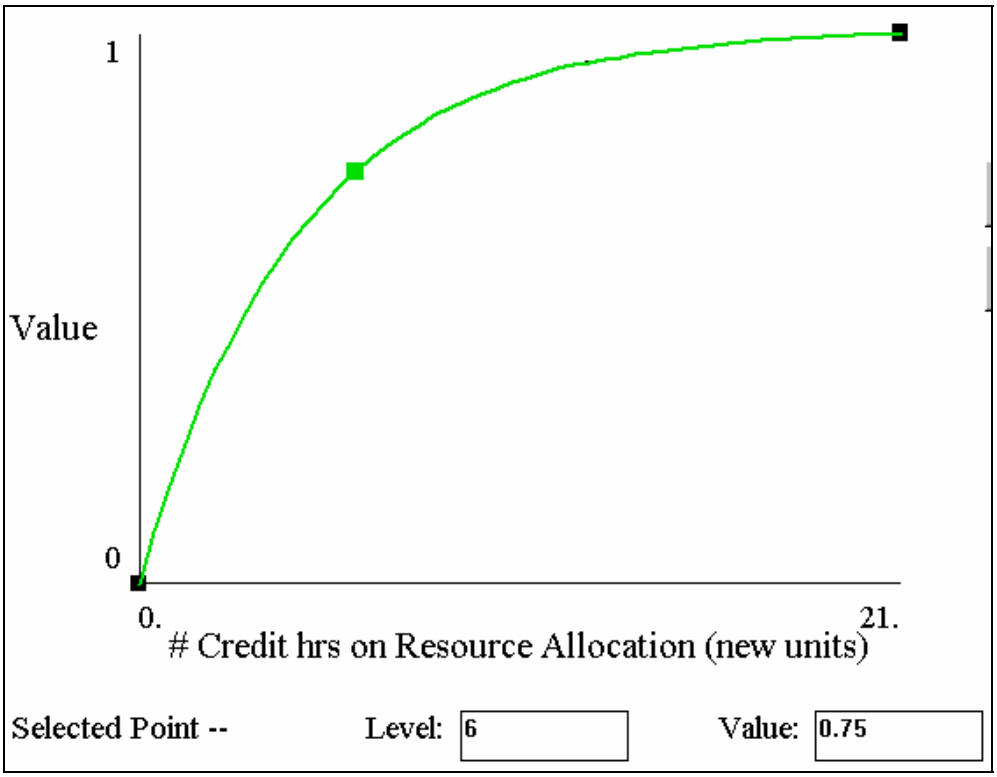


Figure 31. Number of Credit Hours on Resource Allocation Value Function

Appendix B. Degree Program Descriptions

All AFIT course descriptions found from 2006-2007 AFIT Graduate Catalogue, http://www.afit.edu/en/ener/pdf_new/2006_07catalog_8Aug_Fin.pdf

Alternatives a_1 and a_2
AFIT Operations Research Program - Applied Statistics and Decision Analysis (http://www.afit.edu/en/ens/degrees/GOR07M%20Program.pdf)
Core Courses

Course	Name / Description	Credit Hours
OPER 510	**DETERMINISTIC OPERATIONS RESEARCH** This course develops the theory of optimization, building on mathematical fundamentals introduced in the calculus. The emphasis of this course is on exposure to deterministic methods at an introductory graduate level. Topics include fundamentals of linear programming, application of the Kuhn-Tucker conditions, integer programming, nonlinear programming, and dynamic programming. The emphasis is on problem solving and examples.	4
MATH 501	**MATHEMATICS FOR THE OPERATIONAL SCIENCES I** This course along with MATH 502 is designed for students in the graduate operations research and graduate operations analysis programs. The courses attempt to present the fundamental mathematical background necessary for advanced study in areas dealing with qualitative and quantitative analysis of operational/management systems. Included in this two-course sequence are topics in linear algebra, classical optimization, optimization of discrete functions, numerical solutions of linear systems, techniques for solving nonlinear equations and systems of nonlinear equations, interpolation and approximation of functions, numerical differentiation and integration, and computational techniques for solving initial value problems.	4
STAT 527	**INTRODUCTION TO PROBABILITY** This course presents the basic concepts of probability. Emphasized topics are basic probability, discrete and continuous random variables, joint probability distributions and expectations.	4
OPER 540	**STOCHASTIC MODELING AND ANALYSIS I** This course applies the fundamental probability theory to develop standard approaches to stochastic modeling in operations research. Specific topics include conditional probability and exception, the Poisson process and exponential distribution, discrete-time Markov chains, and continuous-time Markov chains. The various models are discussed in the context of military applications.	4
MATH 502	**MATHEMATICS FOR THE OPERATIONAL SCIENCES II** This course along with MATH 501 is designed for students in the graduate operations research and graduate operations analysis programs. The courses attempt to present the fundamental mathematical background necessary for advanced study in areas dealing with qualitative and quantitative analysis of operational/management systems. See description for MATH 501 for more details.	4
STAT 537	**INTRODUCTION TO STATISTICS** This course presents the basic concepts of statistics. Emphasized topics are sampling theory, estimation, hypothesis testing, regression, and nonparametric statistics.	4

OPER 561	**DISCRETE-EVENT SIMULATION** This is an introductory course on the use of computer simulation modeling to analyze complex military systems. The focus of the course is on the development of discrete-event simulation models and the analysis of simulation model input and output. A modern simulation language is taught to provide a modeling framework and the means for implementing a computerized model. Basic concepts important to simulation studies such as random number and random variate generation, model verification and validation, and output analysis are discussed. Examples and applications are oriented toward operational systems within the DoD.	4
OPER 610	**LINEAR PROGRAMMING AND NETWORK FLOWS** This course is an in-depth view of linear programming (LP) and network-flow problems. It includes model formulation, theoretical constructs, solution algorithms (simplex and interior-point methods), post optimality analysis, and large-scale considerations. Related areas, such as specialized LP, network models and fi rst-order approximations are presented. Software systems and models used to solve DoD problems are discussed.	4
OPER 679	**EMPIRICAL MODELING** Analysis of experimental and observational data from engineering systems. Focus on empirical model building using observation data for characterization, estimation, inference and prediction.	3
†OPER 595	**ISSUES IN DEFENSE ANALYSIS** This course discusses the role of analysis in defense decisions and examines the historical contributions and limitations of analysis in the decision-making process. Specific topics include the origins of defense analysis, measures of merit, modeling, analytical pitfalls, contemporary topics, and issues of bias, advocacy, and ethics in defense analysis.	3

Total core: 38 hours

† Operations modeling class required. OPER 595 selected for scoring.

Applied Stats Specialty Track – Sample track completion requirement (3 courses minimum required)

OPER 683	**RESPONSE SURFACE METHODOLOGY** Emphasis in this course is directed towards understanding the basic concepts and uses of RSM to examine and quantify the effect of a large number of variables which influence a system's performance. Key topic areas are experimental design and exploration of response surfaces for determining an optimum conditions response model. Emphasis is on the application of RSM to simulation results.	3
OPER 685	**APPLIED MULTIVARIATE ANALYSIS I** This course is oriented toward the computer-assisted analysis of multidimensional data. The course will present statistical techniques such as multiple regression, principal components analysis, canonical correlation, factor analysis, cluster analysis, discriminant analysis, and neural networks. Emphasis will be on practical application to data sets using computerized statistical packages.	3
OPER 688	**OPERATIONAL EXPERIMENTATION** Introduction to designing experiments for operational testing and evaluation. This is an applied course intended for operations analysts who perform experiments or serve as advisors to experimentation. A statistical approach to the design and analysis of experiments is provided as a means to efficiently study and comprehend the underlying process or system being evaluated. Insight gained leads to improved system performance and quality. Students	3

	must understand basic statistical concepts.	

Total specialty hours scored: 9
Total program hours considered for scoring: 47

Decision Analysis Specialty Track - Sample track completion requirement (3 courses minimum required)

OPER 543	**DECISION ANALYSIS** This course is decision analysis theory and methodology. Decision analysis applies to hard problems involving sequential decisions, major uncertainties, significant outcomes, and complex values. The course includes: decision structuring with influence diagrams and decision trees; modeling uncertainty with subjective probabilities; sensitivity analysis and the value of information; and modeling preferences with utility functions.	3
OPER 643	**ADVANCED DECISION MAKING** This course presents advanced decision analysis concepts, theory, and methodology. The course covers value-focused thinking; hierarchal value structures; utility, value and scoring functions; multi-attribute utility and value problems; multiattribute preferences under uncertainty; aggregation of individual preferences; and utilization of group preferences. Real-world applications of the course material to DoD problems are emphasized.	3
OPER 645	**RISK MODELING AND ANALYSIS** This is a course on the theory and practice of risk analysis. Specific topics include quantitative risk assessment, multi-objective risk assessment, multi-objective risk analysis, Bayesian networks, game theory, actuarial risk, and fault tree analysis. Military and industrial applications are discussed.	4

Total DA specialty hours scored: 10 hrs
Total program hours considered for scoring: 48

*Hours required for thesis work are not counted within the scoring. Thesis work either uses course work already learned or may not complement the track.

Alternatives a_3 and a_4

AFIT Integrated Strategic Leadership Program – Financial Management and Information Leadership
(http://www.afit.edu/en/env/PDF/ISL%20IDE%20Program06J.pdf)
Core Courses

Course	Name / Description	Credit Hours
OPER 501	**QUANTITATIVE DECISION MAKING** This is an introductory course in management science applications for the logistics, systems, acquisition and transportation manager. Emphasis is on understanding and applying the techniques to managerial problem solving and decision making. Major topics include linear programming, decision theory, networks, and queuing theory.	3
IMGT 684	**STRATEGIC INFORMATION MANAGEMENT** This course explores the strategic use of organizational information. This includes a top-down view of how such information is gathered, structured, organized, stored, and used. It addresses both technical and managerial issues of information and its use, with a focus on maximizing the value of information to the organization. It also covers laws and policies related to the strategic management of information.	3
STAT 525	**APPLIED STATISTICS FOR MANAGERS I** Major subject areas in this first course in statistics include descriptive statistics, probability theory, and statistical inference. This course has been tailored to provide the future military logistician with these essential tools in a framework to which he/she can relate.	4
ORSC 675	**CORPORATE STRATEGY AND PUBLIC POLICY ANALYSIS** This course serves as a basis for the understanding and use of the strategic process within public, governmental, and private organizations. Students are introduced to the history and current theory dealing with the development, execution, and evaluation of strategies and policies to help achieve organizational goals. As part of the strategy process, students are introduced to the concepts of industry and competitor analysis, core competencies, and competitive advantage. In addition to theoretical work, students learn practical methods for implementing and maintaining a variable strategic process within Air Force and DoD organizations. Practical experience is gained through application of theory to specific cases of business problems encountered by actual firms and government organizations. While this course draws heavily on the core concepts and frameworks from strategic management and organizational behavior, we will also deal explicitly with the ways in which ideas based on the study of business organizations need to be adapted to deal with the unique aspects of the DoD/government sector; thus, a blend of traditional private sector strategic management concepts as well as public policy concepts and applications are addressed in this course.	4
RSCH 630	**RESEARCH METHODS** Research methods is one of the foundation courses in a management-related master of science degree program. It provides an understanding of the basic methods of conducting research and concepts related to scientific inquiry. This course is designed to advance students along the research process by introducing the basic tools needed to critically analyze claims made through the written body of knowledge and determine the degree to which these claims are valid. As such, the course should help students not only in conducting	4

	research, but also in judging the validity of any claims made verbally or in writing. An important part of the process is an understanding of the statistical procedure used to analyze the data (such as linear regression reliability of measure, correlation, and causality) to support drawing conclusions about the research question. Additionally, the course will provide a foundation for students in designing and conducting their own research projects and help them determine how close to the truth they have come in their own efforts.	
ORSC 572	**ORGANIZATIONAL BEHAVIOR** This course will provide students with an opportunity to study and articulate how fundamental management concepts at the macro and micro levels apply to daily experiences as members of the military. Example topics include scientific management, human relations, individual behaviors, attitudes and differences, as well as organizational level concepts such as effectiveness, structure environment technology, and culture of organizations. The underlying theme of this course is that management is a process which involves coordinating the efforts of people and designing and finding the most effective fit between key organizations variables to accomplish the organization's goals. To be successful, managers must understand how people behave in an organizational setting and what factors affect the functioning of organizations. Although the course will emphasize organizational science theories, a common goal throughout the course will be the applicability of these concepts to management within military organizations.	4
IMGT 669	**BUSINESS PROCESS IMPROVEMENT** This course introduces students to the concepts of business process improvement, including the most popular approach to this concept, Business Process Reengineering, by Hammer and Champy, and principles of lean thinking. This course will cover the historical reasons that organizations are structured the way they are. The students learn to re-conceptualize the organization in terms of business processes and learn how to use that knowledge to improve organizational effectiveness and efficiency. The students will learn to analyze an organization from this standpoint, and will learn to use these concepts to re-design the organization in ways that lead to doing more with less, and at the same time improving the services provided by the organizations' customers.	3
ECON 520	**MANAGERIAL ECONOMICS** This course familiarizes students with selected concepts of managerial economics, enhancing their ability to analyze situations with microeconomic tools, generate and evaluate alternatives, analyze and solve complex problems, and make good economic decisions. The course incorporates critical thinking skills, creative problem solving techniques, and microeconomic theory, thereby enabling students to internalize fundamental economic principles and concepts and then apply them to real-world problems. The course considers the nature of economic incentives facing consumers, workers, and businesses. Topics include demand, supply, individual behavior theory, the time value of money, personal finance, production processes and costs, problem solving, decision making, organization of firms and industry, game theory, and international applications. Also, the role and impact of government is addressed from a microeconomic perspective. Where possible, classroom discussions and assignments include examples tailored to the Department of Defense (DoD).	4
ORSC 672	**MANAGEMENT OF HUMAN RESOURCES** This course provides an overview of topics important to the field of human resource management in organizations. Major emphasis is given to timely personnel theory and research, military and civil service personnel policy, and legislative and judicial decisions molding the field today, especially as they	4

	apply to individuals who may occupy staff and command positions in the future. Subject areas in the course include job analysis, performance appraisal, wage and salary administration, training and development, benefits and services, personnel recruitment and selection, and equal employment opportunity issues. The course is intended for students with several years of experience, typically in the rank of major or above.	
ORSC 775	**STRATEGIC LEADERSHIP** This course has the dual goals of providing in-depth instruction on approaches to leadership theory and facilitating the student's growth and development as leaders, particularly in the military environment. We will examine each of the major leadership theories as well as related areas such as the process of influence, bases of power, determinants of leader behavior, and leader facilitation of group problem solving. Leadership theories will be described, evaluated, and discussed in class. We will also focus attention on military leadership articles through student-led discussions. Emphasis will be placed on leadership application in command positions. Case studies or hands on projects may be used to allow students to apply their own leadership style to various situations.	4

Total core hours: 37

FM Specialty Track

Course	Name / Description	Credit Hours
FMGT 510	**FINANCE THEORY I** This is the first of two theory courses that prepares students to analyze problems with up-to-date finance tools. The course utilizes finance theory to help students internalize the fundamental principles and concepts in finance and apply them to real-world problems. Topics covered begin with the fundamental concepts of financial management including the time value of money, financial statements, cash flow, taxes, risk and return, portfolio theory, and asset valuation. Knowledge of asset valuation is expanded by covering stocks, bonds, and options. Topics in project and corporate valuation include cost of capital, capital budgeting, cash flow estimation and evaluation, risk analysis, real options, financial statement analysis, financial planning, and corporate governance.	4
FMGT 610	**FINANCE THEORY II** This is the second of two theory courses that prepares students to analyze problems with up-to-date finance tools. The course utilizes finance theory to help students internalize the fundamental principles and concepts in finance and apply them to real-world problems. Topics covered begin with strategic and tactical financing decisions including capital structure, distributions, repurchases, investment banking, lease financing, and hybrid financing. Knowledge is expanded by covering special topics such as working capital management, risk management, reorganization, mergers, and acquisition, multinational finance, credit, cash management, pension planning and not-for-profit financial management.	4
FMGT 620	**FINANCIAL ANALYSIS** This is a real-world applications based course that builds on the theory learned in FGMT 510 and FGMT 610. The course utilizes finance theory to have students develop an investment portfolio that maximizes return for a given level of risk. Issues such as diversification, asset allocation, and portfolio maintenance will be highlighted.	4

Total Specialty track hours: 12

Total overall program hours considered for scoring: 49

Information Leadership Specialty Track

Course	Name / Description	Credit Hours
IMGT 580	**ENTERPRISE INFORMATION ARCHITECTURE** Examines enterprise information architecture (EIA) as a management tool to facilitate the implementation of strategic direction. This includes exploring the integration of EIA with strategic and resource planning, information assurance, and acquisition management. It introduces the use of EIA frameworks to improve the capability maturity level of the EIA to meet its intended purpose. Other topics include the role of the DIO in EIA management, the use of models and standards, implementation issues, and an overview of enterprise information assurance/security architecture. Strategies are also explored for using EIA to address enterprise problems such as interoperability and information sharing with the intent of improving enterprise performance of mission or business operations.	4
IMGT 651	**SYSTEMS ANALYSIS AND DESIGN** This course provides an in-depth study of the methodologies currently used in the analysis and design of information systems. Strategies for conducting system requirements analysis and methods for accomplishing the logical specifications of information systems are discussed at length. Techniques and tools used to complete the detailed logical and physical design are discussed indepth.	4
IMGT 680	**KNOWLEDGE MANAGEMENT** This seminar-based course is based on the central premise that knowledge, as opposed to the traditionally recognized resources such as land, labor, or capital, is now a primary source of competitive advantage for today's organizations. As the advantages of new products and efficiencies are more and more difficult to sustain, it is knowledge, and more specifically the creation of new knowledge, that can give organizations a competitive edge. Given that knowledge is a newly recognized key organizational resource, it must be managed as such. This course begins with an exploration of the concepts of data, information, and knowledge and their relationships in the context of managing organizational knowledge. The course also specifically addresses the people, process, and technology elements of managing knowledge and how they contribute to individual and organizational knowledge creation and innovation as well as improving the overall productivity of knowledge workers. Finally, the course helps students draw conclusions about the relationships between information management, knowledge management, systems theory organizational learning, and innovation.	4

Total Specialty track hours: 12
Total overall program hours considered for scoring: 49

Alternative a_5
AFIT Logistics Management Program (http://www.afit.edu/en/ens/degrees/GLM-07-09%20Program%20Guide.pdf)
Core Courses

