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THESIS

REDESIGN OF ADVANCED EDUCATION PROCESSES IN THE UNITED STATES COAST GUARD

by

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September 1999

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REDESIGN OF THE ADVANCED EDUCATION PROCESSES IN THE COAST GUARD

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ABSTRACT

The processes used in the operation of the Coast Guard Advanced Education Program have evolved as most business processes that were developed prior to the introduction of information technology. These processes include the selection, management, assignment and tracking of advanced education students. These processes are still fully dependent on physical files and the mail system. The Coast Guard has an information technology infrastructure that supports better processes, however it is not being utilized in an integrated fashion. The objective of this thesis is to document the present processes and apply Business Process Reengineering techniques to identify avenues of change to improve critical measures of performance. Key findings include the lack of critical performance measures, present system billet and officer codes do not identify job billets that require advanced education or personnel with advanced education, and electronic submission of information could reduce cycle time and facilitate decision-making in these processes.

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I. INTRODUCTION: THE COAST GUARD'S ADVANCED EDUCATION SYSTEM

A. BACKGROUND

The main purpose of this thesis is to analyze and redesign the Coast Guard's Advanced Education System. We focus our research on innovating a specific set of processes, of particular interest to our sponsor, the Coast Guard Systems Directorate (G-S). Although focusing on a specific set of processes within a large system potentially limits the impact of innovation, it allows one to understand and redesign these processes in considerable detail and helps document a systematic method that can be applied to redesign other important processes.

The processes addressed in this thesis concern the management and tracking of advanced education students and graduates within the Coast Guard. Presently, the responsibilities for these processes are spread out over several different offices within the Coast Guard. Each of these offices has many unrelated responsibilities that are considered to be of higher precedence; as a result the systems in place for the Advanced Education System are admittedly ad hoc. The impetus behind Coast Guard Headquarters' interest in these processes is manifold. First, the Coast Guard has been mandated to freeze its advanced education budget, while at the same time the need for personnel with advanced education is growing quickly. During a meeting at Coast Guard headquarters in November 1998, it was mentioned that the Coast Guard may already be six hundred thousand dollars over the 2.3 million dollar cap for the coming year for advanced education (mostly personnel tuition and moving expenses). Second, the systems in place to manage these processes were never really designed in the first place and typically "are replete with mechanisms designed to compensate for information poverty."[Ref. 1] There is a belief that an improved system would provide a greater degree of control for the program managers as well as some gain in efficiency.

There are two closely related threads in the Coast Guard's Advanced Education Program. The first is concerned with the management of students who have been selected for advanced education program funding, the selection of the educational institution they will attend, the content of the curriculum, and the management and execution of the associated budgets. The

second thread is concerned with identifying the present and future need for individuals with advanced education and the subsequent assignment of officers to jobs that have been identified as requiring postgraduate education.

The effective management of advanced education students has become much more critical to the Coast Guard recently as the budget for advanced education has become very constrained. Yet the perceived need for officers with advanced education has risen dramatically. This is particularly true for officers with advanced degrees in Information Technology Management. As an example, out of about 40 jobs at the O-4 level that will become vacant this coming assignment season, June to September 1999, there is an expected shortfall of about 10 qualified officers. Yet, as stated earlier, the advanced education program is already over its budget. Draconian measures will have to soon be taken unless innovative solutions are discovered.

The process for assigning postgraduate educated officers is the same as for assigning all other officers in the Coast Guard with the exception that there are pools of jobs that are identified as requiring postgraduate training. Officers are sent to various educational institutions throughout the United States in order to receive the necessary training to adequately perform the duties of these jobs. Once they have completed the program they are detailed just like every other officer in the Coast Guard. Currently, the Coast Guard's personnel database does not include data on advanced education, complicating the identification of officers that have received that education, particularly in cases of an officer's second assignment after school.

Approximately one year before tour completion or graduations, a "shopping list" of all the jobs in the Coast Guard, that will be open the following year, is made available to all officers. From this list, the officer is supposed to fill out his/her assignment data card (ADC). The ADC is nothing more than a prioritized "wish list" for the officer. The officer can request up to eight job choices. The choices may be a specific billet or a broad category. The detailers use these ADCs to match officers to available jobs.

This process is time consuming for both the detailers and the officers, but it is necessary. Some officers don't fill out their ADCs in a timely manner. Many ADCs are filled out with unrealistic job choices. Detailers are often overwhelmed, as they can receive several hundred

ADCs at one time and the detailers also have to read the Officer Evaluation Reports (OERs) of every member in their accounts. Also, the Coast Guard currently has a shortage of officers, as well as a critical shortage of officers with advanced degrees. Consequently there are about 40 billets in each pay grade that are not filled.

Because the detailing process is distributed among many different officers and locations, no single person or organization appears to understand the process as a whole. And although the detailing process is widely believed to suffer from a number of pathologies, the root causes of and solutions to such pathologies are not immediately evident. Structured techniques may be required to diagnose process pathologies and identify the enabling technologies and redesign transformations required to effect dramatic performance improvement. Modeling the system with a simulation tool may help the detailers see, through animation, where the process bottlenecks are. For example, it could quantify how a simplified redesign of the present system could reduce the amount of time that the detailers spend trying to match people with jobs. Once one or more attractive redesign alternatives have been selected, the Coast Guard will require a method of selection for changing its baseline process. The thesis addresses all of these needs.

B. OBJECTIVE

This research examines the U.S. Coast Guard's management of advanced education students and the assignment process for officers. The objective is to dramatically improve critical measures of performance, such as cost, quality of service, and cycle-time by redesigning the current assignment process.

We intend to do more than fix a broken system. It appears that the system was not really designed in the first place, but that it evolved over time and became institutionalized only to a small degree. In reality, we're identifying the required elements of what is now a haphazard system and designing new processes and a system that integrates them. Our Program Manager, LCDR Jan Stevens, commented, "Anything would be better than what we presently have." Even though the Coast Guard is in the process of licensing enterprise wide software from PeopleSoft, the consensus among the program offices is that it will be two or more years before it is really available. Like past applications, it will not be set up to fulfill the needs of the program offices.

We know that there is a network infrastructure in place that is not being utilized for these processes beyond use of email and individual spreadsheets. Much can be gained by a higher utilization of this existing network infrastructure. One of the general efficiencies we hope to create is the ability for manager users to query a single system at any time and receive dependable and timely information, at several levels of granularity, that will allow them to make informed managerial decisions.

C. RESEARCH QUESTIONS

The primary research question is: "How can the Coast Guard's Advanced Education Processes (AEP) be redesigned to improve critical measures of performance?" The subsidiary research questions are:

- What are the current processes?
- What are the critical measures of performance?
- What pathologies and problems can be observed in the Coast Guard Advanced Education Processes?
- What are the service goals established by the Coast Guard?
- How can computer modeling help the Coast Guard dramatically improve the AEP?
- How can the Advanced Education Processes be migrated from their current state and what are the expected performance benefits?

D. SCOPE OF THE THESIS

This study focuses on the current nature and pitfalls inherent to the existing AEP system. The primary concentration of study consists of capturing the present process and reengineering it as to improve the way we do business. The scope consists of several steps, beginning with gaining a detailed understanding of the Coast Guard's Advanced Education Program processes. This begins with understanding the existing vision for the Coast Guard's Officer assignment and program management communities as they relate to the AEP. The vision must be clearly defined

and known in order to adequately evaluate the process. We must review the assignment process and student management process under the light of current technology. We have to find out if we are utilizing the technology available in order to enhance our efficiency in the way we do business. We also must review pending initiatives to redesign the AEP, analyze existing pathologies and problems with the current AEP, and redesign the AEP to improve critical performance factors for the Coast Guard. We are only focussing on officers in the AEP, all other personnel (other officers and enlisted) are excluded.

E. METHODOLOGY

In pursuit of our task, we begin with a thorough literature review of books, magazine articles, CD-ROM systems, and other library information services. We conduct a thorough review of Coast Guard instructions and directives pertaining to the Advanced Education Program. We perform a case study to observe and document the assignment and student management processes at Coast Guard Headquarters. We use a BPR method to measure the effectiveness of the baseline processes, identify pathologies and faults that exist, and develop redesign alternatives. We create simulation models of the baseline processes and the redesigned alternatives; and analyze simulation models to determine the most effective alternatives.

F. THESIS ORGANIZATION

The thesis is organized as follows. Chapter II follows the introduction and gives a process overview of the AEP and BPR. Chapter III contains models of the current Student Management and Assignment Processes. Chapter IV contains the proposed process redesigns. Chapter V follows with conclusions and recommendations.

II. PROCESS OVERVIEW

A. ADVANCED EDUCATION ASSIGNMENT PROCESS

The advanced education assignment process (AEAP) is a derivative of the assignment process. The fundamental principle of the assignment process requires equitable, unbiased, consistent consideration of Service needs, program and unit requirements, and the individual needs of the member. The intent is to assign the right person to the right job at the right time. This chapter discusses the many factors that go into the assignment process, the difference between the assignment process and the AEAP, defines BPR, defines simulation and describes the different tools used to help reengineer the process. As mentioned in Chapter I, we will only concentrate on the assignment of officers within the Coast Guard.

Officer assignments are driven by the Coast Guard's need to serve the public interest. The specific skill and experience mix to meet this need constantly changes with new technology, changing budgets and new legislation. When detailing members the AO must consider four primary organizational needs:

- Officer Career Paths
- Qualifications
- Occupational Specialty
- Diversity

Within the Coast Guard there are many different jobs. Just like with any other major company, each job requires a certain skill set. Some jobs are general enough in nature that just about any officer can fill them. However, there are many high skill level jobs that are best suited for someone with higher education. The Coast Guard is sending its officers to graduate programs, so that they can get the training needed to fill high skill level billets.

The AEAP is different from the regular Assignment Process. In the regular process, there are only two key people involved, the Assignment Officer (AO) and the member being detailed. The AO's job is extremely critical. The AO is responsible for not only assigning an officer to a

billet, but also for insuring that the officer's career continually progresses. They are career counselors as well as AOs.

The process starts with the creation of a shopping list. A shopping list is a list of billets that need to be filled in the upcoming assignment season. The AO generates this list and makes it accessible by fax to all of the members in the Service. Once the shopping list has been published, the AO starts to receive Assignment Data Cards (ADCs) from the members. An ADC is the member's wish list of jobs he would like to have. Each officer gets up to eight job choices on an ADC. During this process the AOs are required to read all of the Officer Evaluation Reports (OERs) of the officers in their account. The OER is the officer's report card. It tracks how well the officer has performed in each job held. This process takes an enormous amount of time, because on average each AO has over 500 officers in their account (one third of them are detailed each year). After reading the OERs the AO prioritizes the ADCs by rank. The shopping list is also prioritized by job importance and rank. The higher ranks and most crucial billets are filled first. Once the AO has assigned all of the members from a particular rank, a slate of officers and billets is sent to the AO supervisor. The supervisor reviews the slate and then orders are cut. Figure 1 shows a block diagram of the assignment process.

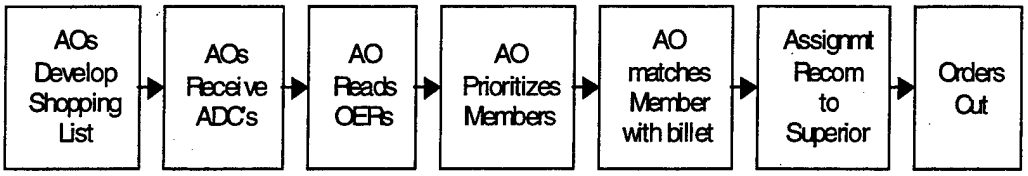


Figure 1: Officer Assignment Process

The AEAP is a little different than the assignment process, (e.g., there are more players involved). The AEAP parallels the assignment process until after members have been matched with billets. Once that has been done, the AO discusses the slate with the Program Manager (PM). The PM is probably the most critical person in the AEAP. PMs are responsible for keeping track of all of the billets in their account as well as those that require a member with advanced training. They do this by use of the Billet Description Identification Form (BDIF). The only billets requiring the BDIF are the ones that require advanced education training. The BDIF is a form that is filled out by the office to which the billet is assigned. The form includes

the job description of that particular billet. When the PMs receive the BDIF, they create a slate of jobs to be filled. The AOs don't know which jobs require someone with advanced training. AOs only know which jobs need to be filled. The AOs liaison with the PMs in order to insure that the members with the necessary training are placed in the billets that require that training. PMs are also responsible for supervising the members that are taking advanced education training. Figure 2 is a block diagram of the AEAP.

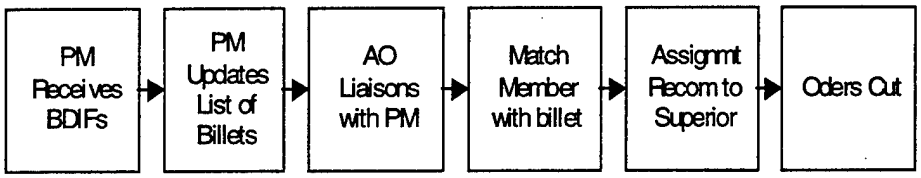


Figure 2: Advanced Education Assignment Process

After identifying the billets that require a person with an advanced education skill set, PMs count the number of those billets that are filled. Their goal is to have a 100% fill rate, however they are satisfied with an 80% fill rate. This number may seem like a low, but with the increasing demand on efficiency within the service and the good economy, we have lost a lot of officers to the private sector. Even though the Coast Guard is losing officers, it is not losing billets. The fact of the matter is that more and more billets are being created as technology evolves.

B. ADVANCED EDUCATION STUDENT MANAGEMENT PROCESS

The management of students in advanced education programs encompasses several different but related processes that are the purview of the Program Managers. These responsibilities include, selecting students to fund from a set of candidates for each education program, selecting the school the student will attend, processing student tuition payment and tracking the Training Allowance Billets (TAB) that students occupy while in school. TABs are the available billets for advanced education in the Coast Guard. Program managers manage their own students and do not have any means by which to gather information about the whole set of advanced education programs short of contacting all the other program managers directly. Over twenty program offices handle more than 50 areas of study. Managing these education programs

is at most 10-15% of an individual program manager's responsibility. One can imagine that the processes in place may well be dysfunctional. For instance, our program manager, Systems Directorate Office of Force Management (G-SRF), controls three areas of study, Electrical Engineering, Information Resources Management, and Advanced Computer and Electronics Technology which encompass about seventy students. No one working in these offices has the time or the inclination to standardize these processes, let alone redesign them. Most of these processes lack any meaningful utilization of the Coast Guard's existing information technology infrastructure. Information flows to and from the students and managers mostly by regular mail. It is recognized, however, that as the budget continues to become ever more constrained, it is increasingly important to ensure that the dollars are being spent as wisely as possible.

The number of personnel that can be selected for each area of study is constrained by both the Coast Guard's budget for advanced education and by the forecasted need for personnel with those particular skills. Members must submit a request to be considered for advanced education. The member may put in for up to four different programs. A selection board is held for each program to chose primary and alternate students. Primary selectees are those individuals the Coast Guard intends to fund for education for that program. Primary selectees negotiate with the requisite program office to determine where they will attend school and the particulars of the curriculum. There is no set of written rules by which the program managers make these decisions. Although ostensibly available, there is no easy way to garner complete information upon which to base a decision. As a result, a lot of these decisions are made conservatively, based upon minimal information. The options available to individual selectees will depend upon several factors including tuition costs, curriculum content, moving expenses, expected length of program, and geographic location of the expected subsequent assignment.

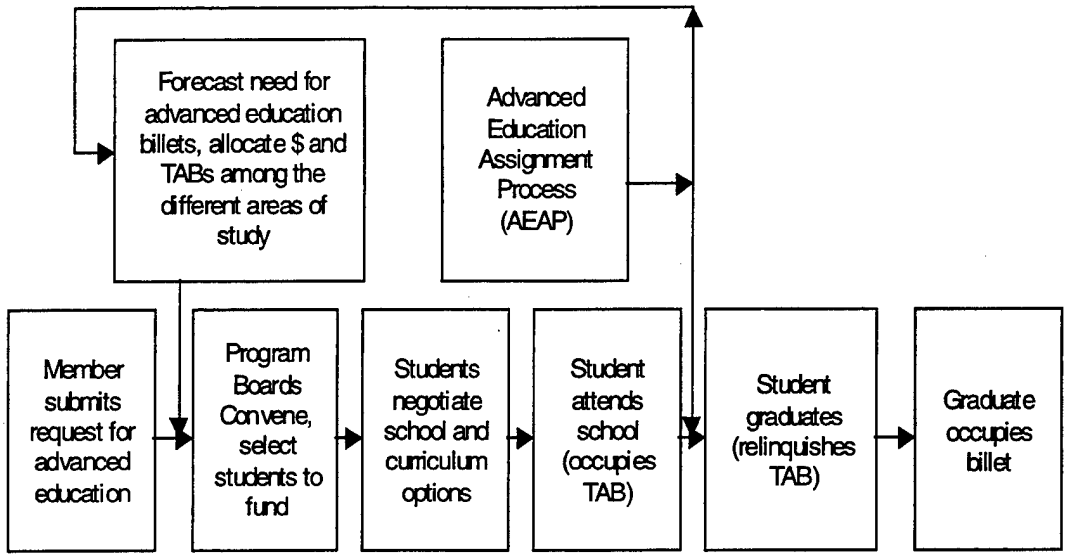


Figure 3: Student Management Cycle

Figure 3 shows the relationship between the processes of student management (the bottom row of boxes) and the Advanced Education Assignment Process. The assignment process plays a role in gauging the need for personnel with advanced degrees, which in turn helps determine how many personnel to send to school for each program. The timing of the steps of the cycle is built upon the annual assignment cycle. Students are selected for advanced education a year before the end of their current assignment. Those candidates that do not become primary selectees can participate in the normal billet assignment process. Most advanced education programs last one to two years. Therefore, forecasting must be done for a need that is at least three years ahead. The decisions made in early 1999 will affect those who go to school in 2000, and those that graduate from school in 2001 and 2002

The student management cycle begins with members submitting packages to headquarters by the middle of May each year to compete for selection by the advanced education program boards that will meet over the summer. Most of these programs result in a degree, either bachelors or masters.

The second block shows that each program office holds a board to review candidates who have submitted packages for the areas of study that they control. The result of each board is a list of primary and alternate students. The primary selectees are guaranteed funding for the program.

Alternates move up to a primary position on the list if primary selectees decide not to enter the program or if the program gets awarded the resources to fund more students.

The third block indicates the negotiated decision between the Program Managers and students about where and when they will attend school. Most program offices will give prospective students the option to attend one of two or three schools. If a student wishes to attend some other school, he or she will have to interface with the school and provide the PM with information about the curriculum. The Program Manager makes the final decision as to whether the proposed curriculum is acceptable. Each school will have different tuition costs and pricing schemes. The student will have to pay any tuition costs above what the program office is willing to pay. The program manager has to be very well organized to be able to make an informed decision. Most PMs will try to set up a simple spreadsheet and attempt to use it as a crude Decision Support System. With anything more that just a few students to deal with, the decision space explodes and the complexity can become mind-boggling.

The fourth block in the figure represents the fact that a student occupies a TAB while attending school. All of the TABs are managed by the Coast Guard Human Resources training office, G-WT-1. The management of TABs can be very difficult. The Coast Guard has a set number of 283 TABs. However, this number is officially managed on only an annual basis. The number includes all of the areas of study. Consider that most school academic years overlap the TAB (fiscal) year, and that there is no single date in a year when all students graduate. Also consider that different programs run for different periods of time, and the same program at the same school can take different students a different amount of time to complete. The fact is no one knows for sure in any particular month how many students are being funded. Most curricula last at least 18 months. One program may have 90 or more students, some which have been in school for a year, some that will graduate this year and some that will start this year. Many students have almost no contact with the program office once they enroll in school and will graduate on a date earlier or later than expected without the program office's knowledge. Each program office keeps track of its students separately. Specific knowledge of how many TABs are actually occupied on a month to month basis over all the programs would require all the offices to pool their information, which they presently do not. If an integrated approach were used, a

student graduating early in one program could mean that another student, perhaps in another program, could start earlier or an alternate student paying his own way could be funded for a few months. This type of coordination is unmanageable under the present system. All the program offices have access the to Coast Guard Intranet and therefore the infrastructure is in place that would allow for an implementation of an integrated system.

C. BUSINESS PROCESS REENGINEERING.

Business Process Reengineering (BPR) is the fundamental rethinking and radical redesign of business processes to achieve dramatic improvements in critical, contemporary measures of performance.[Ref. 2] BPR has been successfully employed by many private sector companies in the last few years. IBM Credit Corporation instituted caseworkers that personally take credit applications through all the steps of the process and slashed the turnaround time for a credit application from seven days to four hours. Ford was able to reduce the number of personnel in their accounts payable department from 500 to 125 by eliminating the need for dealing with vendor invoices. [Ref. 3:p. 36-44] Both examples involved innovative integration of information technology within the processes that were redesigned. The Coast Guard has spent the last several years improving its information technology infrastructure, including deploying the Coast Guard Standard Workstation III (CGSWIII) and the Coast Guard Internet (CGWEB). One of the precepts of this thesis is that the Coast Guard needs to make use of this infrastructure to assist in the redesign and operation of its business processes.

In contemplating the need for Business Process Reengineering, consider the challenges facing the Coast Guard as well as the government in general today:

1. Changing Nature of Processes

The rules of conducting business are changing. At one time, bigger was better. Because of turnover, rotation and decreasing retention rates, adequate was good enough. The economies of scale and mass production compensated for lack of innovation in product design, poor product quality and archaic processes. The runaway success of many small innovative "start up" companies and the major improvements achieved by larger innovative companies show that

bureaucratic, slowly adaptive model of the past is being swept away. The government and military of today has been trying to get by on the increasing efforts of its fewer employees while continuing to support old paradigms. This can not hold for long; the government must now stress flexibility in its operations. The government now must face the risk of losing effectiveness due to downsizing and must make a special effort to maximizing effectiveness by utilizing and integrating technology. These pressures are forcing government agencies to either adapt or perish by loss of good personnel.

2. Overcoming Collective Amnesia

Many government agencies and companies lack the organizational structure to implement major step level changes. An entrenched bureaucracy might not perceive the need for change or may feel threatened by it and react by resisting the new process. The military is notorious for doing things because of tradition and suffers from collective amnesia. Lessons learned by individuals are not always communicated to others and mistakes are repeated. It is as if the military does not understand the importance of efficient business processes or might be paralyzed by a culture of continuous consensus building. Military agencies allow for many of their tasks to be done by young, inexperienced people that don't see the big picture. Then these people transfer and the new person will spend considerable time and effort learning the tasks.

Any of these situations can be disastrous by preventing the military from responding effectively to changing conditions in a timely manner. Such dysfunction can affect every organizational level:

- Top management becomes unfocused, constantly responding to change rather than initiating it.
- Middle managers are so busy worrying about short-term costs, overhead reductions and their jobs, that they don't have time to develop let alone implement long term strategic plans.
- Employees feel powerless and lack motivation to bring about change.
- Employees are seldom in the job long enough to implement new processes.

3. Deployment of Information Systems

Existing information systems are not efficiently deployed. Older legacy systems consume significant amounts of maintenance and support costs. The role of MIS is often simply to automate and perpetuate existing business processes; its time is spent fighting fires rather than effecting healthy long-term change. This situation works against other attempts at organizational and process changes.

4. Leveraging Technology

Advanced technologies are not being leveraged to achieve dramatic business changes. New innovations are driving affordability, quality, and performance of information systems to new levels. However, the government can't always take advantage of these new innovations because of contracts with vendors, and various other political reasons. Management's challenge is to understand how organizational and process changes can be instituted to produce the maximum possible benefits from an array of new technologies including the likes of:

- Distributed computing
- Parallel processing
- Wireless data communications
- Advanced relational data base technologies
- Work flow management
- Computer Aided Software Engineering methodologies
- Personal Digital Assistants and handheld computers

Many of our job designs, work flows, control mechanisms, and organizational structures came of age in a different competitive environment and before the advent of the computer. They are geared toward efficiency and control. However in society today, we are focussed on innovation and speed, service and quality. Instead of embedding outdated processes in software, we should obliterate them and start over. [Ref. 1:p. 25] We should reengineer our processes by

using the power of modern information technology. Doing so will help us to achieve drastic improvements in our performance. Reengineering strives to break away from old rules about how we organize and conduct business. From our reengineered work, new rules will emerge that fit the times. The downside is that reengineering can not be meticulously planned. It is an all-or-nothing proposition with results that are uncertain and requires the attention and the support of top management. BPR addresses all of these things. The ultimate goal of BPR is to fundamentally restructure the way companies do business, to achieve dramatic, permanent improvements in operating performance, customer service, and employee satisfaction.

Redesign is a straightforward activity, but five major steps are involved: develop the business vision and process objectives, identify the processes to be redesigned, understand and measure the existing process, identify IT levers, and design and build a prototype of the process. [Ref. 4:p.199]

The vision and process objective of the AEAP is to fill all of the billets in the Coast Guard requiring advanced training with individuals that have the appropriate training. This is a fairly simple vision, but requires the realization of potential mutually exclusive objectives like cost reduction, high output quality, and even empowerment. Because of the complexity and inefficiency of the AEAP, it is a process to be redesigned.

The Program Managers don't have a good grasp of when the members in their account are graduating and they also don't always know where they are going to send them. The AOs don't know all of the jobs that require a member to have advanced education training. Most of the processes involved in both the management and assignment of advanced education students continue to rely heavily on the movement of paperwork by regular mail. Any organization that relies on changing hand written paperwork data into information useful for decision making relies heavily on the individual efforts of those in the process. These diverse individual efforts are not being integrated for the benefit of the whole. No baseline exists by which to measure the success of the present processes, besides the filling of billets. Post education surveys are being filled out by ex-students and by the supervisors of those ex-students in order to get a qualitative indication of the success of the education, but the results are not yet available. As far as

identifying IT levers, it is obvious that there is little real utilization of the IT infrastructure that presently exists.

D. MODELING AND SIMULATION

Along with BPR, simulation quantifies the differences between the original process and the redesigned processes. Simulation is a powerful tool for those who want to analyze, design, and operate complex systems. It allows users to create models of real-world processes that are too complex to be analyzed by spreadsheets or flowcharts. It is a cost-effective means of exploring new processes, without having to resort to pilot programs. And it is an efficient communication tool, showing how an operation works while stimulating creative thinking about how it can be improved. Simulation is used in industry, government, and educational institutions to shorten the design cycle, reduce costs, and enhance knowledge. This thesis utilizes a simulation application to model processes involved in the management and duty assignment of advanced education students.

A model is a logical description of how a system, process, or component behaves. Instead of interacting with the real system, you can create a model that corresponds to it in certain aspects. For example, the board game Monopoly is a model of a real system: the hotels and facilities of Atlantic City. [Ref. 5]

Simulation involves designing a model of a system, process, or component and carrying out experiments on it. The purpose of these "what if" experiments are to determine how the real system performs and to predict the effect of changes to the system as time progresses. For example, we use simulation to answer questions such as:

- Will this change to our process result in higher yields/quality/revenues?
- How many people are required to maintain service at a specified level?
- Can we design this system with only utilizing half of the manpower?

Simulation enables us to test hypotheses at a fraction of the cost of actually undertaking the activities that the models represent. For example, simulation is usually a lot less expensive and less time-consuming than building a pilot process. [Ref. 6] While experimentation with

models of existing processes is most common, simulation is also used to explore the unknown and unproven. In addition, the modeling process itself is beneficial: it is generally acknowledged that about 50 percent of the benefit of a modeling project are gained by the efforts expended before modeling begins (gathering data, posing questions, understanding processes, etc.).

E. EXTEND

Extend is a dynamic, iconic simulation environment with a built-in development system for extensibility, and is the simulation tool used in creating the models in this thesis. It has the ability to simulate discrete event, continuous, and combined discrete event/continuous processes and systems. Virtually anything possibly imaginable can quickly be built by using Extend's libraries of pre-built blocks. No programming is necessary; however, it can be done if so desired. Everything needed for model building is in Extend. The authoring environment and development systems are built in.

Extend blocks are grouped into libraries according to function; e.g., blocks commonly used in discrete event models can be found in the Discrete Event library. These process specific blocks can be placed on a model worksheet by selecting them from the menu (just by dragging and dropping). You can then connect them utilizing the mouse. Then set the appropriate parameters in the dialog boxes, and it is ready to run.

Since each Extend block has a pre-defined functionality, we only need to enter parameters into each block's dialog box. Data can be entered directly into block dialogs, interactively using controls, or read in from files as the simulation runs. For example, clicking a button can select a probability distribution or change a queue from Last In First Out (LIFO) to First in First Out (FIFO). Dialog boxes also provide you with other vital simulation information like utilization rate, number of items entering or leaving the block, queue length, etc.

F. ANALYTICA

The drawing board is where nearly every model begins. Boxes and arrows are used to give shape to ideas and notions. Almost every discipline has formalized this process with specific interpretations of the boxes and arrows; examples are organizational charts, flow charts,

PERT diagrams, entity-relation diagrams, decision trees, and semantic networks. Influence diagrams were developed by the decision-analysis community as a representation for working with decision-makers and stakeholders in expressing the framework for decisions, including objectives, relationship and uncertainties. Influence diagrams are a good tool for people who work collaboratively and want to use graphical diagrams to develop a shared understanding among the team of the model elements and relationships.

Analytica is used in this thesis to develop a simple Decision Support System (DSS). Analytica is a sophisticated modeling tool that uses influence diagrams to communicate the flow of information and harnesses the power of arrays to model complex problems. It utilizes a visual software interface for creating, analyzing, and communicating quantitative models. It provides an easy interface to graphical influence diagrams that describe a qualitative structure of models and intelligent arrays with the power to scale simple models up to handle large problems. The user interface is easily developed within the program, yet is kept separate from the influence diagram modeling function.

Analytica is available for Windows/NT 4.0 and Analytica can be linked with external documents and spreadsheets, specifically OLE compliant programs such as Microsoft Word and Excel, both for input and output.

III. PROCESS MODELS

A. ADVANCED EDUCATION ASSIGNMENT PROCESS MODEL

The AEAP is simple in nature, however it has proven very difficult to model. It is important to note that not all of the processes within the AEAP described in Chapter 2 are modeled. The former represents a static model simply showing officers being matched with billets. In this chapter, the process is modeled by utilizing various blocks within Extend's Model Libraries. The purpose of using a dynamic model is to simulate the steps and time involved with assigning 1000 officers.

The three main Extend model libraries used are the Generic library, the Discrete Event library and the BPR library. They provide an extensive set of iconic building blocks for modeling. No equations are needed when utilizing these libraries. The Generic library is useful for quickly building continuous models, as well as for performing specialized tasks. The Discrete Event library has all the basic tools for creating models that use queues, servers, item specific attributes and priorities. The BPR library is an extension of the Discrete Event library. BPR library blocks directly correspond to the activities, queues, delays, and transformations that comprise business processes. The BPR library also incorporates high-level modeling concepts such as batching, cycle timing, activity-based costing, and conditional routing.

1. Upstream Process

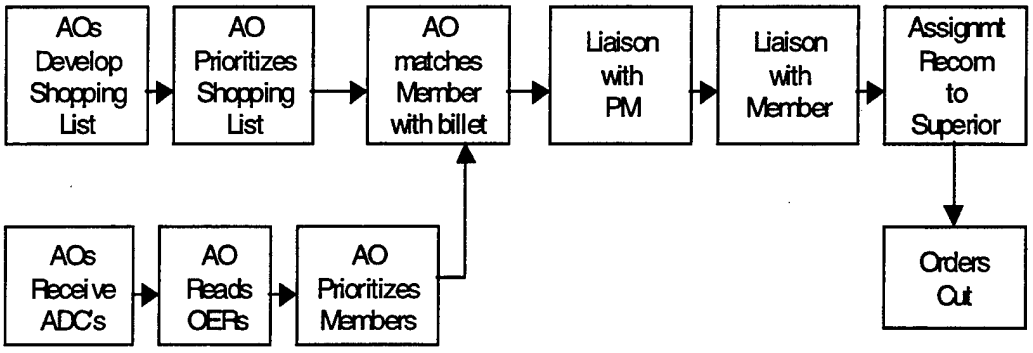


Figure 4: AEAP Block Diagram

Figure 4 shows a block diagram of the process simulated in this chapter. The process of detailing officers is the same every year. All of the delay times and data used in the model come from information gathered during interviews with Assignment Officers. Each model has been validated against its real world counterpart in the Coast Guard and calibrated to reflect performance of its corresponding process in the physical world.