Course Code	Course Name / Description	Credit Hours
LOGM 590	**COMPUTER SIMULATION FOR MANAGERS** The course concentrates on the concept of designing a model, and analyzing the results. The course's main emphasis is on the proper use of simulation techniques to model systems and answer logistics questions. Course work focuses on the use of the computer to enhance the decision-making capabilities of the logistics manager. This course provides the student with a working knowledge of discrete-event computer simulation as a decision-making tool.	3
LOGM 601	**PRINCIPLES AND METHODS OF RESEARCH** This course prepares the student to perform as Principle Investigator on independent research that leads to a significant contribution to a field of inquiry. Beginning with topic selection, the course provides information on how to conduct an appropriate review of the literature to identify gaps and opportunities surrounding the problem area, and identify and evaluate approaches for data collection and analysis leading to valid inference about the topic. Scoping and refining the topic, clearly identifying the problem and sub-problems, and converting the topic into answerable research and investigative questions leading to a formal research proposal is discussed. The broadest scope of qualitative and quanitative research methods, encompassing the stages of observation, categorization, correlation and causality are covered, and the data collection and analysis methods appropriate for a wide variety of problems are addressed in detail. Methods leading to both strong and weak inference are presented, and the philosophy of the scientific method provides the overarching structure for the class. The material presents both a theoretical, "why" based approach as well as practical "how to" lessons.	3
LOGM 615	**LOGISTICS INFORMATION SYSTEMS** This course focuses on the application of information technologies to Logistics Management. As such, the students are expected to develop an understanding of the application of Information Systems to Logistics both in and outside military. Topics covered will include: Information Security Architecture, Warehouse Management Systems, and Transportation Management Systems. MRP/DRP, ERP systems, and E-logistics will be discussed. The application to USAF will be emphasized. The embedded OR/MS methodology in enterprise software will be discussed.	3
LOGM 617	**TRANSPORTATION SYSTEMS & STRATEGIC MOBILITY** Examines each transportation mode for similarities and differences. Ownership of the modes is also detailed, along with cost and service characteristics. Each mode is then examined for its particular contribution to the defense transportation system. The mission, organization, resources and financing arrangements of the three transportation operation agencies of the defense transportation system are examined. Problems associated with strategic mobility are emphasized.	3
LOGM 619	**TRANSPORTATION POLICY & STRATEGIC MOBILITY** Focuses on a study of the complex national and defense transportation policy frameworks that guide the constant development of our transportation systems. Examines how transportation policy impacts, and is, in turn impacted by policies formulated to address other national issues. Particular emphasis is placed on the study of the effects of national policies on the defense	3

	transportation system. Policy analysis models are presented and discussed.	
LOGM 620	**ACTIVITY BASED COSTING/MANAGEMENT** The course is designed to give the students a working knowledge of Activity Based Costing (ABC), including what it is, why traditional accounting practices do not support managerial decision making, and techniques to perform ABC. The necessity of accurate costing will be emphasized, with examples from current privatization initiatives within DoD, as well as commercial sector cases. Once the student is familiar with cost allocation under ABC, Activity Based Management (ABM) will be introduced to enable the student to utilize the output from ABC. In addition, the development and application of non-financial metrics, essential in ABM, will be covered.	3
LOGM 621	**AIR TRANSPORTATION MANAGEMENT** This course focuses on the air operations/air management aspect of the transportation network. As such, the students are expected to develop an understanding of both civilian and military air cargo and air passenger network operations. Topics covered will include: Airline/Air Cargo forecasting and management, principles of air scheduling, and the interaction between the civilian and military air transportation systems. Similarities and differences between these two systems will be covered extensively. The reliance of the DoD on civilian air transportation will be emphasized.	3
LOGM 627	**SUPPLY CHAIN MANAGEMENT** Intended as a capstone course for professional logisticians, LOGM 627 develops the major themes and strategies of Supply Chain Management. The focus is on the system design, structure, capacity, and management of an integrated supply chain. Subject matter includes cross functional analysis and treatment of sourcing/supply, distribution/transportation, maintenance/operations and related logistics support issues in a system-wide approach. Main themes developed are the necessity of an integrative approach to strategy, policy, and decision making; and the need to emphasize system commonality of sourcing, distribution, and operations to form an integrated supply chain in support of global military operations.	3
LOGM 628	**REPARABLE INVENTORY MANAGEMENT** This course is a survey of contemporary theory and practice in the area of reparable item inventory management. The focus of the course content is on the military reparable item logistic pipeline, with specific emphasis given to the effects of inventory policy and decision-making on logistics costs and weapon system availability/ sustainability. The course material is essentially modeling and operations research oriented; however, course emphasis is on understanding and applying of the algorithms presented, rather than on theorems or proofs. Coverage includes state-of-the-art inventory thinking for a variety of inventory management problems, such as: single versus multiple stockage locations, single versus multi item optimization, cannibalization versus no cannibalization policies, peacetime versus wartime demand rates, and a variety of other scenario. Specific model coverage includes METRIC, Mod-Metric, Aircraft Availability Model, Vari-METRIC, and Dyna-METRIC.	3
LOGM 629	**CONSUMABLE INVENTORY MANAGEMENT** This course is a survey of contemporary theory and practice in the area of consumable item inventory management. The course content focuses on the management of service parts inventories for military logistics systems, emphasizing the effects that inventory policy and decision-making have on logistics costs and selected performance measures. The course blends practitioner based and operations research-based perspectives; however, course emphasis is on understanding and applying key inventory management concepts, rather than on theorems or proofs. The course material includes:	3

	managing inventories under certainty and uncertainty, inventory performance measurement, single versus multiple stockage location alternatives, information systems physical item inventory accuracy, and warehousing design and operation.	
CMGT 523	**CONTRACTING & ACQUISITION MANAGEMENT** This survey course introduces students to the DoD contracting and acquisition processes. Through classroom discussion and outside readings, the student is introduced to the overall weapon system acquisition environment, the acquisition process, the overall contracting process, and current ethical and reform issues. The objective of the course is to help students understand the role of contracting in the acquisition process as well as to assess their role and stake in these processes, whether it be as a user, developer, supporter, or manager of a weapon system.	4
ECON 520	**MANAGERIAL ECONOMICS** This course familiarizes students with selected concepts of managerial economics, enhancing their ability to analyze situations with microeconomic tools, generate and evaluate alternatives, analyze and solve complex problems, and make good economic decisions. The course incorporates critical thinking skills, creative problem solving techniques, and microeconomic theory, thereby enabling students to internalize fundamental economic principles and concepts and then apply them to real-world problems. The course considers the nature of economic incentives facing consumers, workers, and businesses. Topics include demand, supply, individual behavior theory, the time value of money, personal finance, production processes and costs, problem solving, decision making, organization of firms and industry, game theory, and international applications. Also, the role and impact of government is addressed from a microeconomic perspective. Where possible, classroom discussions and assignments include examples tailored to the Department of Defense (DoD).	4
OPER 501	**QUANTITATIVE DECISION MAKING** This is an introductory course in management science applications for the logistics, systems, acquisition and transportation manager. Emphasis is on understanding and applying the techniques to managerial problem solving and decision making. Major topics include linear programming, decision theory, networks, and queuing theory.	3
ORSC 542	**MANAGEMENT AND BEHAVIOR IN ORGANIZATIONS** This course will give the student an in-depth understanding of organizational behavior, organization theory, and management theory. Topics include, but are not limited to, classical and neoclassical organization and management theory, study of organizations, organizational culture, individual behavior, motivation, rewards, organizational behavior, politics, leadership, organizational structure and design, job and organizational design, communication and information in the postmodernist era, decision-making process, and organizational change.	4
STAT 525	**APPLIED STATISTICS FOR MANAGERS I** Major subject areas in this first course in statistics include descriptive statistics, probability theory, and statistical inference. This course has been tailored to provide the future military logistician with these essential tools in a framework to which he/she can relate.	4
STAT 535	**APPLIED STATISTICS FOR MANAGERS II** Statistical methods needed to gather, interpret, and apply data in the decision-making process are presented. Concepts discussed include methods on how to: specify what data is wanted, collect data, extract information from existing sources of data, test the validity of key concepts, make intelligent estimates of major problem parameters, and relate one decision variable to another (ANOVA and regression).	4

Total core hours: 53

OM/AL Specialty Track

LOGM 570	**PRINCIPLES OF INVENTORY MANAGEMENT** This course is designed for students who seek a fundamental understanding of the design and operation of inventory management systems. Specifically, this course will provide students with a broad survey of issues concerning managing inventory systems such as (1) the logistics pipeline with emphasis on the DOD, (2) demand data and forecasting methodologies, (3) inventory models applicable to consumable items, (4) inventory models for reparable items, and (5) management issues for operating inventory systems. This is a survey course intended for students who are non-supply officers but wish a greater understanding of inventory systems.	3

Total specialty hours: 3
Total program hours considered for scoring: 56

Alternative a_6
AFIT Information Resource Management Program
(http://www.afit.edu/en/env/PDF/IRM.pdf.)
Core Courses

Course Code	Course Name / Description	Credit Hours
ORSC 542	**MANAGEMENT AND BEHAVIOR IN ORGANIZATIONS** This course will give the student an in-depth understanding of organizational behavior, organization theory, and management theory. Topics include, but are not limited to, classical and neoclassical organization and management theory, study of organizations, organizational culture, individual behavior, motivation, rewards, organizational behavior, politics, leadership, organizational structure and design, job and organizational design, communication and information in the postmodernist era, decision-making process, and organizational change.	4
IMGT 530	**CONCEPTUAL FOUNDATIONS FOR INFORMATION RESOURCE MANAGEMENT** Provides an overview of the broad range of concepts and theories on which academic study of information resource management is based. The course examines the role of information and control systems in supporting organizational functions from routine operational processes to strategic planning and decision making. It also surveys the primary directions that current information systems research is taking and identifies how a variety of research methodologies may be applied to information resource management research questions.	3
IMGT 561	**APPLICATIONS OF DATABASE MANAGEMENT SYSTEMS** With emphasis on data in information systems, and with the increasing complexity of data management, this course explores the applications of computer database systems to support organizational and administrative functions. More specifically, the course covers from both a user's and a designer's perspective: the concept of database management systems (DBMSs); DBMS security, integrity, recovery, and concurrency considerations; DBMS data models (the relational will be emphasized, but the hierarchical and network models will also be covered); data manipulation; and database design. Additional emphasis is placed on emerging techniques including, but not limited to, data warehousing, data marts, and data mining. Principles studied will be reinforced in the laboratory. Students will use a relational DBMS to build a management-oriented application. Further students will be introduced to a variety of databases and database related programs when opportunities arise. The four credit hours for this course consist of three lecture and two hours in the laboratory.	4
IMGT 580	**ENTERPRISE INFORMATION ARCHITECTURE** Examines enterprise information architecture (EIA) as a management tool to facilitate the implementation of strategic direction. This includes exploring the integration of EIA with strategic and resource planning, information assurance, and acquisition management. It introduces the use of EIA frameworks to improve the capability maturity level of the EIA to meet its intended purpose. Other topics include the role of the CIO in EIA management, the use of models and standards, implementation issues, and an overview of enterprise information assurance/security architecture. Strategies are also explored for using EIA to address enterprise problems such as interoperability and information sharing with the intent of improving	4

	enterprise performance of mission or business operations.	
IMGT 651	**SYSTEMS ANALYSIS AND DESIGN** This course provides an in-depth study of the methodologies currently used in the analysis and design of information systems. Strategies for conducting system requirements analysis and methods for accomplishing the logical specifications of information systems are discussed at length. Techniques and tools used to complete the detailed logical and physical design are discussed indepth.	4
IMGT 657	**DATA COMMUNICATIONS FOR MANAGERS** This course introduces the data communications topics in sufficient detail to prepare managers to participate in decision-making activities regarding data communication technologies to organizational information processing. The course overviews concepts of communication systems models, computer networking, and computer security. The course also reviews hardware and software requirements for controlling the flow of data using current telecommunication technology. It examines communication transmission media including twisted pair, coaxial cable, microwave, fiber optics, and satellite. It introduces methods for selecting among alternative communication systems and concludes with an exploration of the future impact of trends in the telecommunications industry on organizational information systems. Wherever possible, both peace time and war time in the military data communication systems are examined.	4
IMGT 690*	Required but not scored (a capstone course)	
RSCH 630	**RESEARCH METHODS** Research methods is one of the foundation courses in a management-related master of science degree program. It provides an understanding of the basic methods of conducting research and concepts related to scientific inquiry. This course is designed to advance students along the research process by introducing the basic tools needed to critically analyze claims made through the written body of knowledge and determine the degree to which these claims are valid. As such, the course should help students not only in conducting research, but also in judging the validity of any claims made verbally or in writing. An important part of the process is an understanding of the statistical procedure used to analyze the data (such as linear regression reliability of measure, correlation, and causality) to support drawing conclusions about the research question. Additionally, the course will provide a foundation for students in designing and conducting their own research projects and help them determine how close to the truth they have come in their own efforts.	3
STAT 525	**APPLIED STATISTICS FOR MANAGERS I** Major subject areas in this first course in statistics include descriptive statistics, probability theory, and statistical inference. This course has been tailored to provide the future military logistician with these essential tools in a framework to which he/she can relate.	4
STAT 535	**APPLIED STATISTICS FOR MANAGERS II** Statistical methods needed to gather, interpret, and apply data in the decision-making process are presented. Concepts discussed include methods on how to: specify what data is wanted, collect data, extract information from existing sources of data, test the validity of key concepts, make intelligent estimates of major problem parameters, and relate one decision variable to another (ANOVA and regression).	4

Total hours for core program: 34

Strategic Information Management Specialty Track

IMGT 684	**STRATEGIC INFORMATION MANAGEMENT** This course explores the strategic use of organizational information. This includes a top-down view of how such information is gathered, structured, organized, stored, and used. It addresses both technical and managerial issues of information and its use, with a focus on maximizing the value of information to the organization. It also covers laws and policies related to the strategic management of information.	3
IMGT 680	**KNOWLEDGE MANAGEMENT** This seminar-based course is based on the central premise that knowledge, as opposed to the traditionally recognized resources such as land, labor, or capital, is now a primary source of competitive advantage for today's organizations. As the advantages of new products and efficiencies are more and more difficult to sustain, it is knowledge, and more specifically the creation of new knowledge, that can give organizations a competitive edge. Given that knowledge is a newly recognized key organizational resource, it must be managed as such. This course begins with an exploration of the concepts of data, information, and knowledge and their relationships in the context of managing organizational knowledge. The course also specifically addresses the people, process, and technology elements of managing knowledge and how they contribute to individual and organizational knowledge creation and innovation as well as improving the overall productivity of knowledge workers. Finally, the course helps students draw conclusions about the relationships between information management, knowledge management, systems theory organizational learning, and innovation.	4
IMGT 669	**BUSINESS PROCESS IMPROVEMENT** This course introduces students to the concepts of business process improvement, including the most popular approach to this concept, Business Process Reengineering, by Hammer and Champy, and principles of lean thinking. This course will cover the historical reasons that organizations are structured the way they are. The students learn to re-conceptualize the organization in terms of business processes and learn how to use that knowledge to improve organizational effectiveness and efficiency. The students will learn to analyze an organization from this standpoint, and will learn to use these concepts to re-design the organization in ways that lead to doing more with less, and at the same time improving the services provided by the organizations' customers.	3

Total hours for specialty: 10
Total hours considered for scoring: 44

Alternative a_7

AFIT Operations Analysis Program (12-month)
(http://www.afit.edu/en/ens/degrees/IOA%2006-08J%20Program%20Guide.pdf)
Core Courses

Course Code	Course Name / Description	Credit Hours
OPER 503	**DETERMINISTIC MODELING** This course applies the basic theories of optimization to develop standard approaches to deterministic modeling. This course is designed to expose students to deterministic modeling in operational analysis. Topics include fundamentals of linear programming, network-flow problems and integer programming. The emphasis of this course is on model formulation and model building.	3
OPER 504	**PROBABILISTIC MODELING** This course introduces probabilistic models prevalent in the operational sciences. The tools employed include conditioning, elementary counting processes, and Markov chains. These tools shall be applied to analyze queuing, inventory, and reliability models.	3
OPER 561	**DISCRETE-EVENT SIMULATION** This is an introductory course on the use of computer simulation modeling to analyze complex military systems. The focus of the course is on the development of discrete-event simulation models and the analysis of simulation model input and output. A modern simulation language is taught to provide a modeling framework and the means for implementing a computerized model. Basic concepts important to simulation studies such as random number and random variate generation, model verification and validation, and output analysis are discussed. Examples and applications are oriented toward operational systems within the DoD.	4
OPER 596	**APPLYING ANALYSIS TO DEFENSE ISSUES** This capstone course discusses the application of Operations Research (OR) in making defense decisions. In particular, the course examines the application of OR to support senior decision makers in their planning and warfighting efforts. Specific topics include the use of analysis in evaluating Department of Defense and Air Force issues, the use of analysis to make better decisions, and contemporary operational and tactical Air Force topics.	3
OPER 677	**MODELING AND ANALYSIS OF AIR OPERATIONS** The purpose of this course is to present air operations modeling from an application oriented point of view. Topics include high resolution combat modeling, mobility modeling, aggregated modeling, and the Air Force Standard Analysis Toolkit. Models currently in use for DoD analysis are used as examples throughout the course.	3
OPER 632	**COST ANALYSIS FOR SYSTEMS DESIGN** This course covers the principles of engineering economy, the development of cost estimating relationships, and the employment of the life cycle concept. Attention is paid to the measurement of tangible and intangible benefits. The goal of the course is to provide a complete treatment of cost analysis, originating with the identification of a need and ending with phase-out and disposal.	3
OPER 646	**DECISION AND RISK ANALYSIS** This course presents multi-attribute decision, risk, value, and utility theory, methodology, and analysis. Decision modeling applies to complex problems involving sequential decisions, major uncertainties, conflicting objectives, and	4

	multi-attribute value and utility functions. The course includes value-focused thinking, decision structuring with influence diagrams and decision trees, modeling uncertainty with subjective probabilities, sensitivity analysis and the value of information, and modeling decision maker preferences using value and utility functions. Real-world applications will be discussed throughout.	
MATH 509	**MATHEMATICAL METHODS IN THE PHYSICAL SCIENCES** This course covers basic topics in linear algebra and the calculus of several variables. Topics from linear algebra include matrix algebra, solutions of systems of linear equations, real vector spaces, and linear transformations between real vector spaces. Topics from several variable calculus include partial differentiation, directional derivatives, functional transformations and Jacobians, maxima and minima, and integration in two and three variables.	4
STAT 526	**APPLIED STATISTICS I** This is the first course in the fundamentals of managerial statistics. The probability theory necessary to provide a foundation for statistics is developed. Topics include Bayes theorem, discrete and continuous random variables, cumulative distribution functions, joint probability distributions, expectation and functions of random variables, measures of central tendency and variation, sampling and sampling distributions, the Central Limit Theorem, and point/interval estimation.	4
STAT 536	**APPLIED STATISTICS II** This is a second course in statistics stressing the point of view that statistics provides the tools for making decisions under conditions of uncertainty. Emphasis is on the processes by which the data are used to make decisions about the population of which the data are a part. Subjects include tests of hypotheses, regression, linear hypotheses, and analysis of variance.	4
STAT 696	**APPLIED GENERAL LINEAR MODELS** Theory and interpretation of the general linear statistical model. Population distribution and/or parameters are tested using regression and analysis of variance in the context of the general linear model. Topics covered include general regression and correlation analysis, basic analysis of variance, and multifactor analysis of variance.	4

Total hours: 39

No specialty track offered

Alternative a_8
AFIT Computer Science Program (http://www.afit.edu/en/eng/Current.cfm**)**
Core Courses

Course Code	Course Name / Description	Credit Hours
CSCE 586	**DESIGN AND ANALYSIS OF ALGORITHMS** This course emphasizes the structure of data and the efficient and effective manipulation (algorithms) of such structures. Physical and logical organization of data is discussed along with data and algorithm abstraction using object-oriented design and abstract data types. Detailed procedures are developed for analyzing the time and space complexities of general algorithms as well as an introduction to NP completeness. Specific data structures discussed include generalized lists, trees, graphs, B-trees, and AVL-trees along with indexing, hashing, sorting, searching and recursive algorithms on specific structures. Well founded algorithm design techniques like divide-and-conquer, local searching, and global searching are also introduced. Course projects emphasize the analysis, reuse, and extension of existing designs and implementations.	4
CSCE 593	**INTRODUCTION TO SOFTWARE ENGINEERING** This course examines the security of computer systems and networks using the tools provided by propositional and predicate logic to discover underlying principles of security. Computer and network security is in a rapid state of change; principles of security, however, remain constant. This course takes the approach that the "key to understanding the problems in computer security is recognition that the problems are not new." The course synthesizes elements from computer networking, operating systems security, and data security within an analytic framework. Topics addressed include access control matrices, protection models, confidentiality, integrity, representing identity, flow and confinement, and malicious logic and intrusion detection. Students taking this course will understand the threats to information resources and will learn about countermeasures and their fundamental limitations.	4
CSCE 692 (Selected systems course)	**DESIGN PRINCIPLES OF COMPUTER ARCHITECTURE** The objective of this course is for the student to understand and be able to apply the fundamental principles of computer architecture design. An emphasis is placed upon the use of quantitative metrics to evaluate cost/performance tradeoffs and upon the use of actual performance data to evaluate design alternatives. Specific topics include construction set architecture design, pipelining, super scalar/VLIW processors, out-of-order execution, compiler optimization, memory system design, and input/output systems.	4
CSCE 531 (Selected Math Req)	**DISCRETE MATHEMATICS** This course provides more in-depth coverage, analysis, and application of set theory, binary relations, functions, and first-order predicate calculus from CSCE 431. Specifically, more emphasis is placed on applying predicate calculus and practice doing proofs, both deductive and inductive formal proofs, and informal proofs. New top areas include: set countability and resolution based theorem proving. This course also provides detailed and varied examples of how discrete mathematics is applied in other graduate courses in computer science and engineering.	4
CSCE 686	**ADVANCED ALGORITHM DESIGN** This course provides a theoretical and practical foundation for understanding and analyzing the design, complexity and correctness of algorithms (control	4

	structure) along with data structure and implementation considerations. The emphasis on computational models relating to NP complete problems is extended. Use of search algorithms (tree/graph, linear programming, dynamic programming, probabilistic, etc.) to solve NP complete problems is related to the selection of various problem solving strategies including the incorporation of heuristics. Formal properties of the various approaches are studied using graph theory and computational models. Additional focus on logic programming, knowledge representation and automated reasoning in concert with the above topics provide a foundation in computational theory. In particular, applications in artificial intelligence, knowledge-based systems, software engineering, database management, signal processing, VLSI, and computer architecture are related through algorithm modeling and current literature.	
CSCE 532 Selected Theory Req't	**AUTOMATA AND FORMAL LANGUAGE THEORY** The objective of this course is to prepare the student with a basic foundation in the concepts of automata and formal language theory. Topics covered will include Turing machines finite state automata, combinatorics, and formal language theory.	4
CSCE 631* Selected Theory Req't	**MACHINES, LANGUAGES, AND LOGICS** This course continues the theoretical development of computational machines, computational functions, and formal languages and their interrelationships. Topics include finite automata, regular expressions, pushdown automata, Turing machines, Post Machines, recursively enumerable sets, recursive sets, recursive functions, decidability and Godel numbering. Associated algorithms on these computational models can be proven correct by developing a proof system using predicate calculus. Topics include first and second order predicate calculus, resolution, and unification. Using these foundations, designs are discussed from a computation viewpoint with emphasis on general computer software and hardware architectures.	4
STAT 583	INTRODUCTION TO PROBABILITY AND STATISTICS Basic concepts of probability and statistics with computer science applications are covered. Topics include: Permutations and combinations; random variable; probability distributions; estimation and confidence intervals; hypothesis testing.	4

Total core hours: 32

*The selected Math and theory requirements were based on a "highly recommended" emphasis and the CSCE 531 and 532 courses are prerequisites for CSCE 631.