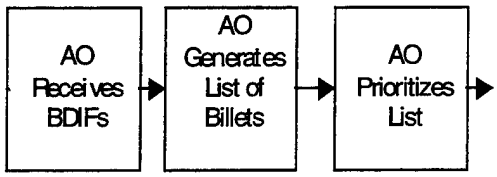


Figure 5: Beginning of the AEAP

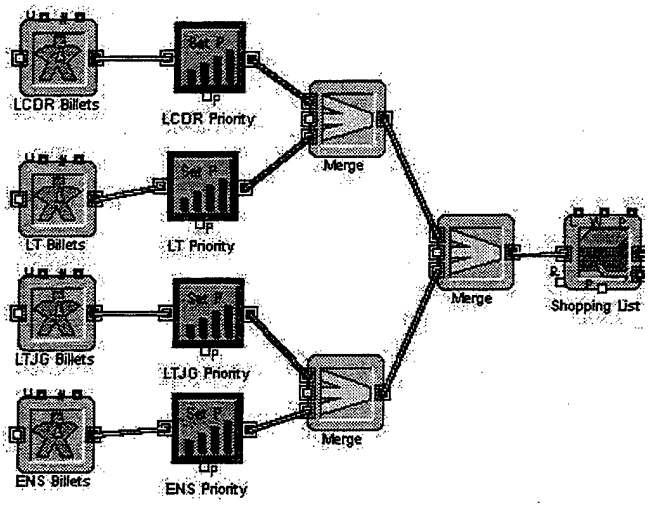


Figure 6: Extend Model, Beginning of AEAP

Figure 5 shows a block diagram of the beginning of the AEAP. Figure 6 is the corresponding Extend model. The AEAP model starts out with two processes taking place simultaneously. The first process involves creating a shopping list of billets available for selection. This process begins with a Labor Pool block from the BPR library. The labor pool provides a list of billets at each rank level that go into a queue to create the final shopping list. There are four blocks working in parallel. The first one represents 140 Lieutenant Commander billets. The second block represents 500 Lieutenant billets. The third and the fourth blocks represent the 300 Lieutenant Junior Grade and 60 Ensign billets, respectively. The Set Priority

blocks are then utilized to set a relative priority to the billets going into the shopping list queue. For example, the higher-ranking billets are serviced first, as they have higher priority. The Merge blocks are used to merge the different inputs into the single shopping list queue.

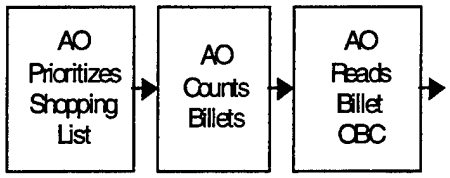


Figure 7: Establishing Priority

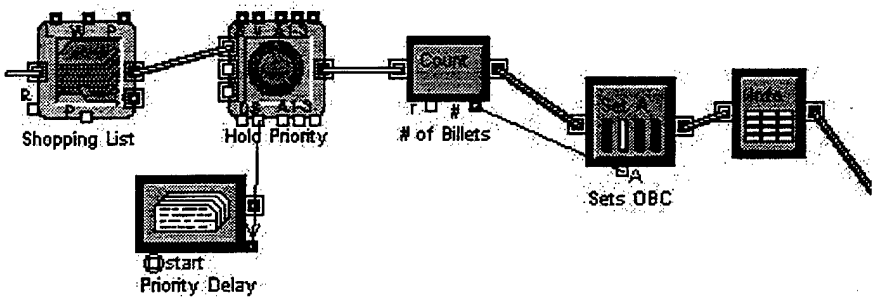


Figure 8: Extend Model, Priority for Shopping List

Figure 7 shows the block diagram of the priority establishing process. Figure 8 shows the Extend model of this process. After the inputs have been merged they go into a Stack block. The Stack block comes from the BPR library and holds the merged items until requested by the other blocks in the model. Once all inputs are received, the Stack block releases them in priority order. A delay following the Stack block is required in order to ensure all items are available within the Stack block to be compared and prioritized. Through a connected Program block, an Operation block is used to create the required delay in the Stack block. Without the delay, items would go straight through the Stack without being prioritized. The Program block is programmed to shut off the flow of information until a set time. Once that time is reached, the Operations block will allow items to flow. After the Operation block, a Count block is used to count the number of billets going through the queue. The Count block is then connected to a Set Attribute block. The Set Attribute block assigns an attribute to each of the billets passing

through the block. In this case, the attribute being set represents the Officer Billet Code of each job within the Coast Guard.

2. Downstream Process

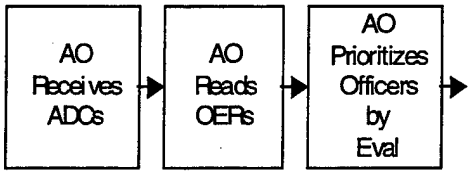


Figure 9: Priority for ADCs

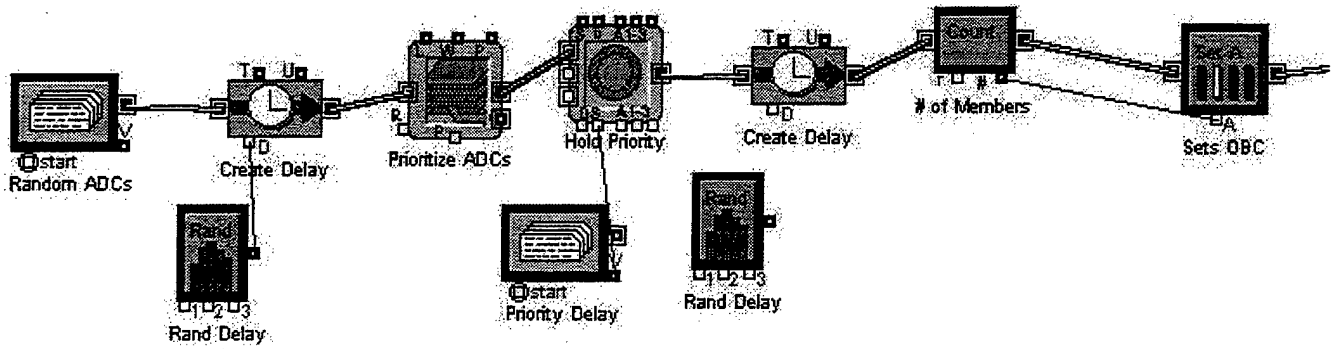


Figure 10: Extend Model, Priority for ADCs

Figure 9 shows the block diagram of the priority process for ADCs. Figure 10 shows the Extend model of this process. While all this is going on, the other branch of the model simulates the arrival of Assignment Data Cards (ADCs) to the AOs. A Program block controls these arrivals. The ADCs are received by the AOs in random order. The Program block allows the user to implement times, values and priorities of an occurrence.

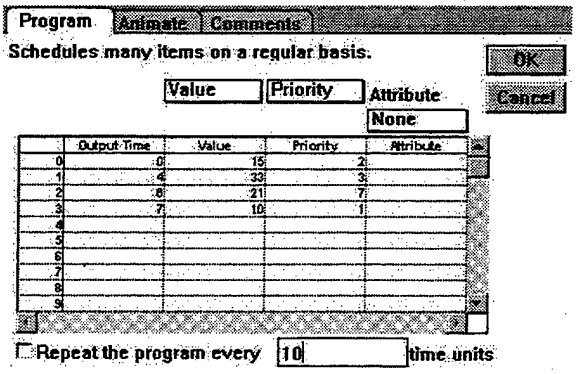


Figure 11: Program Block Input

Figure 11 shows the input of the program block. In this example the program block starts out by sending fifteen Lieutenant Junior Grade billets into the queue at time zero. This is followed by 33 Lieutenant billets at time four, 21 Ensign billets at time six and 10 Lieutenant Commander billets at time seven. Once the ADCs are received, the AO files them for use during the assignment season. OERs are received by each AO and they may need two or three days of reading time to complete all of the OERs. This is not done as a part of the assignment process. This is done because the AOs are quality reviewers for the OER. Part of their responsibilities are to read each OER to ensure that the numbers match with the words. A Delay block represents this occurrence. In order to cause a random delay, the Random Number block is attached to the Delay block. The Random Number block is found in the Generic library and is set to delay between two or three days. The outputs from the delay go into a Stack block for prioritization by rank. The Operation block is again used to delay the Stack block until all inputs are received. Once the inputs are received, all past OERs of the members are read. This is done so the AO can see how well the member did in their previous jobs. This is represented by a delay block with a random generator of zero to one day. Once the OERs have been read the members are counted by a Count block. A Set Attribute block follows the Count block to give each member an identification number. The member with the highest rank will receive a member identification number of one. Lower ranks receive higher numbers.

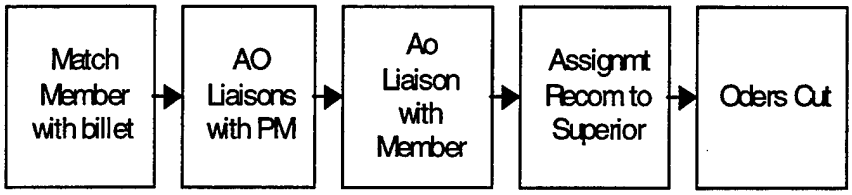


Figure 12: Combining Officers with Billets

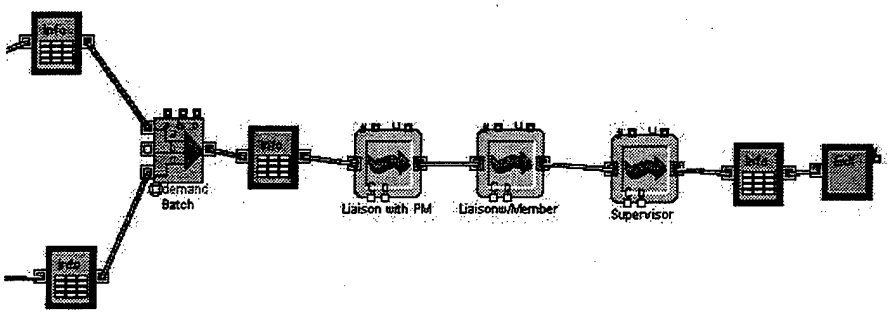


Figure 13: Extend Diagram, Batching of Officers fwith Billets

Figure 12 shows the block diagram of the process of matching officers with jobs. Figure 13 shows the Extend model of this process. Once all of the billets have been prioritized, attributes have been set, all of the ADCs have been received, all OERs read, and all members prioritized, the two processes are combined with a Batch block. The Batch block is found in the Discrete Event library. The Batch block allows items from several sources to be joined as a single item, representing the matching of one officer with one billet. The model combines the highest-ranking jobs with the highest-ranking people, resulting in assignment for each member. The best-qualified officer gets the highest priority job and the least qualified officer gets the lowest priority job. After the Batch block there are three Transaction Preemptive blocks. These blocks represent three separate delays: the AO liaisons with the PM about the billets requiring advanced education training, the AO discusses job options with members, and the AO submits the slate of officers to his supervisor for approval. This process takes approximately five business days. Delays have been set in each block to represent this five-day process. The last block is an Exit block, found in the Discrete Event library. This block passes items out of the simulation, until the simulation is finished.

B. STUDENT MANAGEMENT PROCESS MODELS

The student management processes studied include the selection of students from candidates, the selection of schools for students to attend, and the administrative processes of students attending schools. Figure 14 shows a block diagram of the process of student selection.

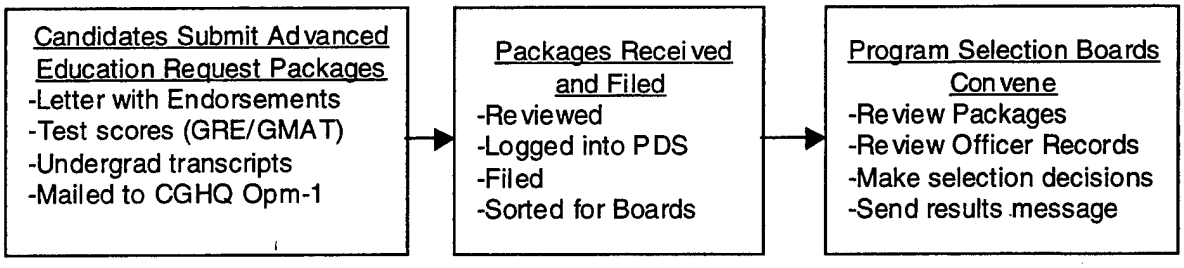


Figure 14: The Student Selection Process

1. Selection of Students

The general steps of this process include the generation and sending of student candidate packages, the filing of these packages, the sorting and extraction of the appropriate packages for each selection board, and the processes of the selection board itself. The modeling of each subprocess is covered separately below.

a) Modeling the Generation of Advanced Education Request Packages

Figure 15 shows a block diagram of the process for a single package. Figure 16 shows the corresponding Extend hierarchical block developed by the authors. The prospective student must start with a painstaking review of the Coast Guard Training and Education Manual, which lays out the procedures for submitting a package. The process details vary with the programs that the student is selecting but most involve the same three steps: generating a letter with endorsements, studying for and taking some sort of examination, and obtaining transcripts from prior education. Each block in the diagram represents a delay. Obviously, all three parallel tasks must be completed for a completed package to be put in the mail.

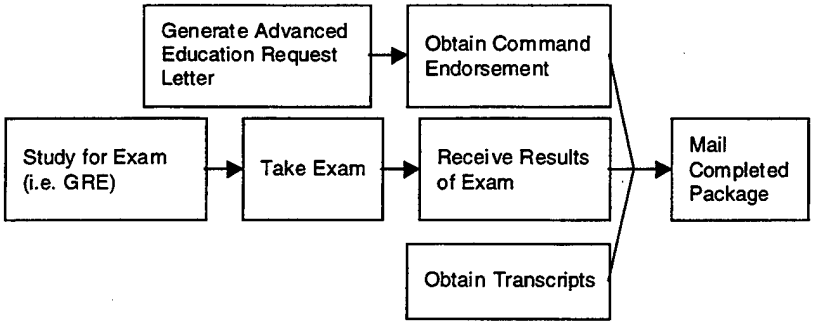


Figure 15: Generation of a Student Package

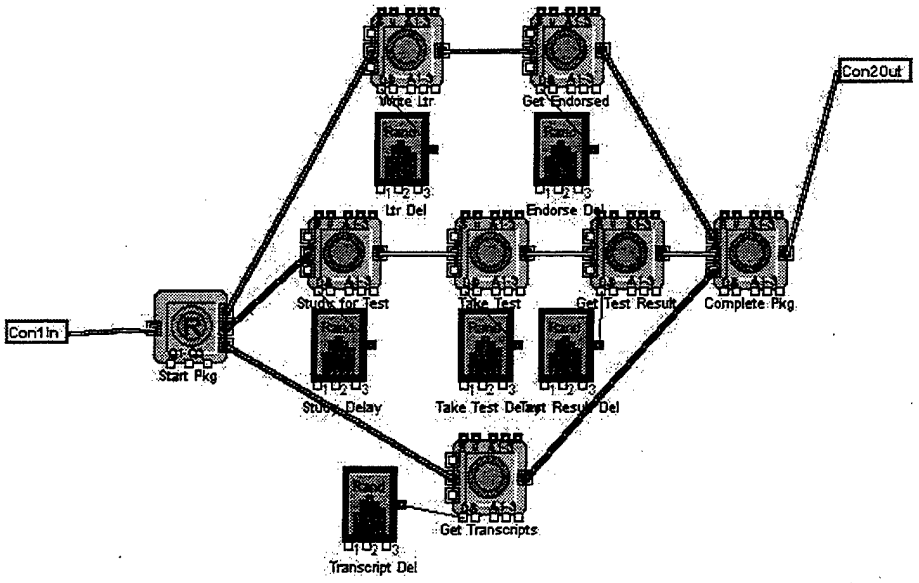


Figure 16: Extend Hierarchical Block, Student Package Generation

The time unit used in the model is hours, with eight hours representing an 8-hour workday and 40 hours representing a workweek. The process of studying, taking the examination and receiving the results is normally the longest, estimated at a minimum of 107 to a maximum of 477 hours, although the obtaining of transcript was estimated to sometimes take as long as 240 hours (6 weeks in model time). These numbers are based on personal experience and anecdotal data from other students. As with the AEAP models described above, each model discussed in this section has been validated and calibrated against its real-world counterpart in the Coast Guard.