Database Systems Specialty Track

CSCE 546	**INTRODUCTION TO DATABASE SYSTEMS** This course introduces the concept of a Database Management System (DBMS), types of database models, application of database systems, and various components of a DBMS. The objectives of the course are to develop an understanding of the uses, capabilities, advantages, and disadvantages of DBMSs; an understanding of the organization and manipulation of data in the types of DBMS available today; and an understanding of database design. A comprehensive set of laboratory exercises leads the student through the design and manipulation of a database using a commercially available DBMS.	4
CSCE 646	**OBJECT-ORIENTED DATA MANAGEMENT** The purpose of this course is to study advanced techniques in management of	4

	data used by object-oriented systems. The course examines object serialization techniques with hands-on projects that give practical experience in developing custom serialization methods and using existing language-provided mechanisms. Storage of object data using relational database management systems is covered by studying transforms of class diagrams to relations and by developing an object-relational layer in project work. A significant portion of the course is dedicated to the study of object-oriented databases in terms of their use in applications and their underlying implementations. Concepts are reinforced through project work involving the use of a commercial object oriented database system.	
CSCE746	**ADVANCED TOPICS IN DATABASE SYSTEMS** This course covers advanced current topics in the area of object-oriented and distributed Multi-Database Systems (MDBS). Specific topics are oriented toward Air Force interest, local research emphases, student interest, and trends in the object-oriented and multi-database technologies illustrative projects and or point papers give the student opportunities to explore some areas of the appropriate fields in enough depth to engender an appreciation and working knowledge for the complexity of the domain.	4

Total specialty track hours: 12

Total hours considered for scoring: 44

Alternative a_9
NPS Manpower Systems Analysis Program
(http://www.nps.edu/Academics/GeneralCatalog/Home.htm)
Core Courses

Course Code	Course Name / Description	Credit Hours
GB3070	**ECONOMICS OF THE GLOBAL DEFENSE ENVIRONMENT** This course develops the fundamental tools of microeconomics and macroeconomics, and applies them to defense management and resource allocation. The course centers on defense applications of economic theory. Topics covered include: defense and the macro economy; markets and their interactions with defense acquisition and contracting; national security implications of globalization; and efficiency in defense decision making.	4
MN3760	**MANPOWER ECONOMICS I** An introduction to the theoretical aspects of labor economics. Concepts covered include the supply of labor, the demand for labor, wage determination, internal labor markets, human capital, earnings functions, turnover, compensation systems, and compensating wage differentials. Special readings are used that apply the principles to military manpower.	4
GB3050	**FINANCIAL REPORTING AND ANALYSIS** This course covers theory, concepts, and practices underlying financial Accounting and Financial Reporting. The conceptual structure underlying the reporting of economic events in the form of the balance sheet, the income statement, and the statement of cash flows is first presented. Accounting recognition and measurement issues surrounding revenues, expenses, assets, liabilities and equity are introduced and analyzed. Finally, different forms of financial analysis based on financial report information are addressed. Throughout the course, emphasis is placed on the manager or user perspective. Attention is given to the federal government financial reporting model and standards.	4
GB3051	**COST MANAGEMENT** This course introduces students to cost management concepts and theories which are used by managers to make decisions on the allocation of financial, physical, and human resources to achieve strategic as well as short-term organizational goals and objectives and evaluate performance using financial and non-financial measures. The course is designed for those having a prior course in financial reporting and analysis or financial accounting. Cost management includes traditional tools and techniques such as cost behavior for decision making, activity costing, cost allocation, and standard costing.	3
GB3010	**MANAGING FOR ORGANIZATIONAL EFFECTIVENESS** Organizations, including defense organizations, are complex, purposive, open systems. As open systems, they face challenges of external adaptation and effectiveness and of internal coherence and efficiency. Our purpose is to understand the structures and processes that make up organizations in order to appreciate how they succeed and why they falter or fail. Our focus is on organizational diagnosis, which requires us to apply relevant theories to evaluate organizational performance. To do this, we will examine topics that include: organizational structure, motivation and reward systems, organizational culture, power and conflict, effective teams, and the leadership characteristics involved in effectively managing today's organizations. Although these topics are relevant to all organizations, we will pay special attention to their application in the context of the DoD and military organizations.	4

GB3042	**OPERATIONS MANAGEMENT** This course provides an overview of operations in military and commercial systems. The course has three sections: (1) Creating processes, including a survey of process types, capacity planning, and service system design; (2) Controlling processes, including MRP/ERP systems and the role of information; and (3) Coordinating processes, including inventory management, purchasing, and supply chain management.	4
GB3040	**MANAGERIAL STATISTICS** This course focuses on the descriptive and inferential statistical concepts useful for conducting basic managerial analysis. Topics include descriptive statistics for quantitative and qualitative data, basic probability concepts and distributions, sampling distributions, interval estimation, hypothesis testing, goodness-of-fit tests, contingency table tests, and multiple regression analysis.	4
GB3041	**ANALYTICAL TOOLS FOR MANAGERIAL DECISIONS** GB3041 continues the development and understanding of the analytical process and the role of analysis in business. Building on skills from GB3040, students will expand their ability to formulate problems and identify solution methods. Topics and tools covered in GB3041 include sampling theory and sampling design strategies, survey methods, observational studies and experimentation, measurement scales, process quality control, time series smoothing methods, probabilistic and risk analysis, assessing the implications of modeling assumptions, and presenting analyses in clear, comprehensive and convincing format.	4
GB3012	**COMMUNICATION FOR MANAGERS** This course provides DoD and international military officers and civilians with the communication strategies and skills to manage and lead in the dynamic DoD environment. Instruction focuses on assessing various communication models, making strategic media choices, writing effective informative documents, developing associates' communication competencies through various feedback roles, and giving lucid briefings.	3
MN3111	**ANALYSIS OF HUMAN RESOURCE MANAGEMENT** A broad coverage of human behavior in the work situation, with key emphasis on the issues of work in the Navy Manpower Personnel and Training Environment. Topical areas covered include selection, placement, training development, and evaluation of personnel; motivation, remuneration, morale, supervision, and working conditions in military organizations; job design and organization development within complex military bureaucracies; equipment design and man-machine interface, and the impact of technological programs within the military.	4
MN4110	**MULTIVARIATE MANPOWER DATA ANALYSIS I** An introduction to multivariate data analysis. This section will focus on the tools necessary to perform data analysis. The primary goal of this course is to introduce multiple linear regression models. The second goal involves making correct inferences and interpretations of the findings. Special topics include hypothesis testing, model specification issues, multicollinearity, dummy variables, and research methodology.	4
MN4111	**MULTIVARIATE MANPOWER DATA ANALYSIS II** An introduction to the specialized multivariate techniques used for analysis of military manpower data. Topics include advanced linear estimation techniques, such as panel data analysis and two-stage models. In addition, nonlinear methods are introduced, such as binary choice models and survival analysis. The course also covers special techniques for policy evaluation and reduction of estimation bias due to omitted variables or sample selection.	4

	Students apply techniques to manpower databases.	
MN4106	**MANPOWER / PERSONNEL POLICY ANALYSIS** Study and analysis of military manpower / personnel policy alternatives with emphasis on identifying the trade-offs involved, the dynamic impact of major policy decisions and the short-term and long-term consequences of decisions. Review, use and evaluation of tools to aid in selecting policy alternatives. Analysis of issues in the DoD and military services.	4

Total core hours scored: 50

Concentration

MN4119	**NAVY MANPOWER REQUIREMENTS PROCESS** An in-depth analysis of fleet and shore unit Manpower requirements and personnel documents. The course will cover the determination and validation of fleet requirements as they pertain to an operational unit's Required Operational Capabilities and Projected Operational Environment and the resulting Ship Manpower Document (SMD), Squadron Manpower Document (SQMD), and Fleet Manpower Document (FMD); and how the Shore Manpower Requirements Determination Process (SMRDP) links the Mission, Function and Task statement to the resulting Statement of Manpower Requirements (SMR). The course covers how fleet and shore manpower documents link with the Activity Manpower Document (AMD). The Personnel sub-process will be studied as it relates to the Enlisted Distribution and Verification Report (EDVR) in support of fleet readiness.	3
OS4701	**MANPOWER AND PERSONNEL MODELS** The objective of this course is to introduce the student to the major types of manpower and personnel models for estimating the effects of policy changes on the personnel system. Topics include longitudinal and cross-section models, optimization models, data requirements, and validation. Application in the form of current military models is included.	4
MN4761	**APPLIED MANPOWER ANALYSIS** Application of theoretical models and quantitative techniques to Navy and DoD manpower, personnel, and training issues. Topics include application of cost-benefit and cost-effectiveness analysis techniques to manpower policies, manpower supply models, attrition and reenlistment models, force structure analysis, manpower productivity, and compensation systems. Course uses specialized readings in DoD and Navy manpower.	4

Total concentration hours scored: 11

Total program hours scored: 61

Alternative a_{10}
NPS Defense Systems Analysis Program
(http://www.nps.edu/Academics/GeneralCatalog/Home.htm)
Core Courses

Course Code	Course Name / Description	Credit Hours
GB3070	**ECONOMICS OF THE GLOBAL DEFENSE ENVIRONMENT** This course develops the fundamental tools of microeconomics and macroeconomics, and applies them to defense management and resource allocation. The course centers on defense applications of economic theory. Topics covered include: defense and the macro economy; markets and their interactions with defense acquisition and contracting; national security implications of globalization; and efficiency in defense decision making.	4
GB3050	**FINANCIAL REPORTING AND ANALYSIS** This course covers theory, concepts, and practices underlying financial Accounting and Financial Reporting. The conceptual structure underlying the reporting of economic events in the form of the balance sheet, the income statement, and the statement of cash flows is first presented. Accounting recognition and measurement issues surrounding revenues, expenses, assets, liabilities and equity are introduced and analyzed. Finally, different forms of financial analysis based on financial report information are addressed. Throughout the course, emphasis is placed on the manager or user perspective. Attention is given to the federal government financial reporting model and standards.	4
GB3051	**COST MANAGEMENT** This course introduces students to cost management concepts and theories which are used by managers to make decisions on the allocation of financial, physical, and human resources to achieve strategic as well as short-term organizational goals and objectives and evaluate performance using financial and non-financial measures. The course is designed for those having a prior course in financial reporting and analysis or financial accounting. Cost management includes traditional tools and techniques such as cost behavior for decision making, activity costing, cost allocation, and standard costing.	3
GB3010	**MANAGING FOR ORGANIZATIONAL EFFECTIVENESS** Organizations, including defense organizations, are complex, purposive, open systems. As open systems, they face challenges of external adaptation and effectiveness and of internal coherence and efficiency. Our purpose is to understand the structures and processes that make up organizations in order to appreciate how they succeed and why they falter or fail. Our focus is on organizational diagnosis, which requires us to apply relevant theories to evaluate organizational performance. To do this, we will examine topics that include: organizational structure, motivation and reward systems, organizational culture, power and conflict, effective teams, and the leadership characteristics involved in effectively managing today's organizations. Although these topics are relevant to all organizations, we will pay special attention to their application in the context of the DoD and military organizations.	4
GB3042	**OPERATIONS MANAGEMENT** This course provides an overview of operations in military and commercial systems. The course has three sections: (1) Creating processes, including a survey of process types, capacity planning, and service system design; (2) Controlling processes, including MRP/ERP systems and the role of information; and (3) Coordinating processes, including inventory	4

	management, purchasing, and supply chain management.	
GB3040	**MANAGERIAL STATISTICS** This course focuses on the descriptive and inferential statistical concepts useful for conducting basic managerial analysis. Topics include descriptive statistics for quantitative and qualitative data, basic probability concepts and distributions, sampling distributions, interval estimation, hypothesis testing, goodness-of-fit tests, contingency table tests, and multiple regression analysis.	4
GB3020	**FUNDAMENTALS OF INFORMATION TECHNOLOGY** Successful organizations in today's Information Age are more dependent than ever on information technology (IT). This course provides business students and other non-IT majors a broad overview of computer technology, information systems, database/knowledge management, networks and information security. The course focuses on IT as a tool to support business processes throughout an organization, regardless of functional specialty. The study of principles and theory is combined with hands-on laboratory exercises to improve both IT literacy and competency. The knowledge and skills acquired will make the students more effective IT users and help them recognize opportunities where the application of IT solutions can provide a strategic advantage.	4
GB3012	**COMMUNICATION FOR MANAGERS** This course provides DoD and international military officers and civilians with the communication strategies and skills to manage and lead in the dynamic DoD environment. Instruction focuses on assessing various communication models, making strategic media choices, writing effective informative documents, developing associates' communication competencies through various feedback roles, and giving lucid briefings.	3
GB4052	**MANAGERIAL FINANCE** This course provides an overview of the basic concepts and principles of financial management in the private sector and its implication on government contracting. It is designed to provide insights into the financial decision-making process encountered by commercial enterprises. The major emphasis is on financial environment, risk and return analysis, valuation models, cost of capital determination, optimal capital structure, and short-term and long-term financing.	3
GB4071	**ECONOMIC ANALYSIS AND DEFENSE RESOURCE ALLOCATION** Develops the tools and techniques of economic efficiency to assist public sector decision makers in analyzing resource allocation in government activities. Focuses on developing the principles of cost-benefit analysis (CBA) and cost-effectiveness analysis (CEA). Stresses the application of CBA and CEA to specific investment projects, programs and policies in the federal government, especially in the Department of Defense.	4
NW3230	**STRATEGY & POLICY: THE AMERICAN EXPERIENCE** The S&P course is designed to prepare the military officer for the mid-level to advanced stages of a professional career in which he or she may be intimately involved in the interplay between military power and the political process – that is, between strategy and policy. The course uses historical examples to demonstrate the military officer's urgent need for a joint and combined warfare perspective on the military profession. That perspective significantly enhances the ability of strategic thinkers and war-fighters to wield the military instrument in support of national goals. In the early stages of an officer's career he or she is trained in tactics. The S&P curriculum, in contrast, is designed to teach officers to think strategically. The course	4

	illustrates the relationship between a nation's political interests and goals and the ways military force may be used to achieve them. It focuses on a series of studies that begins with interests, continues through conflict and ends with the final post-war settlement. Academic disciplines of history, political science, military studies, and international relations are woven into a coherent analysis of how wars begin, how they are fought and how they end. The Strategy & Policy course hones the officer's ability to analyze past operations and apply historical lessons to future joint and combined operations. Three facets of the course develop strategic thought. First and foremost, the course focuses extensively on the strategic analyses that are the cornerstone of strategic thought, particularly the works of Clausewitz, Sun Tzu, Mahan and Corbett. Second, the masters' work is used to analyze strategic decisions made during several historical conflicts. Collectively these case studies sharpen the student's understanding of the essence of strategy. Clear, objective and imaginative thinking is the framework for the final part of the course where students consider recent wars as well as conflicts that may occur in the future.	
GB4043	**BUSINESS MODELING AND ANALYSIS** This course introduces mathematical modeling for a sound conceptual understanding of the decision-making process. This course familiarizes the students with applications, assumptions, and limitations of the quantitative methods in modeling. It focuses on the development of mathematical and spreadsheet models, the verification of those models, sensitivity analysis of the solutions generated from a model, and the implementation of those solutions. Some of the topics covered include linear programming, non-linear and integer programming, simulation, and forecasting. The process of modeling and particular modeling tools are applied to business problems in finance, acquisition, logistics and manpower planning.	3
GB4053	**DEFENSE BUDGET AND FINANCIAL MANAGEMENT** This course analyzes the resource requirements process within the Department of Defense (DoD) and in the executive and legislative branches of the federal government. It begins with a summary of the current threat situation and potential changes to it. Once the threat is defined, the study of the resource allocation process to meet the threat begins. The course covers the resource planning and budgeting processes of the Department of the Navy, DoD and the federal government. It includes the politics of executive and congressional budgeting, and DoD budget and financial management processes and procedures including budget formulation and execution. It also includes analysis of the Planning, Programming, Budgeting and Execution system (PPBES) used by DoD to plan, budget and implement national defense resource management policy and programs. Other areas included are budget process and fiscal policy reform and the dynamics of internal DoD competition for resources. Executive and congressional budget processes are assessed to indicate how national security policy is resourced and implemented through the budget process. Spending for national security policy is tracked from budget submission through resolution, authorization and appropriation. Budget formulation, negotiation, and execution strategies are evaluated to indicate the dynamics of executive-legislative competition over resource allocation priorities. Supplemental appropriation patterns and current year budget execution patterns and problems are also considered.	4
GB4014	**STRATEGIC MANAGEMENT** Strategic Management entails the establishment of an organization's direction and the implementation and evaluation of that direction in view of the organization's external environment and its internal capabilities. The	4

	principal aim of this course is the transfer and adaptation of the principles of business strategic management to the Department of Defense and other government agencies. In previous courses, students concentrated on the functional elements of management (e.g., accounting, finance, acquisition, logistics, contracting, etc.). This course addresses the challenges of setting direction and implementing strategies for the total system or whole organization. Cases and approaches from the public and private sectors enable students to develop the knowledge, skills, and abilities to strategically think, plan, and manage.	
GB4510	**STRATEGIC RESOURCE MANAGEMENT** The objective of this course is to integrate business analysis, financial analysis, and strategic analysis in solving complex management problems involving the allocation of scarce resources to achieve overall organization objectives. Resources here are not limited to financial resources but also include human and physical resources. The course will make use of a wide variety of management tools such as value chain analysis, competitive strategy, market positioning, supply chain management, activity analysis, target costing, cost of quality, and business process improvement techniques.	4