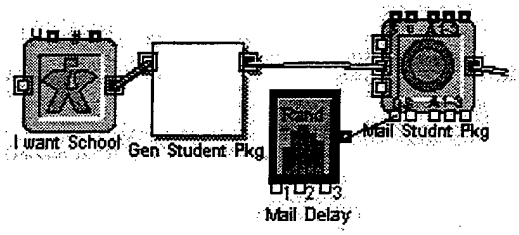


Figure 17: Extend Model, Use of Hierarchical Block

The modeling program allows the package generation process to be contained within a single hierarchical block, which can be included in a larger model. In Figure 17, the

single block labeled "Gen Student Pkg" represents the entire contents of Figure 16, for example. Subsequent hierarchical blocks were used to allow simulation of 500 student packages being generated at the same time.

b) Modeling the Receiving, Filing and Sorting Process

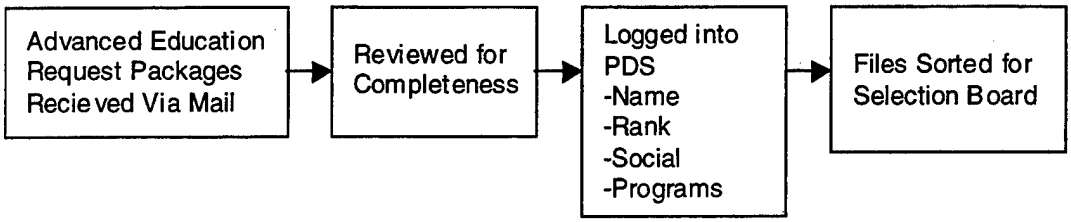


Figure 18: The Receiving/Filing/Sorting Process

The second part of the student selection process is the reception of the student packages. As many as 500 to 800 advanced education request packages are received at Coast Guard headquarters prior to the May 15 deadline every year. Responsibility for these packages is the full time job for a single first class petty officer (YN1). These packages are manually logged, sorted and stored. The block diagram of this process is shown in Figure 18. The logging that takes place is a short keyboard data entry of the name, rank, program(s) requested, and partial Social Security number into the Coast Guard's Personnel Data System (PDS). PDS provides a list that can be used later to assist in sorting the files needed for each program selection board. The reception, logging and filing of student packages are represented in the Extend modeling program by a single Operation Block delay. Based on a phone conversation with the Yeoman responsible for this task in (OPM-1), the delay was set to 10 to 16 minutes for each package.

c) Modeling the Selection Board Process

The third part of the student selection process is the meeting of the selection boards for each program. Such selection boards meet sequentially throughout the summer to select which candidates they will fund. Since prospective students may apply for up to four different programs, some student packages may have to appear at four different boards. In addition to the student packages, complete records on candidates, including Officer Evaluation

Reports (OERs), are available to the board. The specific processes of the selection boards are somewhat confidential. Generally, the board will include no less than three members: a representative from the pertinent program office (PM), the Assignment Officer (AO) and at least one member from an unrelated office. The board reviews the request packages and personnel records of prospective students for the program. The specific criteria for student selection are not published, but depend upon an individual's qualifications, performance, and academic prowess. Also, boards wish to select candidates that will likely be promoted to the next higher paygrade. Officers passed over for promotion while attending advanced education represent a possible waste of funding for the program office, as the officers are unlikely to remain in the service beyond their initial payback tour. Once the selections of the board are complete, the resulting list of selections is released in a message that is distributed Coast Guard wide. The selected students will normally begin attending school in the fall of the following year.

Figure 19 shows the section of the Extend model that simulates the receiving of advanced education packages and the convening of two sequential selection boards. The timing of the model is set up such that the first selection board does not begin until all of the student packages arrive. The second selection board does not begin until the first board has been complete and all of the student packages have been returned.

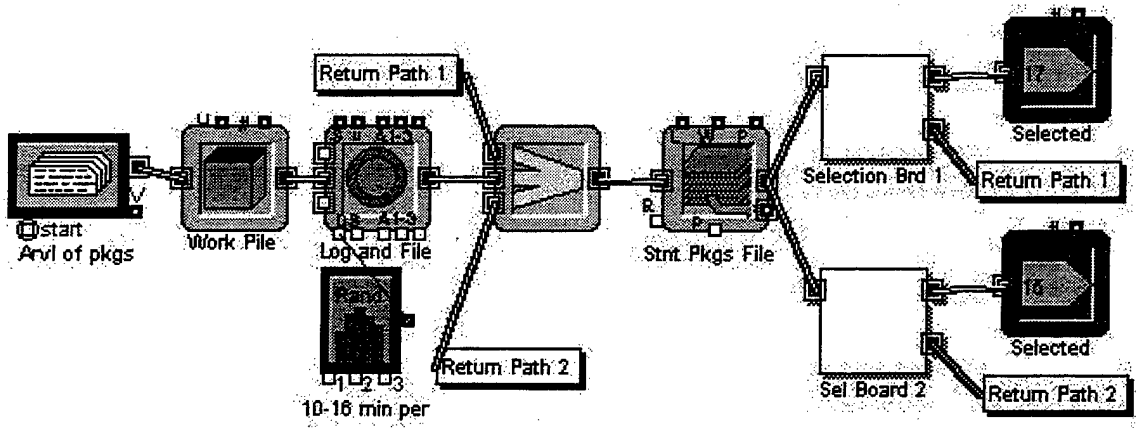


Figure 19: Extend Model, Package Receiving and Board Convenings

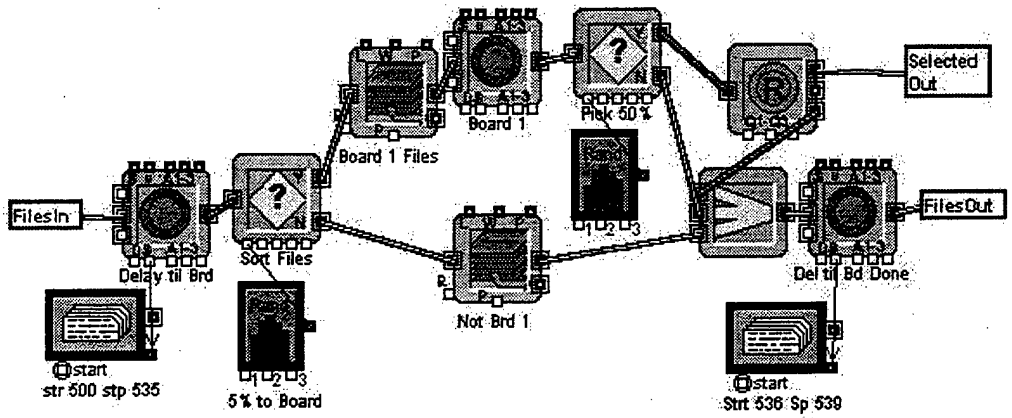


Figure 20: Extend Hierarchical Block, Selection Board Process

Figure 20 shows the details of the Extend hierarchical block that simulates the process of the selection boards selecting students. The first block delays files from entering the model until the board is ready to convene. Once the time for the board to convene has been reached, all of the student packages flow through this section of the model. The board only needs to review packages for its particular program. Therefore a sorting process culls the files that pertain to a particular selection board. In the figure, only 5 percent of the files are considered by the board. The board makes its selections from this subset. Once the selections have been made, all of the files are returned and the next selection board can convene. This model highlights the dependence of the boards on the physical student packages and personnel records. Since many students will be considered in more than one board, all the files must be returned and resorted for the next board.

2. Decision of School Programs for Students

Once students have been selected to attend advanced education, the next step is the determination of where the student will attend school and what the curriculum will include. This process is a negotiation between the student and the PM that leads to a final decision. Since the result of this process is a decision, there is little sense in creating a model that visually simulates the steps of the process. Instead, the elements that affect the decision are identified and organized into a Decision Support System (DSS). For modeling this process, the authors utilize Analytica, a DSS modeling software application.

To briefly review the basic concept of a DSS, according to Bharghava, Krisman and Whinston:

> Traditional decision support systems (DSS) support individuals making *semi-structured decisions* in which mathematical (or other formal) models are used for the structured parts, leaving the decision maker to exercise judgement in handling the unstructured parts. Focusing on the choice-related tasks, DSS facilitate the use of formal modeling techniques in making complex decisions. Among the benefits claimed for these systems is that they facilitate the investigation of more alternatives, and support *ad hoc* query and analysis. [Ref. 7:p. 2].

A structured decision occurs in situations in which the procedures to follow in making a decision can be predicted or specified in advance. The outcome of a structured decision can be predicted with relative certainty, leaving little need for decision support. An unstructured decision involves situations where it is not possible to know in advance what procedures to follow due to involving many random events, unknown variables, or hidden relationships. Unstructured decisions may gain little or no help from a Decision Support System. A semistructured decision is one where some of the decision procedures can be predicted, but not to a point where it leads to a definite decision. [Ref. 8] This class of decision problem can benefit most from a DSS.

The decision in this case is semi-structured, meaning that some of the decision procedures can be quantifiably specified without leading to a definite decision. The structured, tangible portion of the decision deals with moving and tuition costs. The intangible portion of the decision revolves around preferences and tradeoffs associated with the potential school scenarios. The basic problem appears to be in providing the PMs with timely, organized information to assist in decision making.

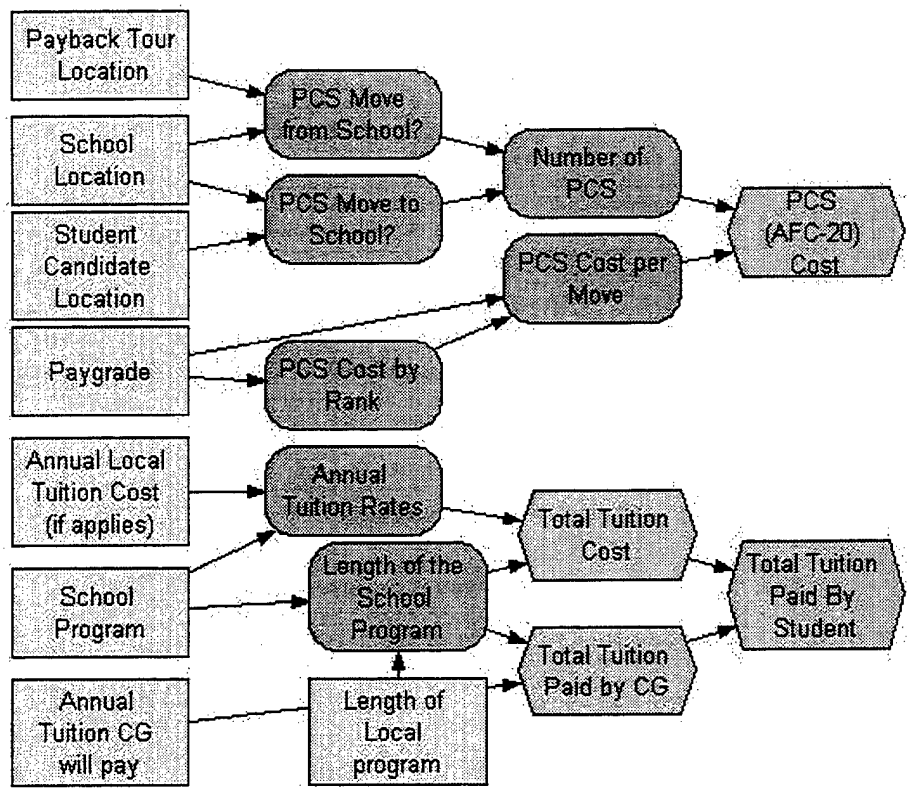


Figure 21: Analytica Influence Diagram, School Program Decision

Figure 21 shows the dependencies of both cost issues, moving costs (AFC-20) and tuition costs, in the form of an influence diagram. In Analytica, nodes represent variables and appear as boxes, ovals, hexagons and other shapes. The different node shapes represent different types of variables. Analytica uses the term variable broadly to include anything that has a value or can be evaluated. The arrows indicate relationships between variables. The details of the relationships are contained within the nodes and are viewable in Analytica when the node is selected. The rectangular boxes signify variables that are in the direct control of the decision-maker and are called decision variables. Rounded boxes are general variables that are typically used to represent a deterministic quantity or functional relationship. The hexagons represent objective variables that indicate the value or desirability of possible outcomes. Normally, an influence diagram will have a single objective variable, but this early stage influence diagram is intended to show the costs of moving and of tuition separately, leaving the tradeoff between the two to the judgement of the decision maker.

The Permanent Change of Station (PCS) moving costs depend upon the paygrade of the student and on the number of PCS moves that will be required in the scenario. Although PMs do not control the AFC-20 account, they have been very conscientious about the expenditure of these funds due to a Coast Guard wide shortage of funding for PCS moves. PMs have been using a rule of thumb to control these costs. The present rule is that if the student is not going to a school where the Coast Guard traditionally sends students, such as the Naval Postgraduate School or the University of Rhode Island, the student must either go to school in his or her present location or to a school in the vicinity of the payback tour. In short, if students want to attend non-typical programs, they will in most cases only be allowed one PCS move. Of course, there are exceptions to this rule, but they are on a case by case basis.

The tuition cost calculation can be even more problematic, but the simplified basis is that tuition for students going to the typical program is paid for by the Coast Guard. The money from this account is in the direct control of the PM. Tuition for a non-typical program is paid for up to an amount roughly equal to the tuition of the typical programs. The student may be liable for any tuition above the typical amount. The amount the Coast Guard is willing to pay for tuition for a certain program changes frequently as tuition amounts for institutions change and as the funding amount the PM is allocated fluctuates. For example, the tuition for the Naval Postgraduate School was raised from $9600 to S10,100 in 1999. The funding levels from the Coast Guard had been already set. Fortunately, a student in an ITM program at a different school dropped out, allowing the windfall funding to be redistributed to cover the added tuition.

These rules of thumb were developed to assist PM decision making where PMs did not have access to complete information. They have the effect of limiting the choices of students, perhaps unnecessarily. If PMs were given quick access to reliable information regarding the progression of their student expenses, they may have more flexibility in providing choices for their students. The specifics of the corresponding DSS are developed in Chapter IV.

3. Administration of Students Attending School

The administration of students attending school involves the processing of tuition payment paperwork. A simplified block diagram of the process is shown in Figure 22.

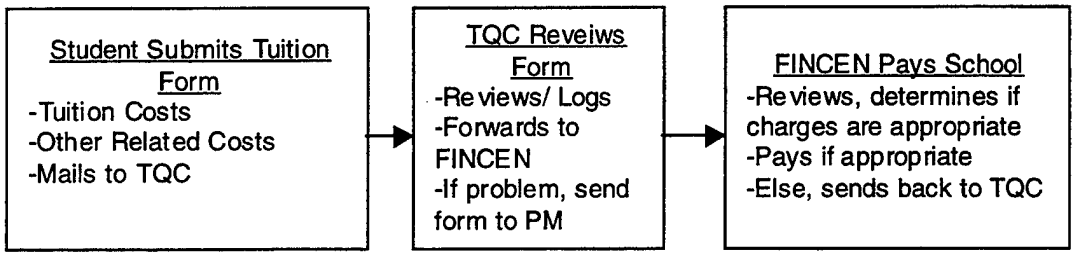


Figure 22: The Student Tuition Payment Process

This process was initially studied due to problems that students and PMs were experiencing. The tuition forms filled out by students are not sent to the PMs, but to another office that forwards the forms to the Finance Center for payment. Any error on the form resulted in long delays as the form was routed back to the PM. The second half of the problem was that the PMs did not have information by which to contact students unless the student had filled out and sent in student data capture forms to the PM. Many students were not submitting these data capture forms. In some cases, by the time the PM was able to contact the student, he or she may already have been disenrolled from classes due to the outstanding tuition payment.

Two things have helped alleviate this situation. The first is that the student tuition forms were changed to include student contact information. The second is the authors of this thesis developed a web site for Coast Guard Advanced Education that provides easy access for students to forms, instructions and information relating to the Advanced Education program. The specifics of the Coast Guard Advanced Education web site appear in Appendix D.

IV. PROCESS REDESIGNS

A. REENGINEERING THE ASSIGNMENT PROCESS

Reengineering a process requires deep thought and a lot of research. Reengineering strives to break away from the old rules about how we organize and conduct business. It involves recognizing and rejecting some of them and then finding imaginative new ways to accomplish work. From our redesigned processes, new rules will emerge that fit the times. [Ref. 3]

Coast Guard Headquarters office of Officer Personnel Management (CGPC-OPM) is responsible for detailing officers in the Coast Guard. There are 12 different accounts that represent all of the billets within the Coast Guard. Each account has two officers working on it, a senior officer and his or her assistant. These 24 officers are responsible for keeping track of all of the Coast Guard members within their accounts, and ensuring that they are detailed in a manner best suited for the Coast Guard.

The system has not always been like this. In May of 1999 the office of CGPC-OPM was redesigned because of streamlining and other realignments. In many cases the two people in each account now split the workload and make sure the account is moving smoothly. The senior officer handles all of the Lieutenant Commander and Commander billets. The junior officer handles all of the Ensign, Lieutenant Junior Grade and Lieutenant billets. This method is effective for what they are trying to accomplish. However it can be better, particularly where officers are prioritized by rank and officers are matched with open billets. Alternatively, we do not propose to redesign the activities further upstream in the process. In the subsections that follow, we briefly review these upstream process activities for reference, even though no redesign is proposed for them at this time. We then address the downstream process activities and outline redesign alternatives offering good potential for performance improvement.

1. Upstream Process

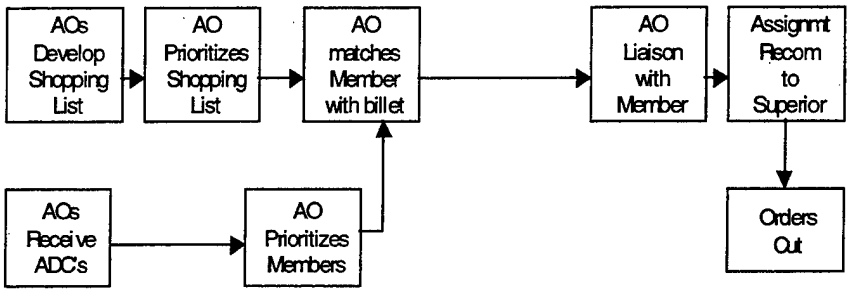


Figure 23: AEAP Redesign Block Diagram

Figure 23 shows a block diagram of the entire redesigned process. This redesign results in a 48% time saving for the AOs. As discussed in chapters two and three, there are several steps that are taken in the assignment process. The AO has to generate shopping lists as well as read OERs, liaison with the program managers, liaison with the members and sends the recommended assignments to their supervisor. The proposal for the redesign eliminates two of these steps, while maintaining the same overall flow of work through the process.

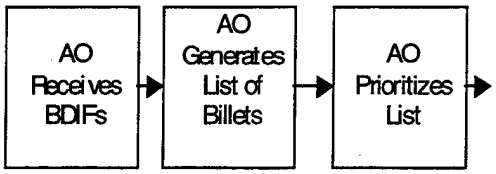


Figure 24: Beginning of Redesigned Process

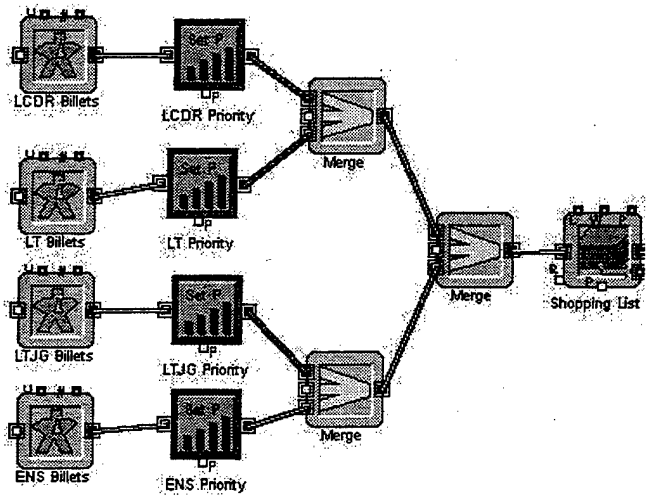


Figure 25: Extend Model, Redesign of the Beginning of the AEAP

Figure 24 shows a block diagram of the beginning of the redesigned process. Figure 25 shows the corresponding Extend Model diagram. As you can tell, the beginning of the process is identical to the original process. This is because the billets come in at random times. The AOs have good intuition for when a billet will need to be filled. However, circumstances arise that cause billets to be vacant before expected. Therefore, no redesign is proposed for this process.

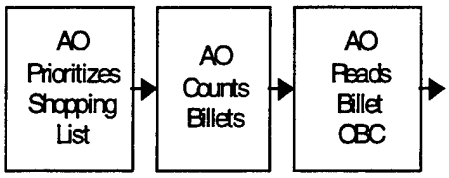


Figure 26: Establishing Priority

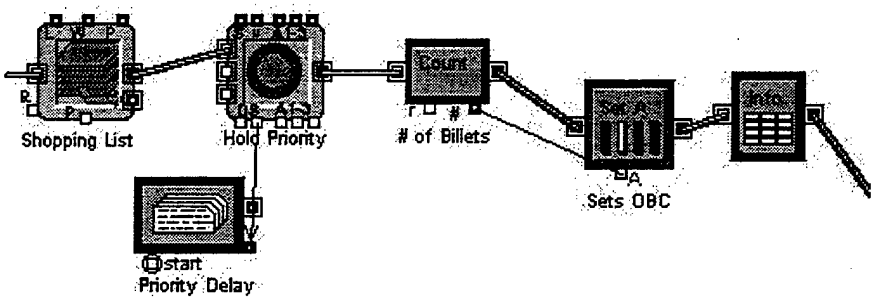


Figure 27: Extend Model, Establishes Priority for Shopping List

Figure 26 shows the block diagram of the priority establishing process. Figure 27 shows the Extend model of this process. These two figures are also the same as the previous model, as we don't consider this to represent a good redesign opportunity. Once all of the billets are in, the shopping list must be generated showing the highest priority jobs first.

2. Downstream Process

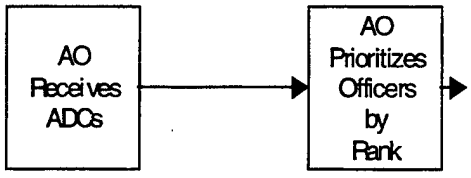


Figure 28: Priority for ADCs

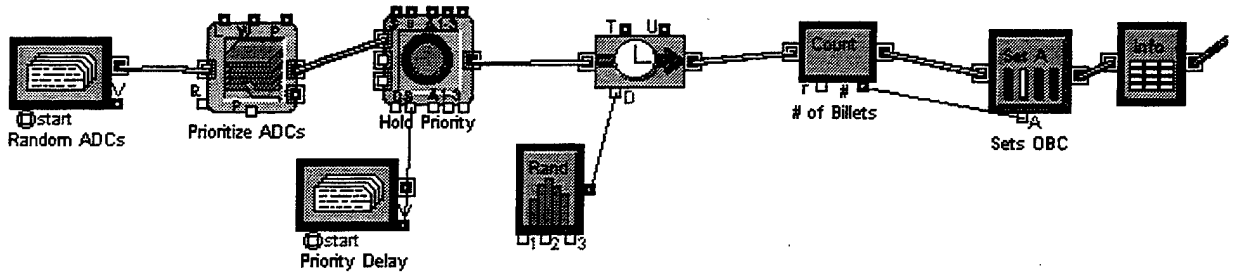


Figure 29: Extend Model for Priority for ADCs

Figure 28 shows the block diagram of the priority process for ADCs. Figure 29 shows the Extend model of this process. This is where we propose to have change introduced. The difference between this process and its predecessor is the AO no longer has to read the OER as a quality reviewer. Reading all of the OERs takes two or three days. This delay is unnecessary. The only reason the AO reads the OER is because the AOs are the first check on OER quality. After they have reviewed them, they send them to another department for further review. Eliminating this step frees up valuable time for the AOs. Subsection 3 of this section discusses how OER quality can still be maintained.

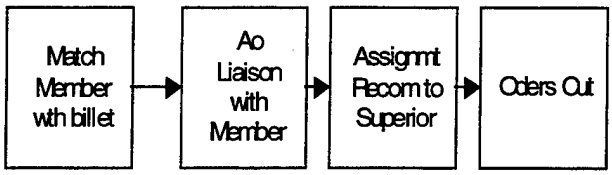


Figure 30: Combining Officers with Billets

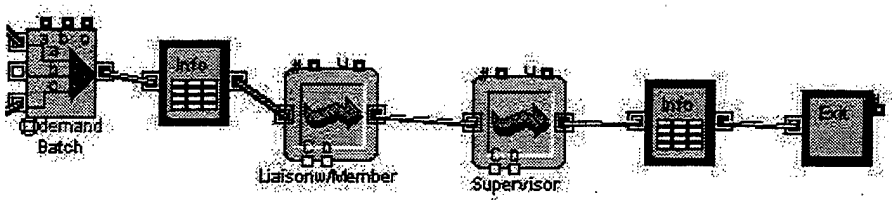


Figure 31: Extend Diagram of Batching of Officers with Billets

Figure 30 shows the block diagram of the process of matching officers with jobs. Figure 31 shows the Extend model of this process. Once the two processes are combined together, in order to detail the officers, the AO liaisons only with the member. As the process stands now, the AO liaisons with the PM as well as the member. The AO-PM liaison step can be eliminated

because with our proposal, the AOs would be privy to the information about billets in their accounts that require members with advanced education training.

Simulation results of the two models are very promising. In the original model, approximately 1,059 hours are required for all 1,000 members to be matched with jobs. Assuming eight-hour workdays, this time translates into 133 days or nearly 7 months. With the redesigned process, only 549 hours are required to match all of the members with jobs. This represents a 48% reduction, thereby significantly streamlining the process. It is important to note that this model has not been tested in a real world application, but the simulation reflects valid performance data from Coast Guard assignment operations. Thus we have confidence in the associated performance projections.

3. Redesign Discussion

With the effects of military streamlining, routine facility and personnel realignments and reorganizations, increased operational requirements, and the demand to remain fiscally responsive, AOs have to find a better way to meet the needs of both the members and the service. The office of G-OPM-2 has recently been realigned in order to better meet these needs. These AOs spend a lot of time doing work that other offices should be handling (e.g., acting as quality reviewers of OER submissions). One of the most important things AOs should know is the description and qualifications for each job in their accounts. Currently, they do not know this information. They rely on PMs to tell them where to send the members in their accounts with advanced education training.

The current system does not identify the advanced education needs of billets. The PMs are acting as AOs, sending recommendations of assignment to the AOs so the AO can forward it to his or her supervisor. AOs don't receive the BDIFs that tell them which billets require a member with advanced education training, and the billet numbers are not coded so the AOs can distinguish whether or not the billet requires advanced education training. The AOs need the information that the PMs have about the billets requiring members with advanced education training. If the AO had this information, he or she would know where to send each member in

the account and have all of the knowledge necessary to properly fill billets. Thus, the AO would not need to liaison with the PM about assignment of members.

This would also benefit the members. As discussed in Chapter 2, the member isn't sure who to talk to about assignment options. The authors spoke with both their AO and PM about billet choices before submitting ADCs. The advice from the AO was sound, but the recommendations were based on the member's past jobs, undergraduate degree type and needs of the service. The PM's advice was also very sound, but the recommendations were based on postgraduate degree type and needs of the program. It wasn't until after the PM advised the AO of which billets needed to be filled by personnel with advanced education that the real billet opportunities were made clear.

Sharing information between the PM and the AO provides for greater efficiency in meeting service need and member goals. The AO has the responsibility of being a career counselor to all of the members in his or her account. When detailing a member the AO has to keep the needs of the service as well as the desires of the member in mind. If the AO does not know that a particular job requires someone with advanced education training, the AO can not fully do his or her job.

Coast Guard Headquarters Office of Evaluations (CGPC-OPM-3) is responsible for ensuring that all OERs are received and of high quality. AOs don't have time to worry about whether the words in the OER match the numbers. Their primary function is to fill billets, not check OER consistency. This responsibility should be lifted and placed in the organization that handles OER quality issues. By doing this, the AOs can concentrate on detailing. Based on simulated results, their 12-16 hour days may be reduced by nearly half through process redesign.

B. REENGINEERING THE STUDENT MANAGEMENT PROCESSES

The overt intent of any reengineering of processes is to realize a bottom line improvement in critical measures of performance such as reduced cycle time, reduced or increased utilization rate of resources (efficiency), cost savings, or increased output rate (effectiveness), or increased quality of the product. There are certainly gains to be made in the process of student selection and in the decisions made about where students will attend school.

1. Model of Proposed Student Selection Process

The easiest target for improving the student selection process is to increase the utilization of the Coast Guard's information infrastructure in the processes. The Coast Guard has spent the last few years deploying the Coast Guard Standard Workstation III (CGSWIII). CGSWIII mirrors the Navy IT-21 requirements. It is a networked Microsoft Windows NT operating system on a PC. Standard applications include the Microsoft Office suite and Microsoft Exchange. The CGSWIII replaces the CGSWII, which has an incompatible proprietary operating system and proprietary applications.

Although the deployment is not 100% complete, nearly every unit in the Coast Guard has access to CGSWIII and the Coast Guard Intranet (CGWEB). Exceptions to this access include many afloat units, members in liaison billets with other services or agencies and students attending advanced education programs. However, the afloat units do have access to CGSWII and the liaisons and students normally have access to some form of email.

There is presently no official use of email in the process of selecting students, although virtually every Coast Guard member has access to email. Student packages could be submitted, either partially or entirely, via email. Although it is important to not exclude individuals that do not have access to CGSWIII access, it is also important to begin integrating the advantages of the information infrastructure that is in place into Coast Guard business processes. In terms of the process simulation model, if student package submissions could be made entirely by electronic mail, this would result in the virtual removal of the mail delay (a delay of 3 to 5 workdays per package). See Figure 32.

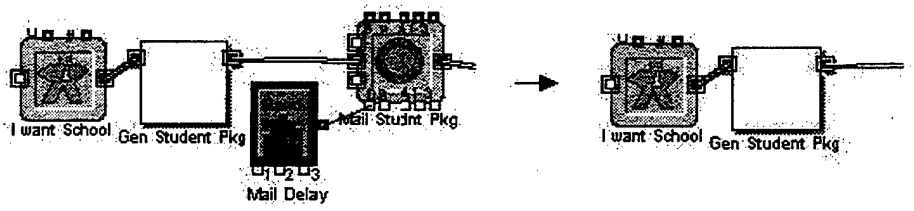


Figure 32: Extend Model, Removal of Mail Delay

Although an IT system (PDS) is presently utilized at this point in the system, its use is limited to assisting in the sorting of physical files and the information must be entered manually.

No fields are entered that would assist the decision process faced by the selection boards. A standardized Microsoft Excel spreadsheet attachment could be included in the package submission consisting of a single line of information that could be electronically pasted directly into a master spreadsheet. Figure 33 shows an example of what the single line entry a student would have to fill would look like.