Total core hours scored: 56

Concentration

GB3510	**DEFENSE FINANCIAL MANAGEMENT PRACTICE** This course is designed for MBA students and presumes the student has a foundation including the PPBE system and Congressional Authorization and Appropriation processes. This course concentrates on financial management practices within DoD as distinct from policy and budgeting theory. The course covers the actors and activities and mechanics of building and defending budgets. It covers funding mechanisms for programs and activities, addressing the proper use and management of appropriated, reimbursable, and revolving funds. Basic principles of fiscal law are explored. It then addresses financial management and stewardship topics including budgetary accounting, management of cost drivers, the relationship between comptrollership and contracting, and internal controls. Contemporary financial management issues are discussed. Exercises and case studies are used to develop the students' ability to apply financial management concepts to real life situations.	3
OA4702	**COST ESTIMATION** This course provides a broad-based understanding of the cost analysis activities involved in the acquisition and support of DoD weapon systems. In addition, it introduces operations research techniques fundamental to the field of cost estimation. The course covers the defense systems acquisition process, time value of money, and economic analysis; it develops, uses, and analyzes estimating techniques commonly encountered in both the DoD and industry, including statistical and nonstatistical cost estimating relationships, inflation indices, cost improvement curves, time phasing, and uncertainty analysis.	4
GB4530	**MANAGEMENT CONTROL SYSTEMS** Overview of internal controls processes. Study of the design, implementation, and evaluation of management planning and control systems in Navy and Defense organizations with comparisons to large, complex private sector organizations. Specific topics include the need for planning and control, strategic planning, the resource allocation process, organization of the management control function, measurement of inputs and outputs,	4

	budgeting, reporting, and performance evaluation.	
GB4570	**ADVANCED FINANCE** This course is designed to provide insights into advanced topics in financial decision making process encountered by commercial enterprises. Major topics covered include long-term financing, lease financing, optimal capital structure determination, dividend policy, security issues and refunding, risk analysis and real options, derivatives and risk management.	2
GB4550	**ADVANCED FINANCIAL REPORTING** This course explores management accountability and financial reporting systems in public and private organizations. The course builds on financial accounting foundations presented in an introductory course and on basic concepts covered in cost management, economics, and finance courses. Also included are internal financial controls and auditing which are two management tools used to ensure timely, accurate, and consistent financial information. Professional standards of the Government Accountability office and the American Institute of Certified Public Accountants will be examined, along with relevant regulations and statutes on financial measurements and communication to decision makers, users, and managers.	4
MN3331	**PRINCIPLES OF ACQUISITION AND PROGRAM MANAGEMENT** This course provides the student with an understanding of the underlying concepts, fundamentals and philosophies of the Department of Defense systems acquisition process and the practical application of program management methods within this process. The course examines management characteristics and competencies, control policies and techniques, systems analysis methods and functional area concerns. Techniques for interpersonal relationships will be examined in team exercise settings. Topics, from a program management perspective, include the evolution and current state of systems acquisition management, the system acquisition life cycle, requirements analysis, systems engineering, contract management, resource management, test and evaluation, user-producer acquisition management disciplines and activities; and program planning, organizing, staffing, directing and controlling. Case studies are used to analyze various acquisition issues.	5

Total specialty hours scored: 22
Total program hours scored: 78

Alternative a_{11}
NPS Program Management
(http://www.nps.edu/Academics/GeneralCatalog/Home.htm)
Core Courses

Course Code	Course Name / Description	Credit Hours
MN3302	**ADVANCED PROGRAM MANAGEMENT** This course builds on the student's experience in the acquisition workforce. Cases are used to examine each of the major disciplines in the acquisition process and bring each student to a current and common understanding of the acquisition environment, process, requirements and management approaches.	2
MN3001	**ECONOMICS FOR DEFENSE MANAGERS** This course develops the fundamental tools of microeconomics and macroeconomics and applies them to topics in the management and allocation of defense resources. Although fundamental economic principles are covered, the course stresses the applications of economic theory to dense issues and policies. Topics covered include: macroeconomic aspects of defense spending and budgeting; defense production functions; allocative efficiency in defense labor and capital markets; international economics and national security; and comparative systems.	3
MN3371	**CONTRACTS MANAGEMENT AND ADMINISTRATION** This course is a study of procurement planning, negotiation, and contract administration, including the determination of need, basic contract law, methods of procurement and fundamentals of management techniques. Topics include procurement organizations, procurement by sealed bidding and competitive negotiation, source selection, pricing, types of contracts, negotiating techniques, structuring incentives, the terms and conditions of contracts, managing contract progress, total quality management, change control, cost and schedule control, contract termination, dispute situations, and international contracting issues.	4
MN3115	**MANAGING FROM A SYSTEMS PERSPECTIVE** This course is about leading and managing groups/teams as a system – a system being defined as a "whole" whose elements interact and "hang together" in the pursuit of a common purpose. It begins the process of identifying the basic concepts and components in the management and diagnosis of systems and prepares the student for other courses, which focus on the managerial spectrum from the components of organizations to management of the organizational system as a whole. The course addresses the following specific subject areas: group/team work designs; group/team roles; stages of development; group/team dynamics; team building; building commitment and empowerment self-managing teams; characteristics of high performing teams; and inter-group relations.	2
MN3384	**PRINCIPLES OF ACQUISITION PRODUCTION AND QUALITY MANAGEMENT** This course provides the student with an understanding of the principles and concepts of production an quality management in the DoD acquisition environment. Topics include production/manufacturing techniques, tools, and technology; cost estimating methods; process oriented contract administration; production planning and control; progress payments; producibility issues; quality assurance and control; and support of contract negotiations in production/operations management.	4
MN4474	**ORGANIZATIONAL ANALYSIS** This course concentrates on analysis of acquisition organizations from and	2

	open systems perspective. focus is on tools and techniques for diagnosing managerial problems by analyzing structure, task requirements, technology, culture, and various organization subsystems. The course emphasizes application in that students complete a course project requiring integrated application of the systems model in an analysis of their own acquisition organization.	
EO4011	**SYSTEMS ENGINEERING FOR ACQUISITION MANAGERS** An introduction to the discipline of system engineering and how it is applied over the life cycle of a product. Topics include: the system approach and system design process; translation of mission needs and operational requirements into system technical requirements; the role of performance analysis and tradeoffs in conceptual system design; functional decomposition of systems requirements into element and equipment requirements; designing for reliability, survivability, readiness, maintainability, and supportability; the role of test and development, production, and operational documentation; the role of systems engineering in the DoD acquisition cycle and project management. Intended for acquisition management students.	3
MN3012	**COMMUNICATIONS STRATEGIES FOR EFFECTIVE LEADERSHIP** This course provides DoD military officers and civilians with the communication strategies and skills to manage and lead in the dynamic DoD environment. Instruction focuses on assessing various communication models, making strategic media choices, writing effective informative documents, developing associates' communication competencies through various feedback roles, and giving lucid briefings.	2
MN3309	**ACQUISITION OF WEAPON SYSTEMS SOFTWARE** This course focuses on the key aspects of mission critical computer resources with particular emphasis on major weapon systems embedded software. The course analyzes software development, software risk management, software in the systems acquisition life cycle, software metrics, contracting methods for software, software test and evaluation, and software configuration management. Case studies, reports, software specifications and standards, and other similar documents/materials are used. The course addresses the underlying management principles involved in software acquisition. Significant software acquisition issues and problems are examined and solutions developed.	4
MN3172	**RESOURCING NATIONAL SECURITY; POLICY AND PROCESS** This course analyzes federal policy-making with emphasis on resource decision making for national defense. The roles of principal budge process participants are examined. Executive and congressional budgetary processes are assessed to indicate how national security policy is resourced and implemented through the budget process. Spending for national security policy is tracked from budget submission through resolution, authorization and appropriation. Budget formulation, negotiation, and execution strategies are evaluated to indicate the dynamics of executive-legislative competition over resource allocation priorities. Students examine the DoN/DoD PPB process as it relates to budget planning and execution.	3
MN4602	**TEST AND EVALUATION MANAGEMENT** This course is designed to cover Developmental, Operational, and Joint Test and Evaluation, including planning concepts and procedures frequently used in test and evaluation programs. Taught from the perspective of the Program Manager, Test Project Officer, and Test Engineer. Actual military cases are used for examples. Topics include the role of Test and Evaluation in Systems Engineering and Acquisition Management, DT and OT test	2

	planning, introduction to test design, conduct of tests, live fire testing, modeling and simulation, human systems integration, reporting of test results, range and resource issues, and lessons learned.	
MN4470	**LOGISTICS STRATEGY** The course explores and analyzes the concepts, processes, and methods of strategic logistics planning and execution, emphasizing proactive techniques to ensure maximum logistics influence on major weapon systems acquisition as well as optimum life-cycle management of fielded systems. The course will examine and analyze key opportunities for maximum logistics influence in requirements development, contracting, test and evaluation, reliability and maintainability, as well as financial management and communications. The course will feature logistics management relevance to service roles and missions. The course will employ lectures, guided discussions, case studies, role playing, panel discussions, and lessons learned in the DoD acquisition environment. Upon successful completion of the course, the student will be awarded a DAWIA (Defense Acquisition Workforce Improvement Act) Level III certificate for Acquisition Logistics.	4
MN3155	**MANAGING FROM A SYSTEMS PERSPECTIVE** This course is about leading and managing groups/teams as a system – a system being defined as a "whole" whose elements interact and "hang together" in the pursuit of a common purpose. It begins the process of identifying the basic concepts and components in the management and diagnosis of systems and prepares the student for other courses, which focus on the managerial spectrum from the components of organizations to management of the organizational system as a whole. The course addresses the following specific subject areas: group/team work designs; group/team roles; stages of development; group/team dynamics; team building; building commitment and empowerment self-managing teams; characteristics of high performing teams; and inter-group relations.	2
MN4105	**STRATEGIC MANAGEMENT** Study and analysis of complex managerial situations requiring comprehensive integrated decision-making. Topics include operational and strategic planning, policy formulation, executive control, environmental adoption, and management of change. Case studies in both the public and private sectors are used. Particular attention is given to strategic management in the military contest, and in the DoD, DoN organizations.	2
MN4307	**PROGRAM MANAGEMENT POLICY AND CONTROL** This course provides the student with knowledge and understanding of major systems management and control processes and tools, application of program management control systems, and use of computer-based management information systems with emphasis on real world, practical systems for performance, cost and schedule control. Case studies involving program management problem solving and decision-making in the acquisition environment are used.	4

Total core program hours scored: 43

No concentration or specialty.

Alternative a_{12}
NPS Executive MBA Program
(http://www.nps.edu/Academics/GeneralCatalog/Home.htm)
Core Courses

Course Code	Course Name / Description	Credit Hours
GE3011	**MANAGEMENT OF TEAMS** Teams are a building block of today's organizations. Teams are evident throughout DoD in such forms as operational squads, integrated product teams (IPTs), R&D innovation teams, and Joint Task Forces. The course examines the differences between groups and teams, between leader-managed and self-managed teams, between virtual and face-to-face teams, and between effective and ineffective teams. Analysis of effective teams include such issues as team dynamics, decision making, rewards, commitment, and the management of conflict (inter-personal, intra-team, and inter-team) in which power, influence and negotiation play central parts.	2
GE3050	**FINANCIAL REPORTING AND ANALYSIS** This course covers theory, concepts, and practices underlying Financial Accounting and Financial Reporting. The conceptual structure underlying the reporting of economic events in the form of the balance sheet, the income statement, and the statement of cash flows is first presented. Accounting recognition and measurement issues surrounding revenues, expenses, assets, liabilities and equity are introduced and analyzed. Finally, different forms of financial analysis based on financial report information are addressed. Throughout the course, emphasis is placed on the manager or user perspective. Attention is given to the Federal Government financial reporting model and standards.	3
GE3109	**ETHICS AND MORAL DEVELOPMENT** The objective of this course is to provide newly-enrolled Executive MBA students with an introduction to the ethical challenges of the global Defense business environment facing Navy corporate business leaders and resource managers. Through the use of case analyses and discussion, the course will explore the application of ethical thinking to contemporary issues in the private and public sectors. The course goals include: 1) introduce ethical concepts which are relevant to the moral and ethical dilemmas inherent in business decisions; 2) help students develop the critical thinking and analytical skills required to address complex issues; 3) identify the range of ethical problems facing senior leaders in business and Government; and 4) encourage the students to develop a personal approach to achieve ethical outcomes in the corporate-level decision making process. The students will use the managerial perspective and critical thinking skills developed in this course throughout the remainder of their studies to identify the ethical dimension in the process of formulating and implementing Navy policy and business strategies required to build and maintain the Fleet of the 21st Century.	3
GE3051	**COST MANAGEMENT** This course introduces students to cost management concepts and theories which are used by managers to make decisions on the allocation of financial, physical, and human resources to achieve strategic as well as short-term organizational goals and objectives and evaluate performance using financial and non-financial measures. The course is designed for those having a prior course in financial reporting and analysis or financial accounting. Cost management includes traditional tools and techniques such as cost behavior for decision making, activity costing, cost allocation, and standard costing; and	3

	recent developments in target costing, total quality management, life-cycle costing, and value-chain analysis.	
GE3010	**ORGANIZATIONS AS SYSTEMS AND STRUCTURES** Defense organizations are purposive systems comprising tasks and technologies, vertical and lateral coordination structures and processes, reward systems, and individual motivation. This course prepares leaders to understand the organizational system components and their relationships: inputs (e.g., environment, history), design factors (i.e., people, task, structure, culture) and outputs/outcomes (e.g., productivity, satisfaction, and growth. A primary focus is on the organizational level of analysis and includes such topics as environment, hierarchy and structural configuration, ideology and doctrine with special emphasis on the context and organization of DoD. Applications and cases in command and control, joint task forces and network centric operations are related to organizational theory and design tradeoffs.	3
GE3070	**ECONOMICS FOR DEFENSE MANAGERS** Develops the fundamental tools of microeconomics and macroeconomics, and applies them to defense management and resource allocation. Course centers on defense applications of economic theory. Topics covered include: defense and the macro economy; markets and their interactions with defense acquisition and contracting; national security implications of globalization; and efficiency in defense decision-making.	3
GE3221	**PRINCIPLES OF ACQUISITION AND PROGRAM MANAGEMENT I** This is the first of two courses which provides the student with an understanding of the underlying concepts, fundamentals and philosophies of the Department of Defense systems acquisition process and the practical application of program management methods within this process. The course examines management characteristics and competencies, control policies and techniques, systems analysis methods and functional area concerns. Techniques for interpersonal relationships will be examined in team exercise settings. Topics, from a program management perspective, include the evolution and current state of systems acquisition management, the system acquisition life cycle, requirements analysis, systems engineering, contract management, resource management, test and evaluation, user-producer acquisition management disciplines and activities; and program planning, organizing, staffing, directing and controlling. Case studies are used to analyze various acquisition issues.	3
GE3043	**ANALYTICAL TOOLS FOR DECISION MAKING** The objective of this course is to enhance students' ability to solve complex managerial problems and make decisions under conditions of uncertainty and competing objectives through the use of computer-based modeling techniques. The course incorporates probability material, decision models and decision analysis, decision trees, forecasting and simulation. The interactive environment of the electronic spreadsheet is used to provide an intuitive understanding of basic principles (e.g., understanding uncertainty and risk with Monte Carlo simulation rather than mathematical analysis).	3
GE3222	**PRINCIPLES OF ACQUISITION AND PROGRAM MANAGEMENT II** This is the second of two courses which provides the student with an understanding of the underlying concepts, fundamentals and philosophies of the Department of Defense systems acquisition process and the practical application of program management methods within this process. The course examines management characteristics and competencies, control policies and techniques, systems analysis methods and functional area concerns. Techniques for interpersonal relationships will be examined in team exercise settings. Topics, from a program management perspective, include the evolution and	3

	current state of systems acquisition management, the system acquisition life cycle, requirements analysis, systems engineering, contract management, resource management, test and evaluation, user-producer acquisition management disciplines and activities; and program planning, organizing, staffing, directing and controlling. Case studies are used to analyze various acquisition issues.	
GE4052	**MANAGERIAL FINANCE** Study of capital budgeting techniques. This course provides an overview of the basic concepts and principles of financial management in the private sector and its implication on government contracting. It is designed to provide insights into the financial decision making process encountered by commercial enterprises. The major emphasis is on financial environment, risk and return analysis, valuation models, cost of capital determination, optimal capital structure, and short-term and long-term financing.	3
GE3042	**OPERATIONS MANAGEMENT** An overview of operations in military and commercial systems. The course has three sections: (1) Creating processes, including a survey of process types, capacity planning, and service system design; (2) Controlling processes, including MRP/ERP systems and the role of information; and (3) Coordinating processes, including inventory management, purchasing, and supply chain management.	4
GE4053	**DOD MISSION AND RESOURCE DETERMINATION** This course analyzes the resource requirements process within the Department of Defense and in the Executive and Congressional branches of the federal government. The course begins with a summary of the current threat situation and potential changes to it. Once the threat is defined, then the study of the resource allocation process to meet the threat can begin. The course then surveys the Planning, Programming, Budgeting System as it operates within DOD and attempts to describe how today's resources are deployed to meet tomorrow's threat. The roles and expectations of the principal PPB players are described as they set about producing the standard outputs of the PPB system. The course then turns to an examination of how the PPB outputs are integrated into the budget and appropriation process within DOD, the executive branch and Congress. The integration of current year needs from the mid-year review is also considered in the budget process with the principal focus being the Department of Navy. The roles of principal budget process participants and the events in which they participate are examined. Executive and congressional budget processes are assessed to indicate how national security policy is resourced and implemented through the budget process. Spending for national security policy is tracked from budget submission through resolution, authorization and appropriation. Budget formulation, negotiation, and execution strategies are evaluated to indicate the dynamics of executive-legislative competition over resource allocation priorities. Supplemental Appropriation patterns and current year budget execution patterns and problems are also considered.	4
GE4043	**DEFENSIVE SUPPLY CHAIN MANAGEMENT** Interest in supply chain management (SMC), both in industry and in academia, has grown substantially over the past decade. Increasing levels of competition across all industries has necessitated that a close attention be paid to supply chain management issues. SCM also plays a vital role in the military operations. This course is therefore designed to provide an introduction to SCM. A supply chain is a network of organizations that supply and possibly transform materials, and distribute final products or services to customers. Supply chain management is a broadly defined term for the analysis and	3

	improvement of flows of material, information, and money through this network of suppliers, manufacturers, distributors, and customers. The objective of SCM is to deliver the right product to the right customer at the right time. SCM emphasizes inventory-service level tradeoffs across the chain of players that together provide the product to a customer. Military SCM poses many challenging problems since the military operates in highly uncertain environments.	
GE3510	**DEFENSE FINANCIAL MANAGEMENT PRACTICE** This course is designed for MBA students and presumes the student has a foundation including the PPBE system and Congressional Authorization and Appropriation processes. This course concentrates on financial management practices within DoD as distinct from policy and budgeting theory. The course covers the actors and activities and mechanics of building and defending budgets. It covers funding mechanisms for programs and activities, addressing the proper use and management of appropriated, reimbursable, and revolving funds. Basic principles of fiscal law are explored. It then addresses financial management and stewardship topics including budgetary accounting, management of cost drivers, the relationship between comptrollership and contracting, and internal controls. Contemporary financial management issues are discussed. Exercises and case studies are used to develop the students' ability to apply financial management concepts to real life situations.	3
GE4016	**MANAGING STRATEGIC CHANGE** The course focuses on senior-level decision-making processes under conditions of significant uncertainty. Part of the process includes assessment of the organization's external environment and its internal capacity to respond to decisions made to be responsive to that environment. The course takes into account the unique context of public organizations, particularly the context of DoD organizations. Furthermore, the course focuses on the challenges of implementing these decisions and evaluating the extent to which the decisions are reaching the desired outcomes and determining what to do if they are not. The overall purpose of the course is to provide opportunities for students to grapple constructively with, and exercise good managerial judgment in, situations that are complex, rapidly changing, multidimensional, and potentially highly consequential in terms of their impact on the future. The course deals with the role of uncertainty in situations and issues that are critical for the long-term future health, survival and prosperity of the organization.	4
GE4100	**COLLABORATIVE PROBLEM SOLVING** Collaborative Problem Solving is a capstone course that uses a project-based learning approach to integrate the knowledge and skills gained thus far in the EMBA. Participants will be introduced to a consulting framework designed to facilitate delivery of the business knowledge and skills learned in the EMBA to their command. Participants will work individually or in a small team to prepare a Project Proposal and a Final Project Report containing recommendations that could solve the command's business problem.	7 Not scored

Total core/program hours scored: 47

No concentration or specialty scored.

Alternative a_{13}
DePaul MBA with Leadership/Change Management Concentration
(http://kellstadt.depaul.edu/html/mbaprograms/mbaProg.shtml)
MBA Core Courses

Course	Name/Description	Credit Hours
MGT 500	**BEHAVIOR IN ORGANIZATIONS** Students will critically examine and creatively solve problems of managing individuals and teams within organizations. Fundamental principles of perception, attribution, motivation and learning will be applied as participants engage in the study of leadership, empowerment, team development, managing change and conflict, decision processes, power and politics and business ethics.	4
GSB 420	**APPLIED QUANTITATIVE ANALYSIS** No description available. Assume like other quantitative methods courses.	4
ACC 500	**FINANCIAL ACCOUNTING** This introduction to financial accounting provides both a theoretical foundation and an opportunity to apply accounting logic in increasingly complex situations. The accounting model and information processing cycle are developed. The content of the income statement, balance sheet, and statement of cash flows are studied in detail and analyzed.	4
MGT 502	**MANAGING OPERATIONS FOR COMPETITIVE ADVANTAGE** At its core, business is about providing a superior product or service. This course analyzes the processes used to deliver products in the marketplace. Several world class firms have demonstrated that effective operations management can be a potent competitive weapon. This course addresses the key operations and logistical issues in service and manufacturing operations, which have strategic as well as tactical implications. Both quantitative and qualitative techniques and principles used by leading organizations are examined. Examples of world class operations are drawn from both the manufacturing and service sectors.	4
ECO 509	**BUSINESS CONDITIONS ANALYSIS** This course teaches students how to use available economic data to assess business conditions. This is done by: (1) evaluating the sources and usefulness of data periodically released by government and private sources, and (2) developing a macroeconomic framework that the student can use to analyze business conditions. Completion of this course will allow students to understand economic news and relate it to their business or job.	4
ACC 555	**MANAGEMENT ACCOUNTING FOR DECISION-MAKING** This course addresses the financial, nonfinancial & ethical dimensions of decision- making. It provides students with a conceptual understanding of cost management and managerial accounting skills. Topics include cost behavior, cost-volume-profit analysis, cost systems, budgeting and control and decision-making. Emphasis is on the interpretation & use of accounting information rather than its creation & accumulation.	4
FIN 555	**FINANCIAL MANAGEMENT** A study of the major decision areas faced by the corporate financial manager and their relationship to the goals of the firm's owners. Specific topics include capital budgeting, capital structure and the cost of capital, dividend policy, and	4

	current asset management.	
MGT 555	**STRATEGIC MANAGEMENT OF HUMAN RESOURCES** This course will help students understand how the management of people is influenced by the social, ethical and legal environment; by diversity in the work place; by the organizational culture; and by the business strategy. The course is taught from an operations management perspective. Students will learn how to effectively perform the following HR activities: selecting employees, developing people, evaluations and rewarding performance, and motivating employees.	4
MKT 555	**DECISIONS IN MARKETING MANAGEMENT** Students are provided with an overview of the marketing process for consumer-oriented firms. Focus is placed on decision-making that aligns a firm's market offerings with the wants and needs of targeted segments of customers within a continuously changing environment. Written cases/projects are part of the course assignment.	4
ECO 555	**ECONOMICS FOR DECISION-MAKING** This course provides students with an opportunity to apply microeconomic principles to managerial decision-making. These principles include those underlying the theories of consumer choice, production and cost as they relate to decisions made by firms and households. Specific topics include consumer demand analysis and estimation; elasticity; production theory; cost structure and estimation; profit maximization; and the effect of market structure on pricing, output and profit.	4
MIS 555	**MANAGEMENT OF INFORMATION TECHNOLOGY** This course focuses on the management and use of information technology (IT). As the use of IT in society grows, particularly in business, our graduates are likely to become responsible for managing some technology resources and to participate in IT planning and development projects as founders, sponsors, team members, managers of development or end-user developers. Students should become effective users and evaluators of information, IT, and information services. The course explores a number of IT-related topics such as the strategic role of IT, IT planning and architecture, building the telecommunication highway system, management issues in systems development, the expanding universe of computing, group support systems, intelligent systems, electronic document management, and managing the human side of systems.	4
GSB 599	**STRATEGIC ANALYSIS FOR COMPETING GLOBALLY** This capstone course views the impact of contemporary issues on corporate strategy. Competitive, cultural, social and ethical issues are examined within the context of a global business environment. The course content emphasizes identifying strategic alternatives, developing corporate and business strategies, and understanding the role of functional activities and organizational processes from a strategic viewpoint. The process of the course involves team interaction, problem-solving, group decision-making, written reports and oral presentations.	4

Total core hours considered: 48

Leadership/Change Management Concentration

MGT 530	**LEADERSHIP IN ORGANIZATIONS** This course utilizes a theoretical framework to provide a foundation of understanding of effective leadership in organizations. The opportunity for	4

	self-assessment of leadership strengths and management styles, as well as reflection and action planning for individual leadership development, is also provided. To enhance self-assessment, there are questionnaires, as well as classroom exercises, experienced in a supportive group environment. Examples of effective organizational leadership are also critically examined in case studies. Current leadership topics to be covered include values and vision, strategy, organizational culture, management style, leading groups and teams, and coaching, thus providing analysis from both the macro and micro organizational levels.	
MGT 535	**CHANGE MANAGEMENT** This course is targeted towards external and internal consultants, as well as managers and other change agents within organizations. Change Management fosters improved competency in the skills necessary during all phases of the change process - from diagnosis, to interventions, through evaluation. Organizational change issues are critically examined, and case studies, exercises, and assessments are utilized, to better understand change from organizational, group, and individual levels. Change models serve as frameworks that emphasize the importance of interactive consultative processes. A major organizational change project is required of all students.	4
MGT 573	**CREATIVITY IN BUSINESS** This course explores the nature and role of creativity in organizations. Theories and modes of creative thinking, and the link between creativity and innovation are presented. The course format is largely experiential, with emphasis on group and individual exercises, techniques, simulations and cases, through which students will investigate the creative process in a variety of organizational settings. The role of managers and team members in nurturing and sustaining a creative enterprise is discussed. The course is designed to open students to the creativity within themselves and organizations, and to the tools with which creativity can be managed to promote innovation and enhance organizational effectiveness as well as satisfaction and quality of work life.	4

Hours considered for electives: 12
Total hours considered for scoring: 60

Alternative a_{14}
GWU MBA - Human Resources Management Concentration
(http://www.gwu.edu/~bulletin/grad/mbad.html)
Core Courses

Course Code	Course Name / Description	Credit Hours
MBAD 205	**HUMAN DYNAMICS IN ORGANIZATIONS** Integrative approach to organizational concepts, management principles, and the effects of leadership styles and human resource policies and practices on organizational performance in a global and competitive work environment.	2 3 qtr
MBAD 210	**FINANCIAL ACCOUNTING** Basic concepts and methods used in financial statements. Use and preparation of the income statement, balance sheet, and statement of cash flows; application of concepts to accounting and reporting issues, including revenue and expense recognition, cash, receivables, inventory, marketable securities, long-lived assets, and debt and equity securities.	2 3 qtr
MBAD 220	**STATISTICAL ANALYSIS FOR MANAGERS** Statistical concepts employed in the solution of managerial problems. Descriptive statistics, frequency distributions, probability, sampling distributions, statistical inference and testing, correlation analysis, regression modeling, analysis of variance. Introduction to forecasting and statistical process control. Statistical software is used for applications.	2 3 qtr
ECON 220	**MANAGERIAL ECONOMICS FOR MBAS** Intermediate microeconomic theory, with emphasis on production and costs, market structure and pricing, risk analysis, and investment theory and capital budgeting.	2 3 qtr
MBAD 230	**MARKETING MANAGEMENT** Emphasis on the marketing process from the viewpoint of the firm. Market analysis, product planning, channels of distribution, pricing, and promotional decision making; developing an integrated marketing plan.	2 3 qtr
MBAD 211	**MANAGERIAL ACCOUNTING** Cost information in managerial decisions and operations of the firm. Cost data collection and analysis. Cost accumulation process. Techniques for using cost data in decision making, planning, control, and performance evaluation and in financial reporting and performance evaluation by others.	2 3 qtr
MBAD 221	**INFORMATION SYSTEMS MANAGEMENT** Management information systems, databases and database management, telecommunications, and enterprise networks. Emerging technologies, including neural networks, multimedia, virtual reality, and videoconferencing. Functional information systems, systems life cycle, knowledge-based systems, computer security and control, and information resource management.	2 3 qtr
MBAD 231	**OPERATIONS MANAGEMENT** Fundamentals of operations management and strategic and tactical decision making. Inventory management, resource allocation, production planning, project management, location and transportation analysis, investment planning, queuing systems, equipment selection and maintenance.	2 3 qtr
MBAD 240	**THE WORLD ECONOMY** Key dimensions of the global economy, including international business opportunities and risks. Trade theory and policy, the balance of payments, foreign exchange markets, exchange rate systems and risks, and international payment systems. Foreign direct investments. The changing role of	2 3 qtr

	multinational corporations; elements of international corporate strategies.	
MBAD 250	**FINANCIAL MANAGEMENT** Theory, policy, and practice in financial management; financial analysis, sources of funds, investing, capital budgeting and structure, risk analysis, cost of capital, and dividend policy.	2 3 qtr
MBAD 260	**BUSINESS AND PUBLIC POLICY** Political, legal, economic, and ethical forces acting on business. Interaction of the market system and public policy process in the development of law and regulation.	2 3 qtr
MBAD 270	**STRATEGY FORMULATION AND IMPLEMENTATION** An integrative approach to strategic management, stressing formulation, implementation of strategy and policy, and evaluation and control of strategy in various types of organizations. An intramural case competition is required. MBAD 270 must be taken in the first semester immediately following the completion of all other core course requirements.	3 4.5 qtr

Total Core hours: 37.5 quarter equivalent hours

Human Resources Management concentration

MGT 252	**GLOBAL HUMAN RESOURCE MANAGEMENT** International applications of human resource management functions. Selection, preparation, and compensation of U.S. managers and executives for service abroad. Adaptation of human resource management policies to conform to specific cultural environments.	3 4.5 qtr
MGT 253	**LEADERSHIP AND EXECUTIVE DEVELOPMENT** Theories of managerial leadership; issues and problems associated with leadership in large organizations at higher management levels: executive selection and development.	3 4.5 qtr
MGT 254	**LABOR MANAGEMENT RELATIONS AND NEGOTIATIONS** Labor-management relations in both union and nonunion settings. Emphasis on negotiation and conflict resolution, arbitration and grievance procedures, public-sector labor relations, labor laws and public policy, and global labor relations issues.	3 4.5 qtr
MGT 257	**PERFORMANCE MANAGEMENT** Comprehensive review of performance appraisal and training and development. Students learn to develop customized training programs that relate to the performance appraisal process.	3 4.5 qtr

Total concentration hours considered: 18 quarter equivalent
Total hours considered for scoring (Quarter equivalent): 55.5

Alternative a_{15}
GWU Human Resources Management Program
(http://nearyou.gwu.edu/hrm/curriculum.html#degree_requirements**)**
Core Courses

Course Code	Course Name / Description	Credit Hours
ORSC 209	**MANAGEMENT SYSTEMS** An overview of theoretical frameworks, evolution, concepts, and methods of complex organizational systems. Modern organization theory using systems thinking and concepts. Organizational and management systems paradigm shifts. Problem solving and decision making, stakeholder theory, organizational environments, organizational effectiveness.	3 4.5 qtr
ECON 219	**MANAGERIAL ECONOMICS** Intermediate microeconomic theory, with emphasis on production and costs, market structure and pricing, risk analysis, and investment theory and capital budgeting.	3 4.5 qtr
PSYC 245	**SEMINAR: ORGANIZATIONAL BEHAVIOR** Analysis of organizational behavior; emphasis on motivation and productivity. Recent research on employee attitudes, primary group, supervisory leadership, formal and informal organization, job design.	3 4.5 qtr
STAT 104	**STATISTICS IN MANAGEMENT, ADMINISTRATION, AND POLICY STUDIES** Introductory study of statistical techniques for research problems. For graduate students in fields other than statistics who have no previous statistics training.	3 4.5 qtr
ORSC 212	**CURRENT ISSUES IN PERSONNEL TESTING AND SELECTION** Psychometric, legal, and organizational issues in personnel employment testing and selection, reliability and validity of selection instruments, and the utility of selection systems. The legal environment, including test fairness in selection, adverse impact, and statistical models of test fairness and specific selection techniques.	3 4.5 qtr
ORSC 214	**PERSONNEL TRAINING AND PERFORMANCE APPRAISAL SYSTEMS** Management training programs and training evaluation techniques. Performance appraisal techniques, appraisal systems, relationship of rewards to performance and the appraisal interview. Training and rating systems that satisfy legal requirements and stimulate employee productivity.	3 4.5 qtr
ORSC 222	**THEORY AND PRACTICE OF COMPENSATION MANAGEMENT** Analysis of contemporary compensation systems from both theoretical and practical perspectives, including the latest decisions of courts and regulatory agencies. Examination of motivational theories of pay, determinants and effects of salary structures on performance, incentive plans, performance-based compensation, and managerial compensation systems.	3 4.5 qtr
ORSC 223	**COLLECTIVE BARGAINING** Analysis of federal and state employee relations laws and regulations. Topics include the bargaining environment, wage and benefit issues in arbitration, arbitration of grievances, employee relations in non-union organizations, and behavioral theories of labor negotiations.	3 4.5 qtr
ORSC 248	**STRATEGIC HUMAN RESOURCES PLANNING** Overview of the principles of human resource planning. Model for determining human resource requirements, including forecasting, goal setting, human resource auditing, and environmental scanning. Analysis of	3 4.5 qtr

	the interfaces between human resource planning and personnel selection, job design, training, compensation, and related functions.	

Total Core hours: 40.5 quarter equivalent hours

Selected elective: Information Systems

ORSC 249	**HUMAN RESOURCES INFORMATION SYSTEMS** Analysis of information systems designed to support planning, administration, decision making, and control activities of human resource management. Examination of applications such as personnel selection and performance appraisal systems, payroll and benefit management, and career pathing.	3 4.5 qtr

Total Elective hours considered: 4.5 quarter equivalent

Total hours considered for scoring (Quarter equivalent): 45

Alternative a_{16}
GWU Organizational Management Program (http://nearyou.gwu.edu/om/)
Core Courses

Course Code	Course Name / Description	Credit Hours
ORSC 209	**MANAGEMENT SYSTEMS** An overview of theoretical frameworks, evolution, concepts, and methods of complex organizational systems. Modern organization theory using systems thinking and concepts. Organizational and management systems paradigm shifts. Problem solving and decision making, stakeholder theory, organizational environments, organizational effectiveness.	3* 4.5 QTR
ECON 219	**MANAGERIAL ECONOMICS** Intermediate microeconomic theory, with emphasis on production and costs, market structure and pricing, risk analysis, and investment theory and capital budgeting.	3 4.5 qtr
PSYC 245	**SEMINAR: ORGANIZATIONAL BEHAVIOR** Analysis of organizational behavior; emphasis on motivation and productivity. Recent research on employee attitudes, primary group, supervisory leadership, formal and informal organization, job design.	3 4.5 qtr
STAT 104	**STATISTICS IN MANAGEMENT, ADMINISTRATION, AND POLICY STUDIES** Introductory study of statistical techniques for research problems. For graduate students in fields other than statistics who have no previous statistics training.	3 4.5 QTR
ORSC 216	**THEORIES AND MANAGEMENT OF PLANNED CHANGE** A systems view of organizational change and development, including intervention strategies, data collection, diagnosis, and the integration and management of system-wide organizational change.	3 4.5 QTR
ORSC 241	**STRATEGIC MANAGEMENT AND POLICY FORMATION** Processes and theories of strategic management in the profit and not-for-profit sectors. Analysis of behavioral, sociopolitical, and economic forces underlying strategy formulation. Issues of strategic competitive advantage; corporate diversification; multinational corporations; evaluation and choice; and implementation of functional and corporate strategies.	3 4.5 QTR
ORSC 242	**ORGANIZATIONAL COMMUNICATION AND CONFLICT MANAGEMENT** Theories and models of communications and communication media; barriers to effective communication and techniques for improving interpersonal, group, and organizational communications. Sources of conflict in organizations at the individual, group, and organizational levels; methods of conflict management and resolution.	3 4.5 QTR
ORSC 243	**SEMINAR: LEADERSHIP IN COMPLEX ORGANIZATIONS** The view of leadership taken in this seminar extends theories beyond the interpersonal, near-immediate time frame toward an organizational perspective in which cause-and-effect linkages are traced. The leadership role as an attribute of a system. How effective leaders reduce uncertainty through appropriate adaptive change.	3 4.5 QTR
PSYC 259	**PSYCHOLOGY OF INDIVIDUAL AND GROUP DECISION MAKING** Examination of processes in organizational decision making and group behavior. Topics include group and individual decision-making approaches, decision aids and support systems, performance and decision effectiveness, and risk analysis.	3 4.5 QTR

Total Core hours: 40.5 quarter equivalent hours

Selected elective: Information Systems

ORSC 249	**HUMAN RESOURCES INFORMATION SYSTEMS** Analysis of information systems designed to support planning, administration, decision making, and control activities of human resource management. Examination of applications such as personnel selection and performance appraisal systems, payroll and benefit management, and career pathing.	3 4.5 QTR

Total Elective hours considered: 4.5 quarter equivalent
Total hours considered for scoring (Quarter equivalent): 45

Alternative a_{17}
GWU Political Science – Field of Public Policy
(http://www.gwu.edu/%7Ebulletin/grad/psc.html)
Core Courses