Microsoft Excel - AdvancedEducationPackageSubmission.xls

File Edit View Insert Format Tools Data Window Help

	A	B	C	D	E	F	G	H	I	J	K	L
1				Advanced Education Program								
2				Choices				Undergrad		GRE	% scores	
3	Last Name	First Name	MI	First	Second	Third	Fourth	Major	GPA	Verbal	Quantit	Analytic
4	Sanders	Marc	F	ITM	IE			EE	3.09	82	72	92
5												
6												
7												

Figure 33: Example Excel Spreadsheet Submission

The master spreadsheet would take the place of the PDS entries currently done by the yeoman. The master spreadsheet would provide easily sortable information to the selection boards. The candidates for each board could be sorted by name, undergraduate major, undergraduate grade point average, GRE (or other) scores or any combination of these fields. The capability already exists within the Excel spreadsheet application to do this. The delivery system (email) is mostly in place.

Ideally, this would also result in a decrease in the processing time per package by the OPM-1 yeoman. A switchover to an Excel master spreadsheet paradigm may cause some initial problems. Excel is not available on CGSWII. Therefore, mail submission of physical packages would still have to be accepted until the deployment of CGSWIII is 100% complete. This may conceivably create an additional burden on the OPM-1 yeoman at headquarters, who would have to handle both types of submissions.

The simulation model tends to indicate that the yeoman is not presently overwhelmed with processing incoming packages, and therefore should have the capacity to accept the additional burden. Figure 34 shows a graph from a simulation run of the Extend model. The two curves are utilization rates of the yeoman processing the packages along with the progressing count of the incoming packages. The scale on the left side of the figure is the utilization rate of

the yeoman. The right side is the accumulated number of packages received. The utilization rate peaks slightly above 33% when the incoming package load is near the high end of the expected 500-800 range.

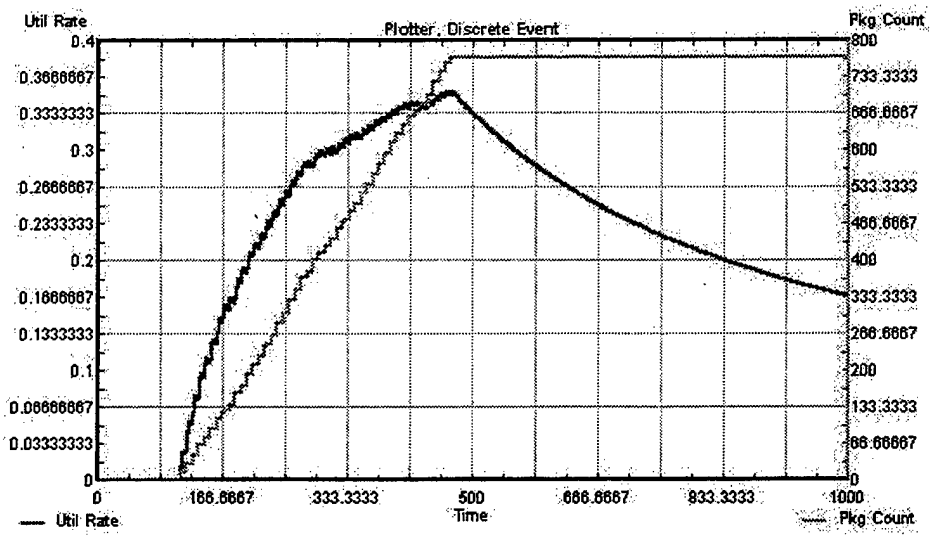


Figure 34: Extend Simulation Plot, Utilization Rate and Incoming Package Count

An ideal future state would be one in which members could make submission of their student package information directly over the Internet via a web browser. There remain some obstacles to this paradigm, security being foremost.

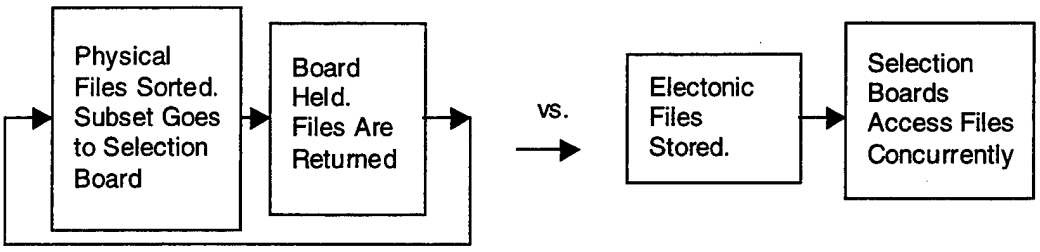


Figure 35: Block Diagram, Use of Physical Files versus Electronic Files

The major advantage of the electronic submission of student package information is the parallelism it would facilitate in the convening of the student selection boards. The impact is that the selection boards could be held concurrently instead of sequentially, see Figure 35. As long as the boards continue to rely on the physical student packages, there is little chance for different program boards to be held simultaneously. The boards presently have to meet over a period of

months. This period could be greatly reduced if the constraint of having physical student packages were removed. Personnel records of the service members are already available electronically.

This change greatly simplifies the conceptual model as well as the Extend model of the process, as records do not have to be returned to the file in order to be drawn and sorted for the next board. See Figures 36 and 37. In Figure 36, the selection boards are held sequentially. The physical files are delivered to the first board, returned to the student package file upon the completion of the board, then delivered to the second board. In Figure 37, the electronic files are duplicated and the selection boards take place concurrently. No return path is needed for the files, as the files used at the boards are electronic copies.

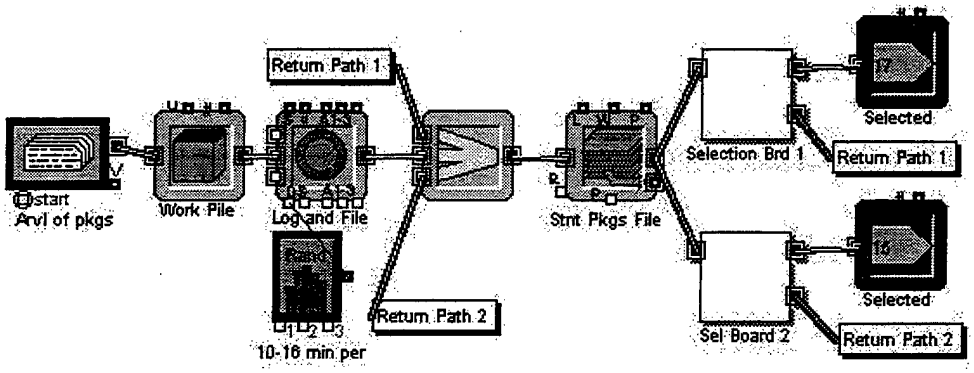


Figure 36: Extend Model, Package Receiving and Board Convenings, before

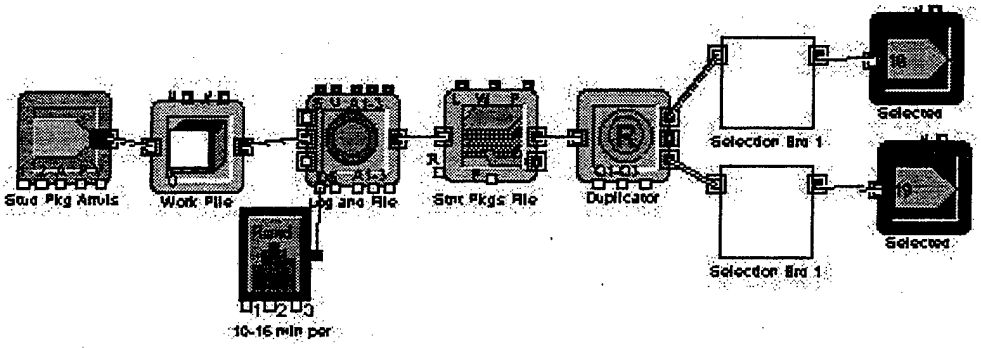


Figure 37: Extend Model, Package Receiving and Board Convenings, after

Of course, there are factors that preclude all of the selection boards being held at one time. Some PMs and some AOs are responsible for more than one program and therefore have to

attend as many as three or four boards. However, many boards could be held in parallel and the period required for the boards to be held would be cut down from months to weeks.

The next step in this process could be to hold virtual boards, where the board members would not actually have to physically meet, but would collaborate via email or a groupware application from their own offices.

2. Decision of School Programs for Students

Most would agree that managers are not completely rational decision-makers. Managers frequently don't have time to collect all decision-related information and fully explore all feasible alternatives. Clear, focused objectives and criteria are often not completely defined with more weight placed on intangible information. Alter (1992) identified eight common managerial decision-making flaws [Ref. 9]

- Poor Framing: Allowing a decision to be influenced excessively by the language used in describing the decision
- Recency Effects: Giving undue weight to the most recent information
- Primacy Effects: Giving undue weight to the first information received
- Poor Probability Estimation: Overestimating the probability of familiar or dramatic events; underestimating the probably of negative events
- Overconfidence: Believing too strongly in one's own knowledge
- Escalation Phenomena: Unwillingness to abandon courses of action that have been decided upon previously
- Association Bias: Reusing strategies that were successful in the past, regardless of whether they fit the current situation
- Groupthink: Overemphasizing group consensus and cohesiveness instead of bringing out unpopular ideas

In the case of PMs making decisions about the school choices for the students they are funding, the flaws that appear to apply are Recency Effects, Primacy Effects, Escalation Phenomena and Association Bias. There is no data to review that would support that these flaws are presently being experienced. However, in this decision environment, where many individual

decisions are being made over a period of months by decision-makers that have other primary responsibilities, they are the flaws most likely to be present.

An addition to this list may be the effect of time constraints. The responses to the questionnaire developed for this thesis indicate that student management issues occupy at most about 25% of a PM's time. Most of the time, PMs are involved with other duties. The decisions that they make regarding the school options for their students are normally prompted by a student making contact with the PM. PMs generally have a good handle on the parameters of the decision, but must be able to weigh the many intangible factors of the student's particular situation against the concrete factors of costs to the Coast Guard. Generally, decision makers having limited information processing capabilities resort to picking an acceptable solution when faced with time constraints, minimal information, and a limited ability to process all relevant information. They become vulnerable to the flaws mentioned above. The rules of thumb that the PMs tend to rely on can bias the decision process into a mode of satisficing vice optimization. The introduction of a DSS that will quickly lay out the concrete factors may help minimize decision-making flaws by simplifying the structured part of the decision, allowing more thought and concentration on the less tangible aspects.

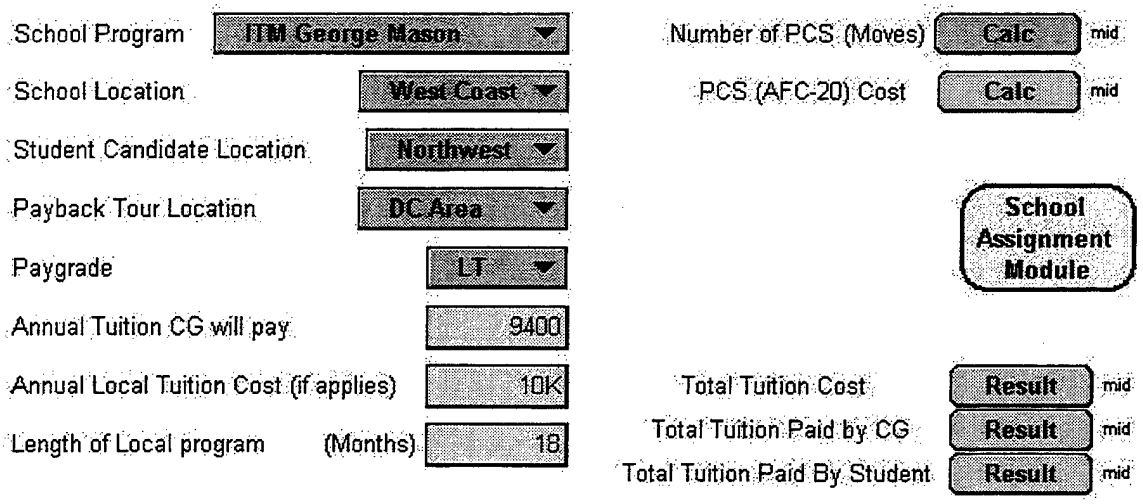


Figure 38: Analytica User Interface for School Program DSS

Figure 38 depicts the user interface for the influence diagram shown in Chapter III. The influence diagram appears here again as Figure 39. The PM can determine both the PCS moving

costs and the tuition costs for many scenarios. Drop down menus appear for the entry of School Program, School Location, Student candidate location, Payback Tour Location and Paygrade. All of these items result in a calculation of the number of PCS moves required and the AFC-20 cost for a student of the selected paygrade. To analyze the tuition scenario, the PM may enter the annual tuition the Coast Guard is willing to pay for that program, an annual tuition and length of program (if the student intends on attending a school in his or her present vicinity). The result will display a listing of the tuition costs for all of the school programs.

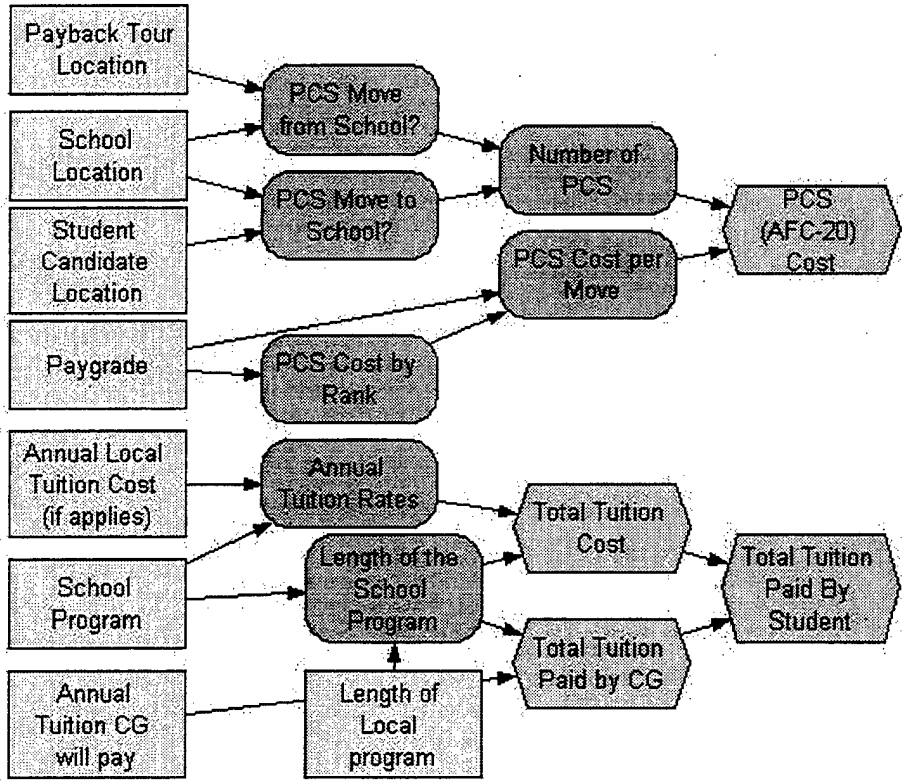


Figure 39: Analytica Influence Diagram, School Program Decision

The following scenario describes of the operation of the DSS. Figure 40 depicts a situation in which the Lieutenant (LT) presently located in the northwest wants to go the Naval Postgraduate School for a Masters in Information Technology Management. The school is located on the West Coast. The most likely payback tour location for this program is in the Washington DC area. By clicking on the two "Calc" buttons in the upper right of the console, the display changes as shown in Figure 41.