Course Code	Course Name / Description	Credit Hours
PSC 203	**APPROACHES TO PUBLIC POLICY ANALYSIS** Empirical and normative foundations of systematic policy analysis: concepts, theories, models, issues, strengths, limitations, and uses and misuses in the policy process.	3 4.5 qtr
PSC 210	**AMERICAN POLITICAL PROCESS** A survey of American political institutions, processes, and behavior.	3 4.5 qtr
PSC 212	**URBAN POLICY PROBLEMS** Analysis of public policy issues confronting urban governments; emphasis on the theoretical roots and empirical impact of past and present programs in such areas as housing, education, poverty, and crime.	3 4.5 qtr
PSC 215	**JUDICIAL POLICYMAKING** Role of the judiciary in policy formulation; emphasis on the U.S. Supreme Court and civil liberties issues.	3 4.5 qtr
PSC 217	**EXECUTIVE BRANCH POLITICS** Structure and operation of governmental bureaucracy with particular emphasis on the politics of formulating and implementing public policy.	3 4.5 qtr
IAFF 220	**SCIENCE, TECHNOLOGY, AND PUBLIC POLICY** Introduction to the study of science, technology, and public policy; focus on policy issues that arise from interactions between scientific and technological developments and government activity.	3 4.5 qtr
IAFF 223	**U.S. SPACE POLICY** Investigation of the origins, evolution, current status, and future prospects of U.S. national space policy and the space programs of the U.S. government in their international context.	3 4.5 qtr
IAFF 225	**ENVIRONMENTAL POLICY** A seminar examining public policy designed to protect the human and physical environment; focus on the ways science and technology simultaneously create new environmental problems and contribute to their mitigation and prevention.	3 4.5 qtr
PSC 229	**POLITICS AND PUBLIC POLICY** Examination of political processes that influence policy formulation, policy implementation, and the uses of policy analysis.	3 4.5 qtr
PSC 246	**THE POLITICS OF U.S. FOREIGN POLICY** Patterns and problems in contemporary U.S. foreign policy. Special attention given to the domestic political factors shaping foreign policy.	3 4.5 qtr
PSC 247	**U.S. FOREIGN POLICY AFTER THE COLD WAR** Contemporary debate about the substance of American foreign policy in the post-Cold War world through the lens of alternative theoretical approaches to the study of international relations. Classical realist (national interest), neorealist (balance of power), neoliberal (international interdependence and institutions), and constructivist (national identity) interpretations are compared.	3 4.5 qtr

Total hours considered for scoring: 49.5

Alternative a_{18}
Milano Organizational Change Management
(http://www.newschool.edu/Milano/acad_org_change.aspx?s=3:2:4)
Core Courses

Course (N/A)	Name / Description	Credit Hours
No course numbers provided on line	**MANAGERIAL ECONOMICS** This course focuses on how organizations can achieve their objectives most efficiently. The basic tools of microeconomics are applied to real-world management issues. Upon completion of the course, you will be able to identify the economic concepts needed to solve practical managerial problems, understand and evaluate various methods of measuring economic relationships, utilize empirical analysis for managerial decision-making, and better understand the economic environment in which a typical for-profit or nonprofit firm must operate.	3 4.5 Qtr
	QUANTITATIVE METHODS This course covers basic statistical methods and how to apply them to policy analysis and management decision-making. Students develop an appreciation for statistics, become statistically literate, learn to use statistical techniques properly, gain confidence using SPSS software, and acquire the skills necessary to look at statistical analyses critically.	3 4.5 Qtr
	MANAGEMENT AND ORGANIZATIONAL BEHAVIOR The course examines organizations from the perspectives of the individual, the group, and the organizational system, with a focus on human behavior and organizational structures and processes. You focus on the critical thinking and practical applications required to solve organizational problems. To deepen understanding of the sources and possible solutions to problems, the course reviews theories that attempt to explain behavior in organizations, which managers use to analyze situations and devise effective practices.	3 4.5 Qtr
	POLICY ANALYSIS This core course develops the policy analytic framework for decision-making, including cost-benefit analysis, cost-effectiveness analysis and financial analysis. It is designed as part of a two-semester sequence that includes a lab.	3 4.5 Qtr
	FOUNDATIONS OF ORGANIZATIONAL CHANGE Foundations is the basic, beginning course in the Milano Organizational Change Management sequence. It explores the contribution of the discipline of Organizational Development to current practice, defines models, approaches and understandings of the way organizations are helped to achieve successful change. The OCM competency model is introduced to assist self and professional understanding.	3 4.5 Qtr
	ORGANIZATIONAL ASSESSMENT AND DIAGNOSIS The course covers a range of methodologies for collecting, organizing, and analyzing data. We explore data collection through such strategies as survey instruments, structured interviews, and focus groups. This is coupled with techniques for analyzing complex data. Also emphasized is managing the data feedback process so that clients can understand the assessment, envision the necessary steps to improve performance and remain committed to the resolution of the identified problems.	3 4.5 Qtr
	GROUP PROCESSES, FACILITATION, AND INTERVENTION This course is primarily a laboratory training experience based on a model refined over the decades by National Training Laboratories. The classic NTL model, which focuses on personal and group development, is adhered to, but is significantly supplemented to provide a rich experience for understanding and applying group-process theory. Further opportunities to develop and practice sophisticated group-facilitation skills are provided.	3 4.5 Qtr

	ORGANIZATIONAL CHANGE INTERVENTIONS The course is built around Chris Argyris' definition: "to intervene is to enter into an ongoing system of relationships, to come between or among persons, groups, or objects for the purpose of helping them." It emphasizes the nature of organizational change, the characteristics of the change agent, and the process of successful intervention into the life of an organization. The focus is on individual, group or team, and organization-wide interventions. Each session explores an intervention element through lecture, case studies, video, individual and work group inputs. In addition, students engage in selected intervention applications with individuals, groups and within organizations. The objectives of this class are to: • Develop a theoretical understanding of intervention processes and models • Explore organizational change cases and applications • Conduct and analyze selected change interventions • Practice the competencies required to intervene successfully in organizations	3 4.5 Qtr
	MANAGING THE CONSULTANT/CLIENT RELATIONSHIP The relationship between change agent and client is perhaps one of the most important predictive variables affecting a successful organizational change intervention. Students learn and use the collaborative consulting approach at each stage of a simulated consulting process. Special emphasis is placed on techniques for managing client resistance and transference issues, common concerns also encountered in the relationship between psychotherapist and patient.	3 4.5 Qtr
Not scored	**ADVANCED SEMINAR IN ORGANIZATIONAL CHANGE MANAGEMENT** In this capstone course for the Organizational Change Management program, we utilize a modified seminar approach. Students review their experiences and the work they have completed in the curriculum and write a rigorous paper of publishable quality (PPQ) on a topic of their choosing. We strive toward a process of professional collegiality to create a supportive peer-group experience within which we integrate the entire Organizational Change Management academic experience. The course is dependent upon student presentations and interventions, faculty and peer review of written work, faculty coaching, continual feedback, and peer support. Guest speakers help us focus on topics, discover our written "voice," achieve publication placement, and provide their perspective on the convergence of writing and organization development.	3 4.5 Qtr

Total core hours considered: 45 quarter equivalent

Two of four required electives selected

No course numbers provided	**TECHNOLOGICAL STRATEGIES FOR HRM** The effective implementation of technology is key to business success, measured in market share, brand growth, customer retention, employee development, etc. Conversely, we've become aware of the abuses, dangers, and security issues inherent in a world increasingly dependent on technology. The growth of the Internet into a core avenue of information and communications, presumes, for example, that current and future employees require a new set of skills to be successful. At the same time, technology alone does not solve all problems. There must be a balance between technology and human intervention. For human resources managers, it is especially important to stay ahead of that curve and become experts on these broad issues.	3 4.5 Qtr
	FINANCIAL IMPACT OF HUMAN RESOURCES MANAGEMENT STRATEGIES This course focuses on identifying the financial impact of various human resources	3 4.5

	strategies, policies, practices, and trends. The course explores various measurements that provide a financial assessment appropriate to the different areas of human resources management, such as turnover, compensation and salary systems, benefits, staffing, training, and career development. For some topics, the emphasis is on measurement methodologies: Students are expected to learn to apply different measures, complete a variety of calculations, use spreadsheets, and understand the strengths and limitations of different techniques for various issues. For other topics, the emphasis is on analysis and human resources implications.	Qtr

Total hours scored for electives: 9 quarter equivalent

Total program hours considered for scoring: 54 quarter equivalent

Alternative a_{19}
UT Human Resources Development Program (http://hrd.utk.edu/)
Core Courses

Course Code	Course Name / Description	Credit Hours
HRD 510	**FOUNDATIONS OF HUMAN RESOURCES** Students develop a working definition and understanding of the foundations that grid the academic discipline and profession of Human Resources. Students develop knowledge of the historical, theoretical, and philosophical foundations as well as the core models of learning, performance, change and management that promote the best practices in the field. Students are introduced to the disciplines of training and development, human expertise, organizational development, and management including HRD goals and activities.	3 4.5 qtr
HRD 556	**ORGANIZATIONAL DEVELOPMENT STRATEGIES** Overview of the roles, strategies, and challenges of organizational development with a focus on the dynamics of organizational change and the internal integration of organizational culture in global context.	3 4.5 qtr
HRD 557	**DESIGN STRATEGIES** Design methodology for business and industry interventions; development of instructor-based, technology-based, and self-directed training for training and development and consulting.	3 4.5 qtr
HRD 559	**EVALUATION STRATEGIES** Evaluation strategies for professional settings. This course examines the importance of evaluation, how to conduct appropriate evaluations, instrumentation and analysis strategies, how to assess the return-on-investment, and guidelines for creating an evaluation report.	3 4.5 qtr
HRD 561	**STRATEGIC HUMAN RESOURCE DEVELOPMENT** This macro course overviews how human resource development (HRD) increases organizational competitive advantage. Human capital theory, systems theory, and systems integration emerge as theoretical frameworks for linking HRD with business strategy to attain strategic initiatives. Value creation for HRD stakeholders, management of HRD resources, and continuous improvement of HRD processes are emphasized. Students explore the role of HRD in organizational visioning, planning, leadership development, innovating, and economic development.	3 4.5 qtr
HRD 563	**ORGANIZATIONAL COMMUNICATION STRATEGIES** Students investigate organizational communication theory, purposes, channels, practices, styles, approaches, skills, and tools. Process improvement strategies span internal and external communication and target oral, written, and nonverbal communications that occur in face-to-face, technology-mediated, and blended organizational communication contexts.	3 4.5 qtr
MGT 521	**HUMAN RESOURCE MANAGEMENT** Personnel functions and human resources management. Community relations, recruiting, selection, training, performance evaluation, wage and salary administration, legal framework as it affects personnel.	3 4.5 qtr

Total core hours: 31.5 (quarter equivalent)

Selected electives (4 of 5 required)

HRD 517	**CAREER DEVELOPMENT** Examination of processes and practices that facilitate the individual's leadership development, performance improvement and career goals in relation to the organization's present and future human resource needs. Identification of personal responsibilities and organizational opportunities through successful career development systems.	3 4.5 qtr
HRD 518	**HUMAN PERFORMANCE IMPROVEMENT SYSTEMS AND TECHNOLOGIES** This course provides studies of concepts, strategies, tools, and trends of performance improvement technologies. Major emphasis will be on planning, facilitating, and implementation of performance technologies that support HR functions and facilitate their value to organizations.	3 4.5 qtr
HRD 519	**HUMAN RESOURCES PROBLEMS** This course accommodates experiential learning for students who have a background in human resource development (HRD). In an employment context, students identify, analyze, design, develop, implement, and evaluate a practical HRD intervention.	3 4.5 qtr
HRD 520	**COLLABORATIVE STRATEGIES IN HRD** This course examines the strategies for collaboration and teambuilding within organizational systems. The course assists HR professionals understand the processes associated with teambuilding including defining types of teams, rewarding and evaluating team performance, operating principles and communication within teams.	3 4.5 qtr

Total selected electives hours: 18 quarter equivalent

Total hours considered for scoring: 49.5

Alternative a_{20}
UWM Human Resources and Labor Relations Program
(http://www.uwm.edu/Dept/Grad_Sch/Publications/Bulletin/human_resources_labor_relations.html#ms)
Core Courses

Course Code	Course Name / Description	Credit Hours
Ind Rel 701	**INDUSTRIAL AND LABOR RELATIONS.** Industrial relations systems, unions and management as institutions, work place as a socio-economic unit, labor market analysis, human resource management and collective bargaining.	3 4.5 qtr
Bus Mgt 706	**MANAGING IN A DYNAMIC ENVIRONMENT.** Provides frameworks and techniques for managing people and improving organizations. Topics include motivation, group dynamics, leadership, performance management, structure, innovation, power, change, and corporate cultures.	3 4.5 qtr
Bus Adm 738	**HUMAN RESOURCE MANAGEMENT.** Strategies for attracting, retaining and developing a diverse and international workforce. Topics include employment law, diversity, staffing, training, performance management, compensation and current issues.	3 4.5 qtr
Bus Adm 483	**PROPERTY DEVELOPMENT AND MANAGEMENT.** Analysis of real estate development; consideration of site selections, market analysis, financing, design, and construction in connection with subdividing residential community development and shopping centers.	3 4.5 qtr
Econ 753	**COLLECTIVE BARGAINING.** Economic and behavioral theories of collective bargaining, bargaining structure, impasses and truces, union effects, management goals, terms of the agreement and national policy.	3 4.5 qtr
Ind Rel 711	**LABOR RELATIONS LAW.** Legal aspects of labor relations; operations of National Labor Relations Board, representation issues, use of economic weapons, good faith bargaining, enforcement, Wisconsin Employment Relations Commission.	3 4.5 qtr
Bus Mgt 731	**RESEARCH TOOLS FOR PRACTITIONERS IN HUMAN RESOURCES AND LABOR RELATIONS.** Planning and carrying out simple surveys; evaluating policies, programs, and procedures in organizations; interpreting, evaluating and using research conducted by others.	3 4.5 qtr

Total core hours: 21 quarter equivalent

Strategic Human Resource Management specialty

Bus Mgt 712	**STRATEGIC MANAGEMENT.** Tools for strategic thinking and developing competitive strategies. Analysis of forces that shape industry competition and competitive advantage. Management issues and internal functional strategies that lead to effective strategy implementation.	3 4.5 qtr
Bus Adm 733	**ORGANIZATIONAL DEVELOPMENT.** Problems of implementing change. Roles of external and internal consultants. Determining needs and measuring relevant variables.	3 4.5 qtr
Bus Mgt 709	**DATA ANALYSIS FOR MANAGEMENT APPLICATIONS.**	3

	Developing statistical thinking through basic concepts for data analysis. Formulation of regression and related models, diagnostics, interpretations and reporting of statistical results for management applications.	4.5 qtr
Bus Adm 443	**SPECIAL TOPICS IN HUMAN RESOURCES MANAGEMENT** Selected topics in human resources management. Specific topics will appear in the Schedule of Classes whenever the course is offered.	3 4.5 qtr
Bus Adm 795	**SEMINAR-IN-MANAGEMENT** Intensive and critical examination of a specific management problem area or a related research question. Specific topic and additional prerequisites may appear in the schedule of classes each semester. Repeatable with change in topic.	3 4.5 qtr

Total specialty elective hours selected: 22.5

Total hours selected for scoring: 43.5 quarter equivalent

Alternative a_{21}
WSU MBA Program (http://www.wright.edu/cgibin/catalog/grad2006.cgi?id=45)
Core Courses

Course Code	Course Name / Description	Credit Hours
MBA 510	**SURVEY OF ACCOUNTING** Introduction to accounting concepts, procedures and practices. Includes analysis of the effect of transactions on financial position, preparation and analysis of financial statements, and use of accounting information to support management decisions.	4
MBA 520	**SURVEY OF ECONOMICS** An introduction to economics. Provides students with modes of reasoning regarding individual and business behavior and enhances student's ability to understand the aggregate economy and how it influences business decisions.	4
MBA 530	**SURVEY OF FINANCE** Theories, concepts, and techniques of financial management. Designed for student with no previous course work in financial management and for those with a need to review the basic techniques.	4
MBA 580	**SURVEY OF QUANTITATIVE BUSINESS ANALYSIS** Survey of quantitative techniques relevant to private and public sector resource allocation, production, and management decision problems, including linear programming, queueing analysis, and decision theory. Emphasis on mathematical modeling and interpretation of solutions.	4
MBA 710	**STRATEGIC COST MANAGEMENT** Application of advanced management accounting concepts to strategic management decisions.	4
MBA 720	**ANALYSIS OF GLOBAL ECONOMIC CONDITION** Theories, practices, and patterns of international business and the effect of globalization on the business environment. Interrelationships between interest rates, unemployment, economic growth, inflation, and balance of payments impact on businesses.	4
MBA 730	**FINANCIAL ANALYSIS AND DECISION MAKING** Application of finance concepts theories, and techniques of financial management. Emphasis on case problems and decision making.	4
MBA 740	**LEGAL AND ETHICAL DECISION MAKING** Interdisciplinary study of the legal, ethical, and public policy issues in the global environment. Topics include restraints on competition, environmental regulation, product quality, employment, and technology.	4
MBA 750	**LEADING TEAMS AND ORGANIZATIONS** A hands-on, experience-based course devoted to leading people and teams in today's workplace. Emphasizes communication, conflict resolution, influence strategies, and empowerment principles.	4
MBA 760	**MARKETING STRATEGY** Overview of managing the marketing mix variables and discussion of marketing plans, formation of strategies and problem solving. Material will be covered by readings and discussion of cases. Individual and team exercises will be assigned.	4
MBA 770	**INFORMATION TECHNOLOGY AND BUSINESS TRANSFORMATION** Examining the use of IT to improve a firm's operational effectiveness and strategic positioning. Identify and evaluate changes in information and physical flows, cost structures and market forces that IT causes throughout	4

	value chain.	
MBA 780	**SUPPLY CHAIN MANAGEMENT** Explores the fundamentals of supply chain management, including the strategic role of the supply chain, key drivers of supply chain performance, and analytical tools and techniques for supply chain analysis. Cases and in-class exercises.	4
MBA 755	**DEVELOPING AND IMPLEMENTING COMPETITIVE STRATEGIES** Competitive strategy as practiced in organizations from an integrated (cross-functional) perspective. Industries, competition, and other environmental forces are analyzed to determine an organization's competitive strategy. Student team work required.	4

Total core credit hours considered: 48

Program concentration: Management, Innovation, and Change

MGT 706	**ORGANIZATIONAL DEVELOPMENT AND CHANGE** Organization development is presented as an ongoing change process that must be planned and managed. A variety of interventions are explained, and situations are analyzed to determine effectiveness.	4
MGT 766	**MANAGING FOR CREATIVITY AND INNOVATION** Course addresses importance of innovation to organizations, common impediments to innovation, and ways organizations can stimulate, cultivate and implement creative ideas.	4
LAW 620	**LEGAL ASPECTS OF MANAGING A DIVERSE WORKFORCE** U.S. and state employment discrimination law, court decisions, enforcement, and workforce diversity.	4

Total specialty credit hours considered: 12
Total credit hours scored: 60

Alternative a_{22}
WSU Master of Public Administration Program
(http://www.wright.edu/cgibin/catalog/grad2006.cgi?id=40)
Core Courses

Course Code	Course Name / Description	Credit Hours
URS 710	**ENVIRONMENT OF PUBLIC ADMINISTRATION** Examines the legal and political variables that affect the management and operation of local governments with special emphasis on Ohio.	4
URS 711	**URBAN ORGANIZATIONAL THEORY AND MANAGEMENT BEHAVIOR** Analysis of the fundamental behavior concepts and processes involved in public sector organizations. Evaluation of approaches to major behavioral issues such as motivation, leadership, and management development.	4
URS 712	**RESEARCH METHODS IN PUBLIC ADMINISTRATION** Focuses on different aspects of policy evaluation by obtaining facts and analyzing information on impact of public programs. Deals with controversy over the use of objective performance indicators and citizen surveys as program performance measures.	4
URS 713	**PUBLIC PLANNING** Reviews concepts, theories, and practices of community development and planning. Evaluation of current developments in the field with special emphasis on implementation strategies.	4
URS 715	**PUBLIC AND NON-PROFIT BUDGETING** Focuses on the budget process at the city level. Structural influences on the budget process are discussed. Different budget techniques are analyzed and critiqued.	4
URS 716	**PUBLIC HUMAN RESOURCES ADMINISTRATION** Examines personnel functions such as job evaluation, recruitment and selection, performance appraisal, compensation, training, labor relations, and affirmative action.	4
URS 720	**QUANTITATIVE ANALYSIS FOR PUBLIC MANAGERS** Survey of the methodologies and concepts for analyzing the efficiency and effectiveness of decision-making, information management, and processes of the public organization.	4