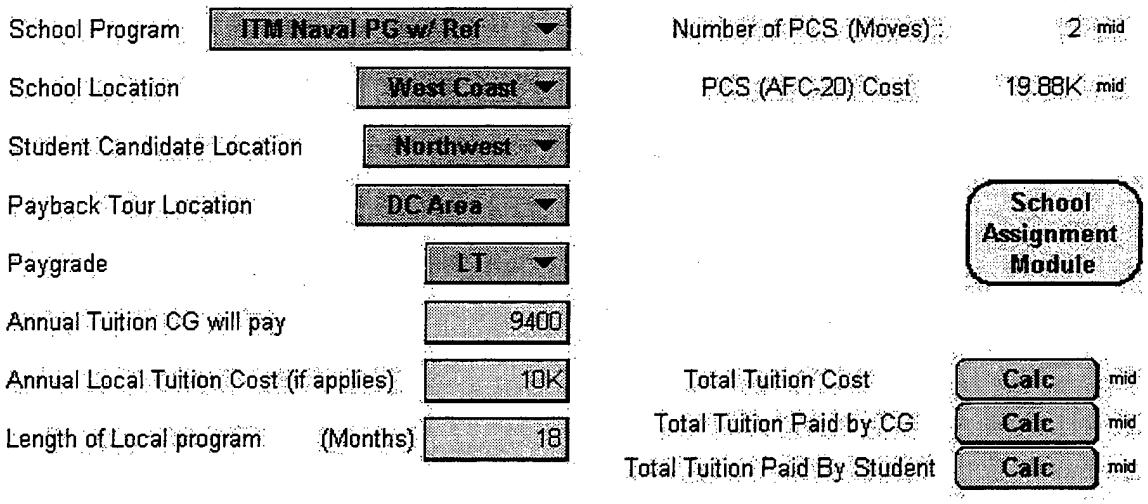


Figure 40: Analytica User Interface, Showing PCS Moving Cost

The number of PCS moves (2) and the resultant AFC-20 cost ($19.88K) are displayed. Simple logic determines the number of moves required and arrays internal to the DSS cross-reference the budgeted moving costs for all the paygrade selected.

The second part of the problem concerns the tuition costs. The PM can enter what the Coast Guard is willing to pay for annual tuition for this program, in this case $9,400. The Lieutenant has found that he could go to an 18 month long school program that is local to his present duty station, but the annual tuition is $10K. Clicking on the "Result" button for Total Tuition Cost results in the display shown in Figure 41, showing the total tuition costs for all of the program choices, including the local program.

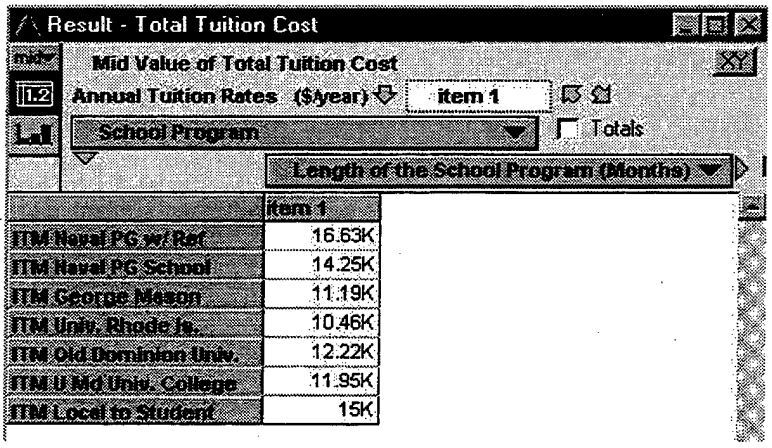


Figure 41: DSS Total Tuition Display

Figures 42 and 43 respectively show the total tuition costs that would be paid by the Coast Guard and the student in this scenario.

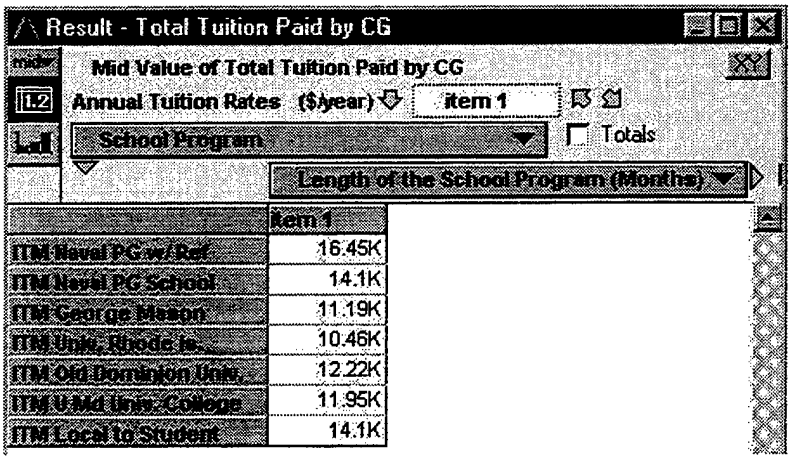


Figure 42: DSS Coast Guard Total Tuition Cost Display

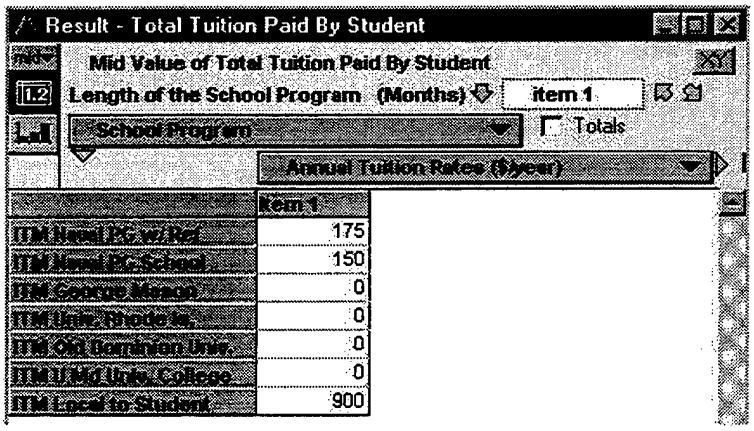


Figure 43: DSS Student Tuition Cost Display

In the scenario, the PM can quickly determine that the student could remain in his present location to attend school, if he is willing to pay $900 dollars of the tuition. The PM could offer to cover the $900 dollars, seeing as the Coast Guard would be saving a PCS move cost of almost $10K in the process.

The purpose of a DSS is to convert decision making from an art into a scientific, more rational approach. Relying on a DSS can help managers avoid some of the common mistakes listed above. A DSS can help a manager frame a problem, collect more pertinent information,

develop and evaluate feasible courses of action, test assumptions, and select the best solution to achieve the desired objectives. The details of the nodes within DSS can be found in Appendix C.

V. CONCLUSIONS AND RECOMMENDATIONS

A. SUMMARY

In this final chapter, we first summarize key elements of the thesis for reference. The subsequent section summarizes the findings from this research, beginning with a recapitulation of research questions and then addressing the student assignment process and its student management counterpart. Important conclusions and recommendations stemming from the research are then presented in turn. The thesis closes with suggestions for future research.

The Commandant of the Coast Guard, under pressure from Congress, capped the Coast Guard's advanced education budget at its 1997 level for at least five years. About this time, a decision was also made to increase the pay back obligation time incurred by students from double the time spent in school to triple. A subsequent drop in number of applications for advanced education prompted the Commandant to use an August 1999 "stroke of the pen" initiative to reduce this pay back obligation. In the meantime, the number of billets in the Coast Guard that require advanced education is increasing. Program Managers are having difficulty in filling billets that require advanced education. As an example, 30 senior enlisted and warrant officers with Communications, Information Resources Management or Electrical Engineering experience were commissioned as Lieutenants within the last year. This was a one-time program designed to fill billets in those specialties that were becoming vacant with no qualified officers available. That this number of officer accessions is triple the number of regular warrant officer to Lieutenant accessions highlights the severe shortcomings of the advanced education program in providing enough graduates to fill the needs of the service.

This thesis examines the U.S. Coast Guard's processes regarding the management, assignment and tracking of advanced education students. The objective is to dramatically improve critical measures of performance, such as cost, quality of service, and cycle-time by redesigning the current assignment process. The focus of the research is on innovating a specific set of processes, of particular interest to our sponsor, the Coast Guard Systems Directorate (G-S). Although focusing on a specific set of processes within a large system potentially limits the

impact of innovation, it allows one to understand and redesign these processes in considerable detail and helps document a systematic method that can be applied to redesign other important processes. The system appears not to have been designed in the first place, but to have evolved over time and has become institutionalized only to a small degree. The research identifies the current processes in detail, the pathologies, the measures of performance and service goals. Computer modeling is used to simulate the workings of the current processes and to investigate the workings of the redesigned processes. A Decision Support System is proposed to assist in one process and a prototype is developed.

The specific processes addressed in this thesis concern the selection of advanced education students, the decision of which institutions students will attend, and the billet assignment of students following advanced education programs. Presently, the responsibilities for these processes are spread out over several different offices within the Coast Guard. Each of these offices has many competing responsibilities that are considered to be of higher precedence; as a result the systems in place for the Advanced Education System are unintegrated and somewhat ad hoc. The background and implementation of the present processes are covered in detail in Chapters II and III.

An initial step in the research was to develop a web site for Coast Guard Advanced Education. The site was completed by the authors in January of 1999 and has been posted as part of the Coast Guard's web site since February 1, 1999. The Universal Resource Locator (URL) for the site is www.uscg.mil/hq/g-w/g-wt/g-wtt/g-wtt-2/policy/adved.htm. The organization of this web site is included as Appendix D. The web site was conceived as a point of presence on the Internet for Coast Guard Advanced Education. It was designed to address the needs of prospective students, current students, Program Managers, and to some extent, units having billets that require advanced education and units desiring to arrange student participation in research. The web site management was assumed by the office of G-WTT-2. Unfortunately, changes have since been made that cause the site to be unviewable with a Netscape browser, the default web browser for many educational institutions. The site is fully navigable via Microsoft Internet Explorer.

Interviews were conducted with several Program Managers and Assignment Officers. A questionnaire was developed to query the attitudes and suggestions of Program Managers and Assignment Officers about the processes. The questionnaire is included as Appendix F.

The processes for the selection of advanced education students and the assignment of students following school were modeled in the simulation application Extend. Business Process Reengineering concepts were applied to these models to provide redesign alternatives. The redesigned alternates were compared with the present processes. The models of the processes as they presently exist are covered in Chapter III. The models of the redesigned processes are covered in Chapter IV.

A prototype Decision Support System (DSS) was developed to assist Program Managers in quickly identifying the costs inherent in different school program options for students. The DSS is discussed in Chapter III and implemented in Chapter IV.

B. KEY FINDINGS

1. Research Questions

The research questions concern the nature of the current processes of the Coast Guard Advanced Education System, the associated measures of performance, the pathologies, the service goals, and how computer modeling can assist. The current states of the processes are covered in detail in Chapter II. Critical measures of performance are lacking for the processes. The nearest equivalent to a current measure of performance is the percentage of a program's billets requiring advanced education that are filled by individuals possessing advanced education. This information is predominantly used by Program Managers to validate their portion of the advanced education budget. Most of the processes are dependent on procedures that predate the introduction of computer information technology. The Coast Guard's information technology infrastructure, although available, is not being utilized to facilitate the processes in an integrated fashion. For example, paper forms and the postal service form the basis for the processes, although the CG IT infrastructure supports email and possibly web-based submission.

Ways for the Coast Guard to utilize the existing IT infrastructure within the specific context of the student selection and school program decision processes are specifically discussed in Chapters III and IV. In short, since the Coast Guard has settled on Microsoft Windows NT and Office products as the basis for the Coast Guard Standard Workstation III, form submissions for these processes could easily be made via email and attachments. Standardized spreadsheet information could easily be combined into a master spreadsheet that would facilitate the subsequent selection board process. Although this suggestion is specific to the processes studied within this thesis, the concept could easily apply to myriad other processes in the Coast Guard.

Modeling of the processes in the Extend simulation application resulted in deeper understanding of the mechanics of the processes as well as the ability to visualize the processes in action.

2. Student Assignment Process

Findings regarding the process of assigning students to billets following the completion of their education programs are:

- Assignment Officers don't have specific knowledge of the billets in their accounts that require advanced education. They rely on the Program Managers to provide this information. The detailing of members from advanced education programs is essentially completed by PMs.

- The Experience Indicator (EI), the code assigned to each Coast Guard officer to indicate occupational areas and experience, does not provide any information regarding educational level. EIs are assigned to help track individuals with specialized training and to facilitate statistical data collection. The EI is used by AOs and PMs to help track an officer's background. See Appendix B.

- Assignment Officers do not rely on EIs when assigning billets to officers, as they have access to complete personnel records. Program Managers do not have access to personnel records and therefore do rely on the EI.

- The Officer Billet Code (OBC), the code assigned to each officer billet in the Coast Guard, does not indicate a required educational level for the billet. The OBC system was designed to provide program and personnel managers with more descriptive information about each Coast Guard officer billet. See Appendix A.

- Advanced Education is not a searchable field in the Coast Guard's Personnel Data System. PMs and AOs do not have direct access to information on who in the Coast Guard has AE. Even though a new human resources application is being developed for the Coast Guard by Peoplesoft, the early model does not indicate that it will address this concern.

- The Billet Description Information Forms (BDIF), which document the requirement for advanced education for a billet, are not commonly accessible to Assignment Officers. The files of BDIFs are maintained by each Program Manager for their program. Although a Microsoft Access database for BDIFs has been developed by CG postgraduate students at the University of Rhode Island, it is presently only populated with BDIF information from a few programs.

- Assignment Officers are the first check of quality assurance on Officer Evaluation Reports. This process has little to do with officer assignments. The AOs are merely reading the OERs, ensuring that the numbers given in each section match the words in that section. Even during the assignment season, AOs are required to review incoming OERs, although there is a separate office in charge of OER quality.

3. Student Management Processes

Findings for the processes of selecting students for the programs and deciding where they will attend school are:

- Submission of packages by service members who wish to be considered for advanced education programs is done by mail. Service members may apply to as many as four different advanced education programs. Student Selection Boards are dependent on these physical files, contributing to the fact that selection boards must be held sequentially, normally taking place over the period of June through September.

- At only one step in the process is an information technology resource being utilized. A short data entry into the Personnel Data System (PDS) facilitates the filing of the physical student packages and helps identify the appropriate subset of packages that need to appear at each selection board. This system provides no qualitative information to the selection boards.

- Electronic submission of student packages could provide for flexibility in the scheduling of student selection boards, possibly reducing the time period required for the completion of the selection boards from months to weeks. Electronic submission could also supply the selection boards with information that would assist in selection board decision-making.

- The concrete decision factors involved in deciding where a student may attend school can be modeled into a simple Decision Support System.

4. Survey and Interview Findings

As a result of the interviews and the questionnaire feedback, many concerns were expressed that when compiled together provide the Program Managers' perception of the present processes.

- Program Managers estimate that they spend at most about 25% of their time involved in the management of students.

- Program Managers believe that the Coast Guard information infrastructure is at least adequate. However, students are cut off from this infrastructure while attending school.

- Some PMs feel too much emphasis is placed on prospective students being tour complete when they apply for advanced education programs. This serves to reduce the pool of quality applicants.

- Program Managers feel that the student management processes are somewhere between haphazard and organized.

- The present process of allocating Training Availability Billets (TAB) and funding among the Advanced Education Programs is a contentious and nebulous process that is carried out behind closed doors. In general, Program Managers are not informed as to the priorities upon which the allocations are based. Cross program scrutiny is not welcome. Program Manager replies on this subject were unanimously negative.

- Program Managers feel that Billet Description Information Forms (BDIF), the forms that describe the justification for requirement of advanced education in a billet, are taken at face value and are not reviewed adequately for validity.

- Most Program Managers feel that they have access to the information that they require to make decisions, but the access is indirect. They would prefer direct access.

C. CONCLUSIONS AND RECOMMENDATIONS

1. The Assignment of Advanced Education Graduates

The AEAP can be more efficient merely by dropping two steps. Eliminating the steps where the AOs read the OERs as quality review and the AOs liaisoning with the PMs cuts simulated process time nearly in half (48%). This not only streamlines the process, but also reduces the workload of both the AOs and the PMs.