Total core course hours: 28

Elective selected: Management

URS 675	**MANAGEMENT OF URBAN NONPROFIT AGENCIES** Examines the organizational and managerial foundations of nonprofit organizations. Areas such as the nature and mission of nonprofit organizations, strategies for achieving the mission, roles involved, evaluating performance, resource development/fundraising, and managing volunteers are explored.	4

Total elective hours selected: 4
Total hours considered for scoring: 32

Alternative a_{23}
WSU Education Administration Program – Leadership Specialty*
Core Courses

Course Code	Course Name / Description	Credit Hours
EDL 713	**APPLIED PSYCHOLOGICAL LEARNING THEORY** Selected theories of learning and their value to instructional practices. Emphasis on the relationships among learning theories, learner characteristics, motivational theories, and instructional practices.	4
EDL 751	**STATISTICS AND RESEARCH** Introduction to descriptive and inferential statistics and their application to assessment procedures.	4
EDL 757	**STUDENT ASSESSMENT** Intensive study of formative and summative methods used by teachers to assess student performance and modify or differentiate instruction to meet student needs.	4
EDL 771	**EDUCATIONAL LEADERSHIP BEHAVIOR** Focuses on the development of a strong base of understanding in organizational structure for skill building in leadership, communication, decision-making, and problem-solving. Educational renewal, political considerations, ethical behavior, professional development, and change processes are also included.	4
EDL 773	**CURRICULUM DEVELOPMENT FOR SCHOOL LEADERS** Designed to improve the school leader/administrator-s ability to manage and lead the development and organization of curriculum and materials. This course presents the concepts and skills of curriculum development and shows how to apply these to actual course planning.	4
EDL 775	**INSTRUCTIONAL MANAGEMENT AND EVALUATION** Understanding teaching from research and methodological viewpoints. Emphasis on examining various bases of teaching and improving instruction techniques.	4
EDL 776	**SUPERVISION OF INSTRUCTION AND PERSONNEL** Focus is on the supervision of curriculum and instruction. A systems approach to formative and summative assessment of instruction. The evaluation of curriculum and program effectiveness will be emphasized.	4
EDL 780	**ETHICS AND POLITICS IN EDUCATION** Developing an understanding of potential structures and effective principles of school/community relations. Concepts of power, pressure groups, lobbying, potential networks, and public ethics are examined. Characteristics of effective communication, advisory bodies, and public relations programs are covered.	4
EDL 781	**SCHOOL FINANCE AND ECONOMICS** The financing of public education and the economics of education. Guiding principles for developing financial programs and management procedures are covered.	4
EDL 782	**SCHOOL LAW** Provides an examination of the legal framework that all school personnel must function in. Emphasis on both legal precedents and statutory provisions.	4
EDL 790	**PRACTICUM IN INSTRUCTIONAL LEADERSHIP** Provides educational leadership degree candidates an opportunity to apply concepts and skills to educational practice and to evaluate their own	4

	leadership effectiveness.	
EDT 895	**ADMINISTRATION & SUPERVISION OF EDUCATIONAL TECHNOLOGY** Covers leadership theory and networking; qualifications and duties of the director; planning and administering the program; preparing the budget; buying equipment and handling materials; in-service training and evaluation of the program.	4

Total hours considered for scoring: 48

*Courses required for licensure as a principal not included for scoring. They are not required to earn the masters degree.

Alternative a_{24}
WSU Psychology Program
(http://www.psych.wright.edu/graduateprogram/documents/gradhndbk.pdf)
Core Courses

Course Code	Course Name / Description	Credit Hours
PSY 701	**RESEARCH DESIGN AND QUANTITATIVE METHODS** The foundation of experimental design and quantitative techniques will be developed. Students are expected to understand assumptions underlying each technique or procedure. They must also understand their applications to experimental and field research and to experimental and quasi-experimental designs. Both complex analyses of variance, multiple regression and non-parametric techniques will be covered. Computation and computer skills must be mastered. First year research projects and their design and analysis will be reviewed.	4
PSY 702	**RESEARCH DESIGN AND QUANTITATIVE METHODS: ANOVA** Continuation of PSY 701.	4
PSY 703	**RESEARCH DESIGN AND QUANTITATIVE METHODS: MULTIPLE REGRESSION** Issues in multiple regression are reviewed using statistical software programs. These issues include bivariate regression, continuous and categorical predictors, interaction effects, and statistical power.	4
PSY 732	**PERSONALITY STRUCTURE AND ASSESSMENT** The major approaches for describing personality structure will be discussed and the results of factor analytic studies will be summarized. Implications of personality structure for behavior will be explored and the interactionist model will be described and evaluated. Relevant data on individual differences and tests will be summarized and evaluated. Consistency of differences across situations as well as application of results will be discussed.	4
PSY 753	**GROUP PROCESSES AND SOCIAL BEHAVIOR** Theories and data on social behavior will be reviewed. Topics will include attitude and attitude change, social perception, prejudice, and group decision-making. Possible applications will be discussed.	4
PSY 776	**VISUAL SCIENCE** Study of visual systems including psychophysical measurement, temporal and spatial properties, display criteria, colorimetry, and visual system modeling.	4
PSY 875	**PSYCHOACOUSTICS** Advanced examination of auditory psychophysics and perceptual processes involving consideration of peripheral and central auditory physiology whenever possible.	4
PSY 665	**INFORMATION PROCESSING** Study of cognitive skills (e.g., attention) and the scientific paradigms used in their investigation.	4
PSY 761	**HUMAN LEARNING AND MEMORY** Phenomena, principles, and problems of learning and retention.	4
PSY 721	**ENGINEERING PSCHOLOGY** A survey of psychological principles and methods pertinent to issues of human-machine interactions. It is emphasized that basic and applied research inform each other and are both necessary for advancing the field.	4

Total core credit hours: 40

Industrial/Organization Specialty

PSY 741	**PERSONNEL SELECTION** In-depth review of the psychological basis of personnel selection including recruitment techniques, criterion development, performance evaluation, validity generalization, and instruments. Theoretical, practical, and legal issues are covered.	4
PSY 743	**PSYCHOLOGY OF LEADERSHIP** Designed to explore the theories, research, and practice of leadership in work organizations from a psychological perspective.	4
PSY 745	**RESEARCH METHODS IN INDUSTRIAL/ORGANIZATIONAL PSYCHOLOGY** The course focuses on the unique methodological challenges faced by I/O researchers. The empirical problems that the complex nature of organizations and their uncontrollable environments pose for researchers are discussed. Theory, causation, and experimental validity are reviewed. Various research designs (e.g., true experiments, quasi-experiments, correlation and regression analysis, ethnographic study) are presented and scrutinized. Methods of data collection (e.g., unobtrusive measurement, survey, qualitative) are reviewed. Meta-analysis as a research method is discussed.	4

Total specialty credit hours: 12

Total hours considered for scoring: 52

Alternative a_{25}
WSU Humanities Program (http://www.wright.edu/cgibin/catalog/grad2006.cgi?id=28)
Core Courses

Course Code	Course Name / Description	Credit Hours
HUM 700	**GRADUATE INTRODUCTION TO HUMANITIES I** A general introduction to interdisciplinary graduate study in the humanities.	4
HUM 710	**GRADUATE RESEARCH METHODS IN THE HUMANITIES** An introduction to graduate research in the humanities with primary emphasis on research writing.	4
HUM 720	**GRADUATE INTRODUCTION TO HUMANITIES II** Exploration of a single topic or problem from the perspective of a number of disciplines in the humanities.	4

Total core hours: 12

Two selected sub-programs: **History and Music** (16-28 hours required)

HST 605	**ANCIENT HISTORY** Selected problems in Roman history to the death of Constantine in A.D. 337.	4
HST 625	**MODERN EUROPEAN HISTORY** Modern Europe from the Enlightenment to the present through a national (e.g., Germany), chronological (e.g., nineteenth century), or topical (e.g., socialism) approach. Titles vary.	4
HST 670	**EARLY AMERICAN HISTORY** Examines colonial, revolutionary, and early republic periods of American history.	4
HST 700	**HISTORICAL METHODS** Intensive training in the research methods and materials of history.	4
MUS 601	**INTRODUCTION TO GRADUATE STUDIES IN MUSIC** Methods of investigation in music; use of music bibliography; problems of collecting and evaluating information; and reporting of findings.	4
MUS 646	**MEDIEVAL AND RENAISSANCE MUSIC** Includes critical analysis of representative works from major composers	3
MUS 636	**COUNTERPOINT** Analytical study of representative compositions of the twentieth century. Study of contrapuntal techniques with practical application in writing and analysis.	3

Total hours considered for specialty: 26
Total hours considered for scoring: 38

Appendix C. Matlab Code and Matrix Results

```
% Matlab code for combinatorial checks for sums for weighted value
scores

clear all
% Criteria set
c2=.24
c3=.27
c4=.31
c5=.34
c6=.37
c7=.40
c8=.43
% Alternative value matrix of weighted value scores
v=[0.05994  0   0   0   0.139802036 0.18    0   0
0.05994 0   0   0   0   0.18    0   0
0.18    0.048042846 0.032210142 0.018159977 0.017561565 0.01283831
0.00943324  0.058910838
0.18    0.048042846 0.041050106 0.018159977 0.017561565 0.01283831
0.00943324  0.036092289
0.12006 0   0.021   0.020456593 0.056026625 0.046138414 0.012249063
0.057989045
0.18    0   0.041334625 0.018159977 0   0.019086013 0.019828869 0
0.05994 0   0   0   0.069914098 0.120513393 0   0.029873316
0.05994 0   0.042   0   0   0.006519422 0   0
0.18    0.019492972 0.025365041 0.015793375 0.049289426 0.055617538
0.043624339 0.058501992
0.18    0   0.035573103 0.015793375 0.017561565 0.01283831  0.022091442
0.06
0.12006 0   0.025365041 0.010841623 0   0   0.026261757 0.06
0.18    0   0   0.020456593 0.036214499 0.002729657 0.017439114 0.06
0.18    0.035271296 0.025365041 0.03654602  0.049289426 0.009832209 0
0.050658999
0.18    0.087033714 0.021   0   0.056026625 0.002729657 0   0.054925588
0.12006 0.087033714 0.027202166 0   0   0.004469446 0.024233602
0.03871111
0.12006 0   0.027202166 0.063302437 0.056026625 0.004469446 0.024233602
0.03871111
0.18    0   0   0   0   0   0   0
0.12006 0   0.027202166 0.063302437 0.0880771   0.00221033  0.024233602
0.052659564
0.12006 0.087033714 0.017008739 0.041650768 0   0   0.026261757
0.024190391
0.12006 0.071147781 0   0.053215566 0   0.004469446 0   0.024190391
0.18    0   0.025365041 0.028983698 0.107175967 0   0.012249063
0.050658999
0.12006 0.035271296 0   0   0.049289426 0   0   0.036092289
0.12006 0   0.025365041 0   0   0.009832209 0.022091442 0.036092289
0.05994 0.035271296 0   0.020456593 0   0.033418641 0   0
0.05994 0   0   0   0   0   0   0];
```

```
% Set matrix for alternative results
Bucket = [];

for i=1:25;  % 25 alternatives to check
    % inner loops to check the 7 different types of sets
    minscore=v(i,1)+v(i,2)+v(i,3)+v(i,4)+v(i,5)+v(i,6)+v(i,7)+v(i,8);
    % Check pairs (8 choose 2)
    x(i)=0;  %sets x(i) value to capture sum
    for j=1:7;
        for k=j+1:8;
            x(i)=v(i,j)+v(i,k);
            if x(i) >= c2;
                bucket(i,2)=i;
            end;
        end;
    end;

    % Check triples (8 choose 3)
    x(i)=0;
    for j=1:6;
        for k=j+1:7;
            for l=k+1:8;
                x(i)=v(i,j)+v(i,k)+v(i,l);
                if x(i) >= c3;
                    bucket(i,3)=i;
                end;
            end;
        end;
    end;

     % Check quadruples (8 choose 4)
     x(i)=0;
    for j=1:5;
        for k=j+1:6;
            for l=k+1:7;
                for m=l+1:8;
                x(i)=v(i,j)+v(i,k)+v(i,l)+v(i,m);
                    if x(i) >= c4;
                      bucket(i,4)=i;
                    end;
                end;
            end;
        end;
    end;

     % Check quintuples (8 choose 5)
     x(i)=0;
    for j=1:4;
        for k=j+1:5;
            for l=k+1:6;
                for m=l+1:7;
                    for n=m+1:8;
                       x(i)=v(i,j)+v(i,k)+v(i,l)+v(i,m)+v(i,n);
```

```
                        if x(i) >= c5;
                          bucket(i,5)=i;
                        end;
                    end;
                end;
            end;
        end;

          % Check sextuples (8 choose 6)
          x(i)=0;
        for j=1:3;
            for k=j+1:4;
                for l=k+1:5;
                    for m=l+1:6;
                        for n=m+1:7;
                           for o=n+1:8;
                            x(i)=v(i,j)+v(i,k)+v(i,l)+v(i,m)+v(i,n)+v(i,o);
                                if x(i) >= c6;
                                  bucket(i,6)=i;
                                end;
                        end;
                    end;
                end;
            end;
        end;

          % Check septuples (8 choose 7)
          x(i)=0;
        for j=1:2;
            for k=j+1:3;
                for l=k+1:4;
                    for m=l+1:5;
                        for n=m+1:6;
                           for o=n+1:7;
                               for p=o+1:8;

x(i)=v(i,j)+v(i,k)+v(i,l)+v(i,m)+v(i,n)+v(i,o)+v(i,p);
                                    if x(i) >= c7;
                                      bucket(i,7)=i;
                                    end;
                                end;
                        end;
                    end;
                end;
            end;
        end;

           % Check octuple (8 choose 8)
           x(i)=0;
           for j=1:8;
               x(i)=x(i)+v(i,j);
           end;
```

```
      x(i)=v(i,1)+v(i,2)+v(i,3)+v(i,4)+v(i,5)+v(i,6)+v(i,7)+v(i,8);
      if x(i) >= c8;
         bucket(i,8)=i;
      end;
end;
bucket  %outputs the resulting bucket
```

Matlab matrix results are provided below. Each row represents an alternative and each column represents the level from 1 through 8 for the buckets from the portfolio selection criteria. If the alternative met the criteria for a specific bucket, then its alternative subscript number appears in its row in the column number based on the criteria it met. For example, the NPS MSA degree program in alternative a9, so its results are in the 9th row. It met the criteria for all 8 values so its subscript number 9 is indicated in the 8th column. It also met the sublevel criteria for lower levels as well so its subscript is displayed in each column corresponding to the level it met. The first column is blank for all entries since there was no criteria set for meeting a single value. Additionally, the matrix stops building after the last alternative that meets criteria is displayed. In the results shown, the alternatives 22 – 25 did not meet any of the criteria levels so their rows are not built in the matrix.

Initial Portfolio Selection Results.

```
bucket =

     0     1     1     1     1     1     0     0
     0     0     0     0     0     0     0     0
     0     0     3     3     0     0     0     0
     0     0     0     0     0     0     0     0
     0     0     0     0     0     0     0     0
     0     0     0     0     0     0     0     0
     0     0     0     0     0     0     0     0
     0     0     0     0     0     0     0     0
     0     0     9     9     9     9     9     9
     0    10    10     0     0     0     0     0
     0     0     0     0     0     0     0     0
     0    12    12     0     0     0     0     0
     0     0    13    13    13    13     0     0
     0    14    14    14    14    14    14     0
     0     0     0     0     0     0     0     0
     0     0     0     0     0     0     0     0
     0     0     0     0     0     0     0     0
     0     0    18    18    18    18     0     0
     0     0     0     0     0     0     0     0
     0     0     0     0     0     0     0     0
     0    21    21    21    21    21    21     0
```

Sensitivity analysis on Lifecycle Processes:

```
bucket =

     0     1     1     1     1     0     0     0
     0     0     0     0     0     0     0     0
     0     0     3     3     3     0     0     0
     0     0     4     4     0     0     0     0
     0     0     0     0     0     0     0     0
     0     0     0     0     0     0     0     0
     0     0     0     0     0     0     0     0
     0     0     0     0     0     0     0     0
     0     0     9     9     9     9     9     9
     0     0     0     0     0     0     0     0
     0     0     0     0     0     0     0     0
     0     0     0     0     0     0     0     0
     0     0    13    13    13    13     0     0
     0    14    14    14    14    14    14     0
     0     0     0     0     0     0     0     0
     0     0     0     0     0     0     0     0
     0     0     0     0     0     0     0     0
     0     0     0    18     0     0     0     0
     0     0     0     0     0     0     0     0
     0     0     0     0     0     0     0     0
     0    21    21    21    21    21     0     0
```

Sensitivity matrix for Change in Decision Analysis weight:

```
bucket =

     0     1     1     1     1     1     0     0
     0     2     0     0     0     0     0     0
     0     3     3     3     3     3     0     0
     0     4     4     4     4     0     0     0
     0     0     0     0     0     0     0     0
     0     0     0     0     0     0     0     0
     0     0     0     0     0     0     0     0
     0     0     0     0     0     0     0     0
     0     9     9     9     9     9     9     9
     0    10    10    10     0     0     0     0
     0     0     0     0     0     0     0     0
     0    12    12     0     0     0     0     0
     0    13    13    13    13    13    13     0
     0    14    14    14    14    14    14     0
     0     0     0     0     0     0     0     0
     0     0     0     0     0     0     0     0
     0     0     0     0     0     0     0     0
     0     0    18    18    18    18     0     0
     0     0     0     0     0     0     0     0
     0     0     0     0     0     0     0     0
     0    21    21    21    21    21    21     0
```

Sensitivity matrix for change in Lifecycle Analysis weight:

```
bucket =

     0     1     1     1     1     0     0     0
     0     0     0     0     0     0     0     0
     0     3     3     3     3     0     0     0
     0     0     4     4     0     0     0     0
     0     0     0     0     0     0     0     0
     0     0     0     0     0     0     0     0
     0     0     0     0     0     0     0     0
     0     0     0     0     0     0     0     0
     0     9     9     9     9     9     9     9
     0    10    10     0     0     0     0     0
     0     0     0     0     0     0     0     0
     0    12    12     0     0     0     0     0
     0     0    13    13    13    13     0     0
     0    14    14    14    14    14    14     0
     0     0     0     0     0     0     0     0
     0     0     0     0     0     0     0     0
     0     0     0     0     0     0     0     0
     0     0    18    18    18    18     0     0
     0     0     0     0     0     0     0     0
     0     0     0     0     0     0     0     0
     0    21    21    21    21    21    21     0
```

Appendix D. Program Course-hour Scores

Alternative a_1: AFIT Operations Research—Decision Analysis

Value Measure	Range	Program Score	Courses (corresponding hours)
Strategic Level Focus	L/M/H	Low	
Hours HR Processes	0 – 30	0	
Hours Systems	0 – 20	0	
Hours Change Management	0 – 30	0	
Hours Decision Analysis	0 – 18	10	OPER 543(3) / 643(3) / 645(4)
Hours Lifecycle Analysis	0 – 30	30	OPER 510(4) / 540(4) / 561(4) / 610(4) / 679(3) / 595(3); STAT 527(4) / 537(4)
Hours Organizational Design	0 – 30	0	
Hours Resource Allocation	0 – 21	0	

Alternative a_2: AFIT Operations Research—Applied Statistics

Value Measure	Range	Program Score	Courses (corresponding hours)
Strategic Level Focus	L/M/H	Low	
Hours HR Processes	0 – 30	0	
Hours Systems	0 – 20	0	
Hours Change Management	0 – 30	0	
Hours Decision Analysis	0 – 18	0	
Hours Lifecycle Analysis	0 – 30	39	OPER 510(4) / 540(4) / 561(4) / 610(4) / 679(3) / 595(3) / 683(3)/685(3)/688(3); STAT 527(4) / 537(4)
Hours Organizational Design	0 – 30	0	
Hours Resource Allocation	0 – 21	0	

Alternative a_3: AFIT Integrated Strategic Leadership—Financial Management

Value Measure	Range	Program Score	Courses (corresponding hours)
Strategic Level Focus	L/M/H	High	IMGT 684, ORSC 675 / 775
Hours HR Processes	0 – 30	6	ORSC 572(2) / 672(4)
Hours Systems	0 – 20	3	IMGT 684
Hours Change Management	0 – 30	3.5	ORSC 572(2), IMGT 669(1.5)
Hours Decision Analysis	0 – 18	1.5	OPER 501(1.5)
Hours Lifecycle Analysis	0 – 30	9.5	OPER 501(1.5), STAT 525(4), RSCH 630(4)
Hours Organizational Design	0 – 30	1.5	IMGT 669(1.5)
Hours Resource Allocation	0 – 21	16	ECON 520(4), FMGT 510(4) / 610(4) / 620(4)

Alternative a_4: AFIT Integrated Strategic Leadership—Information Leadership

Value Measure	Range	Program Score	Courses (corresponding hours)
Strategic Level Focus	L/M/H	High	IMGT 684, ORSC 675 / 775
Hours HR Processes	0 – 30	6	ORSC 572(2) / 672(4)
Hours Systems	0 – 20	15	IMGT 580(4) / 651(4) / 680(4) / 684(3)
Hours Change Management	0 – 30	3.5	ORSC 572(2), IMGT 669(1.5)
Hours Decision Analysis	0 – 18	1.5	OPER 501(1.5)
Hours Lifecycle Analysis	0 – 30	9.5	OPER 501(1.5), STAT525(4), RSCH 630(4)
Hours Organizational Design	0 – 30	1.5	IMGT 669(1.5)
Hours Resource Allocation	0 – 21	4	ECON 520(4)

Alternative a_5: AFIT Logistics Management— Operational Maintenance/Acquisition Logistics

Value Measure	Range	Program Score	Courses (corresponding hours)
Strategic Level Focus	L/M/H	Medium	LOGM 617 / 619
Hours HR Processes	0 – 30	0	
Hours Systems	0 – 20	3	LOGM 615(3)
Hours Change Management	0 – 30	4	ORSC 542(2)
Hours Decision Analysis	0 – 18	4.5	LOGM 590(3), OPER 501(1.5)
Hours Lifecycle Analysis	0 – 30	18.5	LOGM 601(3) / 628(3) / 629(3);STAT 525(4) / 535(4);OPER 501(1.5)
Hours Organizational Design	0 – 30	2	ORSC 542(2)
Hours Resource Allocation	0 – 21	14	LOGM 620(3) / 627(3); CMGT 523(4); ECON 520(4)

Alternative a_6: AFIT Information Resource Management—Strategic Information Management

Value Measure	Range	Program Score	Courses (corresponding hours)
Strategic Level Focus	L/M/H	High	IMGT 530 / 580 / 684
Hours HR Processes	0 – 30	0	
Hours Systems	0 – 20	16	IMGT 580(4) / 561(4) / 651(4) / 657(4)
Hours Change Management	0 – 30	3.5	IMGT 669(1.5), ORSC 542(2)
Hours Decision Analysis	0 – 18	0	
Hours Lifecycle Analysis	0 – 30	12	RSCH 630(4), STAT 525(4), 535(4)
Hours Organizational Design	0 – 30	3.5	IMGT 669(1.5), ORSC 542(2)
Hours Resource Allocation	0 – 21	0	

Alternative a_7: AFIT Operations Analysis

Value Measure	Range	Program Score	Courses (corresponding hours)
Strategic Level Focus	L/M/H	Low	
Hours HR Processes	0 – 30	0	
Hours Systems	0 – 20	0	
Hours Change Management	0 – 30	0	
Hours Decision Analysis	0 – 18	5.5	OPER 596(1.5) / 646(4)
Hours Lifecycle Analysis	0 – 30	26.5	OPER 503(3) / 504(3) / 561(4) / 596(1.5) / 677(3), STAT 526(4) / 536(4) / 696(4)
Hours Organizational Design	0 – 30	0	
Hours Resource Allocation	0 – 21	3	OPER 632(3)

Alternative a_8: AFIT Computer Science—Database Systems

Value Measure	Range	Program Score	Courses (corresponding hours)
Strategic Level Focus	L/M/H	Low	
Hours HR Processes	0 – 30	0	
Hours Systems	0 – 20	30	CSCE 546(4) / 586(4) / 593(4) / 631(4) / 646(4) / 686(2) / 692(4) / 746(4)
Hours Change Management	0 – 30	0	
Hours Decision Analysis	0 – 18	0	
Hours Lifecycle Analysis	0 – 30	6	CSCE 686(2), STAT 583(4)
Hours Organizational Design	0 – 30	0	
Hours Resource Allocation	0 – 21	0	

Alternative a_9: NPS Manpower Systems Analysis

Value Measure	Range	Program Score	Courses (corresponding hours)
Strategic Level Focus	L/M/H	High	GB3070 / 3051 / 3010, MN4106
Hours HR Processes	0 – 30	2	MN3111(2)
Hours Systems	0 – 20	4	GB3042(4)
Hours Change Management	0 – 30	3	GB3012(3)
Hours Decision Analysis	0 – 18	4	MN4106(4)
Hours Lifecycle Analysis	0 – 30	20	GB3040(4) / 3041(4), MN4110(4) / 4761(4); OS4701(4)
Hours Organizational Design	0 – 30	11	GB3010(4), MN3111(2) / 4119(3)
Hours Resource Allocation	0 – 21	15	GB3050(4) / 3051(3) / 3070(4), MN3760(4)

Alternative a_{10}: NPS Defense Systems Analysis

Value Measure	Range	Program Score	Courses (corresponding hours)
Strategic Level Focus	L/M/H	High	GB3070 / 3010 / 3051 / 4014 / 4530; NW3230
Hours HR Processes	0 – 30	0	
Hours Systems	0 – 20	8	GB3042(4) / 3020(4)
Hours Change Management	0 – 30	3	GB3012(3)
Hours Decision Analysis	0 – 18	1.5	GB4043(1.5)
Hours Lifecycle Analysis	0 – 30	9.5	GB93040(4) / 4043(1.5) / 4702(4)
Hours Organizational Design	0 – 30	4	GB3010
Hours Resource Allocation	0 – 21	40	GB3070(4) / 3050(4) / 3051(3) / 4052(3) / 4071(4) / 4053(4) / 4510(4) / 3510(3) / 4570(2) / 4550(4); MN3331(5)

Alternative a_{11}: NPS Program Management

Value Measure	Range	Program Score	Courses (corresponding hours)
Strategic Level Focus	L/M/H	Med	MN4103 / 4470
Hours HR Processes	0 – 30	0	
Hours Systems	0 – 20	4	MN3309(4)
Hours Change Management	0 – 30	2	MN3012(2)
Hours Decision Analysis	0 – 18	0	
Hours Lifecycle Analysis	0 – 30	0	
Hours Organizational Design	0 – 30	5	MN4474(2), EO4011(3)
Hours Resource Allocation	0 – 21	22	MN3302(2) / 3001(3) / 3371(4) / 3384(4) / 3172(3) / 4307(4) / 3155(2)

Alternative a_{12}: NPS Executive MBA

Value Measure	Range	Program Score	Courses (corresponding hours)
Strategic Level Focus	L/M/H	High	GE3011 / 3109 / 3010 / 4053
Hours HR Processes	0 – 30	0	
Hours Systems	0 – 20	0	
Hours Change Management	0 – 30	4	GE4016(4)
Hours Decision Analysis	0 – 18	3	GE3043(3)
Hours Lifecycle Analysis	0 – 30	3	GE4043(3)
Hours Organizational Design	0 – 30	3	GE3010(3)
Hours Resource Allocation	0 – 21	29	GE3050(3) / 3051(3) / 3070(3) / 3221(3) / 3222(3) / 4052(3) / 3042(4) / 4053(4) / 3510(3)

Alternative a_{13}: DePaul MBA—Leadership/Change Management

Value Measure	Range	Program Score	Courses (corresponding hours)
Strategic Level Focus	L/M/H	High	MGT 500 / 502 / 530 / 555, GSB 599
Hours HR Processes	0 – 30	4	MGT 555(4)
Hours Systems	0 – 20	4	MIS 555(4)
Hours Change Management	0 – 30	8	MGT 500(4) / 535(4)
Hours Decision Analysis	0 – 18	4	ACC 555(2); ECO 555(2)
Hours Lifecycle Analysis	0 – 30	8	GSB 420(4); ECO 509(4)
Hours Organizational Design	0 – 30	0	
Hours Resource Allocation	0 – 21	8	ACC 555(2); ECO 555(2); FIN 555(4)

Alternative a_{14}: GWU MBA—Human Resources Management

Value Measure	Range	Program Score	Courses (corresponding hours)
Strategic Level Focus	L/M/H	High	MBAD 231 / 260 / 270; MGT 253
Hours HR Processes	0 – 30	18	MGT 252(4.5) / 253(4.5) / 254(4.5) / 257(4.5)
Hours Systems	0 – 20	3	MBAD 221(3)
Hours Change Management	0 – 30	0	
Hours Decision Analysis	0 – 18	4.5	MBAD 211(1.5) /231(3)
Hours Lifecycle Analysis	0 – 30	3	MBAD 220(3)
Hours Organizational Design	0 – 30	0	
Hours Resource Allocation	0 – 21	10.5	MBAD 210(3) / 211(3) / 250(3); ECON 220(3)

Alternative a_{15}: GWU Human Resources Management (MA)

Value Measure	Range	Program Score	Courses (corresponding hours)
Strategic Level Focus	L/M/H	Med	ORSC 209 / 248, PSYC 245
Hours HR Processes	0 – 30	18	ORSC 212(4.5) / 222(4.5) / 223(4.5) / 248(4.5)
Hours Systems	0 – 20	4.5	ORSC 249(4.5)
Hours Change Management	0 – 30	0	
Hours Decision Analysis	0 – 18	0	
Hours Lifecycle Analysis	0 – 30	4.5	STAT 104(4.5)
Hours Organizational Design	0 – 30	4.5	ORSC 209(4.5)
Hours Resource Allocation	0 – 21	4.5	ECON 219(4.5)

Alternative a_{16}: GWU Organizational Management

Value Measure	Range	Program Score	Courses (corresponding hours)
Strategic Level Focus	L/M/H	Med	ORSC 209 / 241, PSYC 245
Hours HR Processes	0 – 30	0	
Hours Systems	0 – 20	4.5	ORSC 249(4.5)
Hours Change Management	0 – 30	18	ORSC 216(4.5) / 241(4.5) / 242(4.5) / 243(4.5)
Hours Decision Analysis	0 – 18	4.5	PSYC 259(4.5)
Hours Lifecycle Analysis	0 – 30	4.5	STAT 104(4.5)
Hours Organizational Design	0 – 30	4.5	ORSC 209(4.5)
Hours Resource Allocation	0 – 21	4.5	ECON 219(4.5)

Alternative a_{17}: GWU Political Science

Value Measure	Range	Program Score	Courses (corresponding hours)
Strategic Level Focus	L/M/H	High	PSC 212 / 217 / 229 / 246
Hours HR Processes	0 – 30	0	
Hours Systems	0 – 20	0	
Hours Change Management	0 – 30	0	
Hours Decision Analysis	0 – 18	0	
Hours Lifecycle Analysis	0 – 30	0	
Hours Organizational Design	0 – 30	0	
Hours Resource Allocation	0 – 21	0	

Alternative a_{18}: Milano Organizational Change Management

Value Measure	Range	Program Score	Courses (corresponding hours)
Strategic Level Focus	L/M/H	Med	Mgt&Org Behavior, Org Assess & Diag
Hours HR Processes	0 – 30	0	
Hours Systems	0 – 20	4.5	Tech Strat HRM (4.5)
Hours Change Management	0 – 30	18	Found of Org Change(4.5); Group Proc, Facil, & Inter(4.5); Org Chng Inter(4.5); Mng Consult/Client(4.5)
Hours Decision Analysis	0 – 18	6.75	Mgt Econ(2.25);Quant Meth(2.25);Policy Anal(2.25)
Hours Lifecycle Analysis	0 – 30	2.5	Quant Meth(2.25)
Hours Organizational Design	0 – 30	4.5	Org Assess & Diag(4.5)
Hours Resource Allocation	0 – 21	9	Mgt Econ(2.25); Policy Anal(2.25); Fin Impact of HRM(4.5)

Alternative a_{19}: UT Human Resources Development

Value Measure	Range	Program Score	Courses (corresponding hours)
Strategic Level Focus	L/M/H	Med	HRD 561 / 520
Hours HR Processes	0 – 30	18	HRD559(4.5) / 517(4.5) / 518(4.5), MGT521(4.5)
Hours Systems	0 – 20	2.25	HRD561(2.25)
Hours Change Management	0 – 30	9.5	HRD510(2.25) / 556(2.25) / 563(4.5)
Hours Decision Analysis	0 – 18	0	
Hours Lifecycle Analysis	0 – 30	0	
Hours Organizational Design	0 – 30	5	HRD510(2.25) / 556(2.25)
Hours Resource Allocation	0 – 21	2.25	HRD561(2.25)

Alternative a_{20}: UWM Human Resources and Labor Relations

Value Measure	Range	Program Score	Courses (corresponding hours)
Strategic Level Focus	L/M/H	Med	BusMgt706 / 712, IndRel711,
Hours HR Processes	0 – 30	11.25	IndRel701(4.5) / 711(4.5), Econ753(2.25)
Hours Systems	0 – 20	0	
Hours Change Management	0 – 30	13.5	BusMgt706(4.5) / 712(4.5); BusAdm733(4.5)
Hours Decision Analysis	0 – 18	0	
Hours Lifecycle Analysis	0 – 30	4.5	BusMgt709(4.5)
Hours Organizational Design	0 – 30	0	
Hours Resource Allocation	0 – 21	2.25	Econ753(2.25)

Alternative a_{21}: WSU MBA—Management, Innovation, and Change

Value Measure	Range	Program Score	Courses (corresponding hours)
Strategic Level Focus	L/M/H	High	MBA 710 / 750 / 780 / 755
Hours HR Processes	0 – 30	0	
Hours Systems	0 – 20	4	MBA 770(4)
Hours Change Management	0 – 30	6	MGT 706(2) / 766(4)
Hours Decision Analysis	0 – 18	8	MBA 580(4) / 730(4)
Hours Lifecycle Analysis	0 – 30	0	
Hours Organizational Design	0 – 30	2	MGT 706(2)
Hours Resource Allocation	0 – 21	8	MBA 520(4) / 720(4)

Alternative a_{22}: WSU Public Administration

Value Measure	Range	Program Score	Courses (corresponding hours)
Strategic Level Focus	L/M/H	Med	URS 710 / 712
Hours HR Processes	0 – 30	4	URS 716(4)
Hours Systems	0 – 20	0	
Hours Change Management	0 – 30	0	
Hours Decision Analysis	0 – 18	4	URS 720(4)
Hours Lifecycle Analysis	0 – 30	0	
Hours Organizational Design	0 – 30	0	
Hours Resource Allocation	0 – 21	4	URS 715(4)

Alternative a_{23}: WSU Education Administration—Leadership

Value Measure	Range	Program Score	Courses (corresponding hours)
Strategic Level Focus	L/M/H	Med	EDL 776 / 780 / 790
Hours HR Processes	0 – 30	0	
Hours Systems	0 – 20	4	EDT 895(4)
Hours Change Management	0 – 30	0	
Hours Decision Analysis	0 – 18	0	
Hours Lifecycle Analysis	0 – 30	8	EDL 751(4) / 757(4)
Hours Organizational Design	0 – 30	4	EDL 771(4)
Hours Resource Allocation	0 – 21	4	EDL 781(4)

Alternative a_{24}: WSU Psychology

Value Measure	Range	Program Score	Courses (corresponding hours)
Strategic Level Focus	L/M/H	Low	PSY 743
Hours HR Processes	0 – 30	4	PSY 741(4)
Hours Systems	0 – 20	0	
Hours Change Management	0 – 30	4	PSY 753(4)
Hours Decision Analysis	0 – 18	0	
Hours Lifecycle Analysis	0 – 30	16	PSY 701(4) / 702(4) / 703(4) / 745(4)
Hours Organizational Design	0 – 30	0	
Hours Resource Allocation	0 – 21	0	

Alternative a_{25}: WSU Humanities—History and Music

Value Measure	Range	Program Score	Courses (corresponding hours)
Strategic Level Focus	L/M/H	Low	
Hours HR Processes	0 – 30	0	
Hours Systems	0 – 20	0	
Hours Change Management	0 – 30	0	
Hours Decision Analysis	0 – 18	0	
Hours Lifecycle Analysis	0 – 30	0	
Hours Organizational Design	0 – 30	0	
Hours Resource Allocation	0 – 21	0	

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Vita

Major Katherine J. Gentil graduated as Valedictorian from Millington Central High School in Millington, Tennessee. She entered undergraduate studies at Liberty University in Lynchburg, Virginia, where she graduated *Summa Cum Laude* with a Bachelor of Science degree in Mathematics in May 1989. She was commissioned through Officer Training School, Lackland AFB TX, on 5 June 1991. Maj Gentil earned her Master of Education Administration degree from South Dakota State University in December 1995.

Maj Gentil's first assignment was in the 68th Missile Squadron at Ellsworth AFB SD as a Deputy Missile Combat Crew Commander. She served as an instructor and crew commander. In December 1993, she was assigned to the 437th Support Group, Charleston AFB SC, where she served as an executive officer and then as section commander for the 437th Maintenance Squadron. In December 1995, she transferred to the 366th Maintenance Squadron at Mountain Home AFB ID. She deployed in August 1996 to Dhahran and Al Kharj, Kingdom of Saudi Arabia, as the 4404th Support Group Executive Officer. She was assigned to the Military Personnel Flight (MPF) as Relocation and Employment Section Chief, then became the MPF Commander in January 1998. In May 1999, she was assigned to the Air Force Personnel Operations Agency, Pentagon, where she performed personnel analysis until Dec 2001 when she moved to HQ USAF/DP staff to work in the Total Force Development branch and then became Chief, Military Personnel Transformation. Maj Gentil moved to Randolph AFB TX in June 2003 to work at the Air Force Personnel Center as Chief, Personnel Career Field Operations and Chief, Mission Support Officer Development. She was selected to attend the Air Force Institute of Technology, Wright-Patterson AFB OH. Upon graduation, she is assigned to HQ Air Force Materiel Command, as Chief, Organization Branch. Maj Gentil is married and has two children.

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14. ABSTRACT

This research develops a career field's educational profile through use of the decision analysis approach of value-focused thinking (VFT). VFT is used to solicit the capabilities that the career field manager (CFM) desires its officers obtain from an advanced academic program. This process generates a value hierarchy and a focused set of alternatives (degree programs). The academic programs' content are evaluated against the hierarchy to determine how well it meets the values of the functional area. A rank-ordered list of degrees is produced and a portfolio of degrees is selected through the use of CFM-approved goal-setting criteria. The specific breakdown of the portfolio into percentages of the force that should attain each degree is then determined through the CFM's specified relative value increments of the goal-setting criteria. The resulting effort creates a guide for CFMs to communicate to their corps on the types of degrees to earn and provides justification for fully-funded degree slots.

15. SUBJECT TERMS

Advanced academic degrees, value focused thinking, decision analysis, portfolio development, goal setting, multiple criteria decision making, manpower, personnel, force development, educational profiles

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