The Experience Indicator does not provide Assignment Officers or Program Managers with enough information to facilitate assignment decisions. We recommend a method initially suggested by CAPT Collin Campbell, of Coast Guard Headquarters Office of Personnel Management (CGPC-OPM), for changing the EI. It includes changing the meaning of the digits within the EI. The first and second digits would describe the officer's primary occupational specialty. The third and fourth digits would describe the officer's secondary occupational specialty. The fifth and sixth digits would represent the officer's most recent advanced education training and the seventh and eighth digits would be used for any additional training. By changing the EI system to the recommended method, the AOs would be able to look at a member's EI and then place that member in a billet that needs his or her experience. For the same reason, the AOs need to know which billets within their accounts require someone with advanced education training. The OBC could also be changed to indicate the requirement in a billet for advanced education. If this were the case, AOs could fill these billets without direct assistance from the PMs.

While exploring the options of how to redesign the AEAP in order to make the jobs of the AOs and PMs easier, a DSS was considered. This DSS would allow for the AOs to put a member's name and qualifications into the system, along with all of the available billets and their requirements with the result being the best job fit for that member. After seriously thinking about the impact that this would have on the member, the authors of this thesis opted not to utilize this approach. One of the unique things about the assignment process in the Coast Guard is that the member is given some opportunity to discuss job options with the AOs. If the AOs were to use a DSS, AOs may be less willing to discuss the personal desires of the member.

Moreover, the Coast Guard is so small that there is a lot of cross training necessary to fill all the billets.

Members in the Coast Guard have to develop broad experience in order to continue to be promotable. It is quite difficult to make a long career out of a narrow specialty in the Coast Guard. In order to remain promotable, a member has to do the work that the Coast Guard is known for, such as Search and Rescue, Law Enforcement, Aids to Navigation and Maritime Safety. In this thesis it was mentioned that many new processes are started and never finished because a member is transferred before it is completed or the new command interrupts the change. As a result, offices suffer bureaucratic stagnation. It may eventually be recumbent on the Coast Guard to allow the notion of specialty officers. In other words, allow an officer to work in a field that he or she is good at and not penalize them for taking several consecutive tours in that field.

2. Managing Advanced Education Students

The Coast Guard has an information technology infrastructure. However, this infrastructure is not being utilized as it could to facilitate the business processes the Coast Guard uses in its Advanced Education Program.

These processes need to take advantage of IT in an integrated form. Student application packages are received by mail and manually logged and filed. A short data entry is performed into the Coast Guard's Personnel Data System for each package, which facilitates the sorting of the packages for the selection boards, but provides little or no other value to the board processes. The board members still review the physical packages manually. If student package submissions were made by a standardized email, the filing process would be facilitated. This would also provide easily sortable information to the selection boards. Boards could rely much less on the physical packages, which could result in a shorter time period required for the boards to meet. Eventually, the boards could even meet "virtually" as long as arrangements can be made to provide electronic access to the board members via their CGSWIII accounts.

The decision of where a student can attend school requires the consideration of many factors. Tangible factors, such as the resultant Permanent Change of Station (PCS) moving costs

and tuition costs, must be weighed against the many intangible factors, such as geographic stability, curriculum content and quality. The flexibility the Program Managers have in making these decisions is affected by their ability to quickly ascertain the costs in a given scenario. The DSS prototype mapped out in Chapter IV provides the framework for development of a simple DSS that could be implemented in a Microsoft Excel spreadsheet. By quickly getting a handle on the tangible portion of the problem, Program Managers may have more flexibility to consider the intangible tradeoffs.

In general, what was hoped to result in a useful process redesign has proved to be a first step in assessing the present design as well as the development of some tools and procedures to push the present processes into the information age. In order for true reengineering to take place in the Coast Guard's Advanced Education System, need for change must be recognized and authorized at a leadership level. According to Hammer and Champy, a leader is defined as a senior executive who authorizes and motivates the overall reengineering effort.

> Without a leader, an organization can do some "paper studies," can even come up with new process design concepts, but absent a leader, no reengineering will actually happen. Even if it gets started, a leaderless reengineering effort will run out of steam or hit the wall by the time it is ready to implement. [Ref. 3:p. 102]

The Coast Guard's Advanced Education Program is facing serious challenges. The present system is not keeping up with the service's needs. We hope that this thesis can be the starting point for an Action Workout (AWO) led by Coast Guard Quality Performance Consultants that would focus on the processes of the management and assignment of advanced education students.

D. SUGGESTED FUTURE RESEARCH

There are several areas in which further work would benefit the Coast Guard's Advanced Education program.

- Implement and update the School Assignment DSS in a Microsoft Excel spreadsheet. This will require knowledge in the use of Visual Basic. Improvements could include more precise estimations of PCS costs. The present model estimates the same cost for a move across country as a move across a state,

which is presently the only estimate available. Perhaps the DSS could be made available on Internet via a web interface, allowing prospective students to ascertain the cost tradeoffs for themselves.

- Research the forecasted need for Advanced Education and the ability of the Programs to provide for this need over the next 5-10 years. This would be a logical initial step for an AWO.

- Investigate the implementation of email submission of forms for a broad range of Coast Guard processes.

- Investigate the implementation of virtual selection boards.

- Investigate and redesign the processes involved in the allocation of Training Availability Billets.

APPENDIX A. OFFICER BILLET CODE

CHAPTER 1

Section A. Officer Billet Code System

1. Purpose. The Officer Billet Code (OBC) system has been designed to provide program and personnel managers with more descriptive information about each Coast Guard officer billet. The following is an explanation of the coding system:

Digit	1	2	3	4	5	6
Example	6	0	4	1	6	A

(a) DIGITS 1 & 2: Primary Occupational Field identifier, assigned according to table one. This identifier represents the functional field of the billet, and not necessarily the qualification requirements of the incumbent.

(b) DIGIT 3: Organizational Level Code, assigned according to table two.

(c) DIGIT 4: Job position code within the given level of organization; assigned according to table three. The job position descriptions in table three will be refined further as the need to identify particular billets is determined.

(d) DIGIT 5: Authorized grade indicator (i.e. Captain = 6).

(e) DIGIT 6: An alpha indicator assigned to identify billets with attributes of particular interest, or to distinguish between certain billets which are otherwise identical. The use of this digit will be refined further to meet the needs of program and personnel managers.

In the example above, OBC 60416A identifies a captain billet, commanding officer of an air station.

2. Warrant officer billets have temporarily been coded with a "1" in the grade indicator (digit No. 5).

Section C. Organizational Level Codes (DIGIT 3)

TABLE TWO

0 HEADQUARTERS

1 AREA & AREA UNITS

2 DISTRICT

3 HEADQUARTERS UNIT

4 FIELD UNIT

5 FIELD SUBUNIT

6 FLOATING UNIT

7 MLC's & SUPPORT CENTERS

8 (UNASSIGNED)

9 SPECIAL CATEGORY
(student, flight training, etc...)

Section D. Job Position Locator Codes (DIGIT 4)

TABLE THREE

Job Position Code on	HQ	AREA/MLC/ DISTRICT	HQ UNIT	BASE	GROUP	STATION	MSO/COTP MIO	FLOATING UNIT
1	COMDT	CDR	CO	CO	CDR	CO	CO	CO
2	V COMDT CCS	Dc/DEP	XO	XO	Dep CDR	XO	XO	XO
3	Ofc Ch		•					
4	Ofc Ch		•	OPS Dept Ch	OPS OFF Div Ch	Port OPS	Port OPS Dept Ch	OPS
5	Div Ch/ Staff Ch	Div Ch	•	Ind/Eng Dep Ch	Eng Div	Eng Off	Insp/Inv/Eng Dept Ch	Eng Off
6	Div Asst Staff Ch		•	Other Dept Ch	Other Dept Ch		Other Dept/ Sec Ch/Sup	
7	Br Ch	Br Ch	•				Other/Dept	
8	Duty	Duty	Duty	Duty	Duty	Duty	Duty	Duty
9	Trng	Trng	Trng	Trng	Trng	Trng	Trng	Trng
0	Misc/Sp Staff Liason	Misc	Misc	Misc	Misc	Misc	Misc	Misc

APPENDIX B. OFFICER EXPERIENCE INDICATOR

EXPERIENCE INDICATOR CODES

TABLE I
PRIMARY OCCUPATIONAL FIELDS AND SPECIALITIES
(digits 1 and 2, 3 and 4, 5 and 6 of the Experience Indicator)

GENERAL ADMINISTRATION 01 - 09
01 General Command and Staff
02 Civil Rights
03 Public and International Affairs
04 Legal
05 Reserve Programs
06 Inspection
08 Special Aide/Assistant/ Liaison
09 Staff Services and Security

PERSONNEL 10 - 19
10 Personnel - General
11 Human Resource Management (Officer)
12 Human Resource Management (Enlisted)
14 Recruiting
15 Training
16 Personnel Systems
17 Personnel Services
18 Physician's Assistant
19 Medical Administration

MANAGEMENT 20 - 29
20 Management - General
21 Planning, Programming, and Budgeting
22 Data Processing
23 Research and Development
25 Planning - General
26 Information Resource Management
27 Management Contingency/Defense
28 Acquisition/Project Management

COMPTROLLERSHIP 30 - 39
30 Comptrollership
31 Financial Management
32 Fiscal Operations
33 Supply and Inventory Management
34 Supply Operations
35 Contracting
36 Resale Programs

MARINE SAFETY 40 - 49
40 Marine Safety - General
41 Commercial Vessel Safety - General
42 Port Safety/Environ Protection - General
43 Port Contingency Planning
44 Vessel Traffic Services
45 Vessel Inspection
46 Vessel Technical
47 Marine Investigation
48 Hazardous Material
49 Explosive Loading

ENGINEERING 50 - 59
50 Engineering - General
51 Ocean Engineering
52 Naval Engineering
53 Engineering Afloat
55 Civil Engineering
56 Industrial Engineering
58 Electronics Engineering
59 Engineering Physics

AVIATION 60 - 69
60 Aviation - General
61 Aviation Engineering Admin
62 Aircraft Maintenance, Overhaul, Repair and Supply
64 Aviation Electronics
65 Aviation Administration
66 Aviation Safety
67 Air Liaison and Special Staff

OPERATIONS 70 - 79
70 Operations - General
71 Search and Rescue
72 Marine Science Activities
73 Readiness
74 Communications
75 Aids to Navigation
76 Intelligence
77 Law Enforcement
78 Ice Operations

BOATING SAFETY 80 - 89
80 Boating Safety - General
81 Auxiliary/Education
82 Boating Affairs
83 Boating Standards
84 Boating Investigation

HEALTH SERVICES 90 - 99
90 Health Care Administration
91 Physician
92 Physician Assistant
93 Nurse
94 Dentist
96 Environmental/Occupational Health
95 Pharmacist
97 Physical Therapy
98 Psychology
99 Optometry

Table II

DUTY ASHORE
(digit 7 of the Experience Indicator)

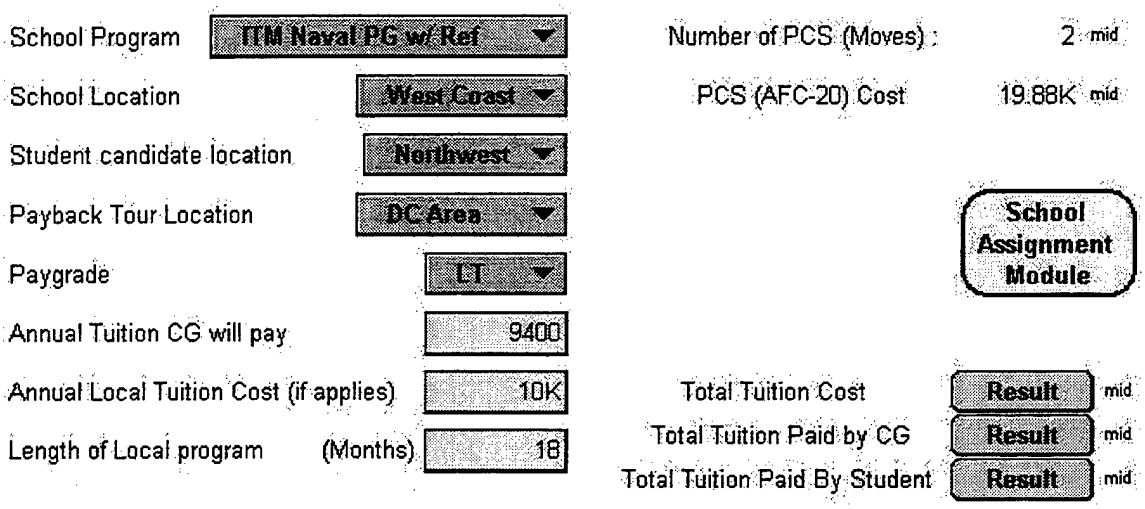
0 No Assignment
1 Duty
2 Commanding Officer or Executive Officer experience in the grade of LTJG or ENS
3 Department Head experience in the grade of LT
4 Executive Officer experience in the grade of LT or Department Head experience in the grade of LCDR
5 Commanding Officer experience in the grade of LT
6 Executive Officer experience in the grade of LCDR or Department Head experience in the grade of CDR
7 Commanding Officer experience in the grade of LCDR
8 Executive Office experience in the grade of CDR
9 Commanding Officer experience in the grade of CAPT or CDR

Table III

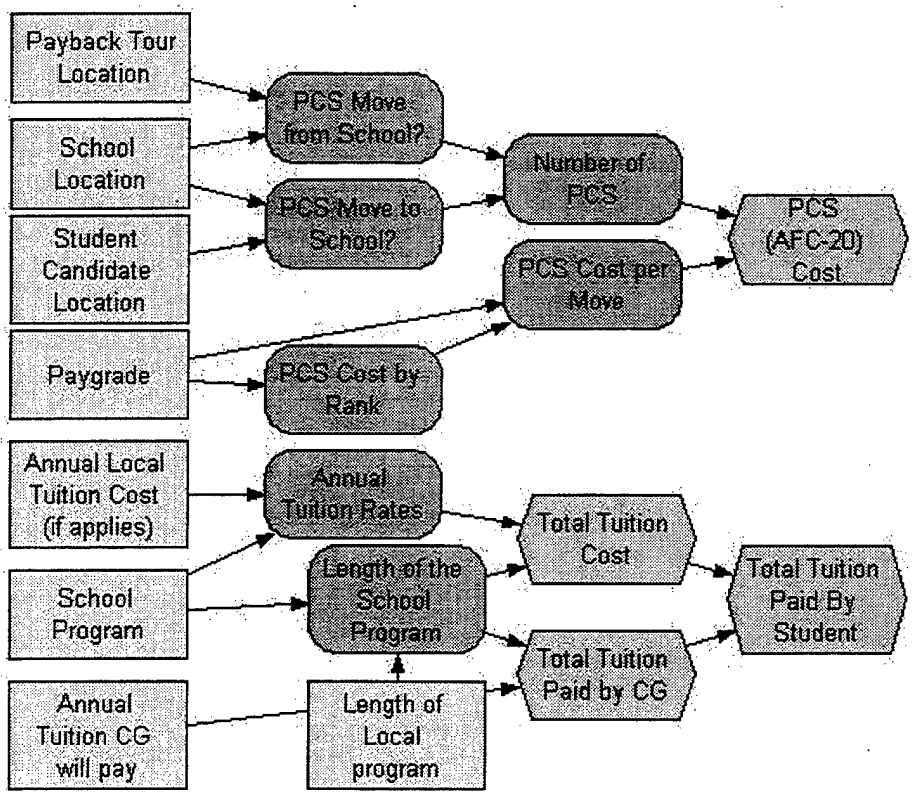
DUTY AFLOAT
(digit 8 of the Experience Indicator)

0 No assignment
1 Afloat experience in the grade of LTJG or ENS
2 Commanding Officer or Executive Officer experience in the grade of LTJG or ENS
3 Department Head experience in the grade of LT
4 Executive Officer experience in the grade of LT
5 Commanding Officer experience
6 Executive Officer or Department Head experience in the grade of LCDR
7 Commanding Officer experience in the grade of LCDR
8 Executive Officer experience in the grade of CDR
9 Commanding Officer experience in the grade of CAPT or CDR

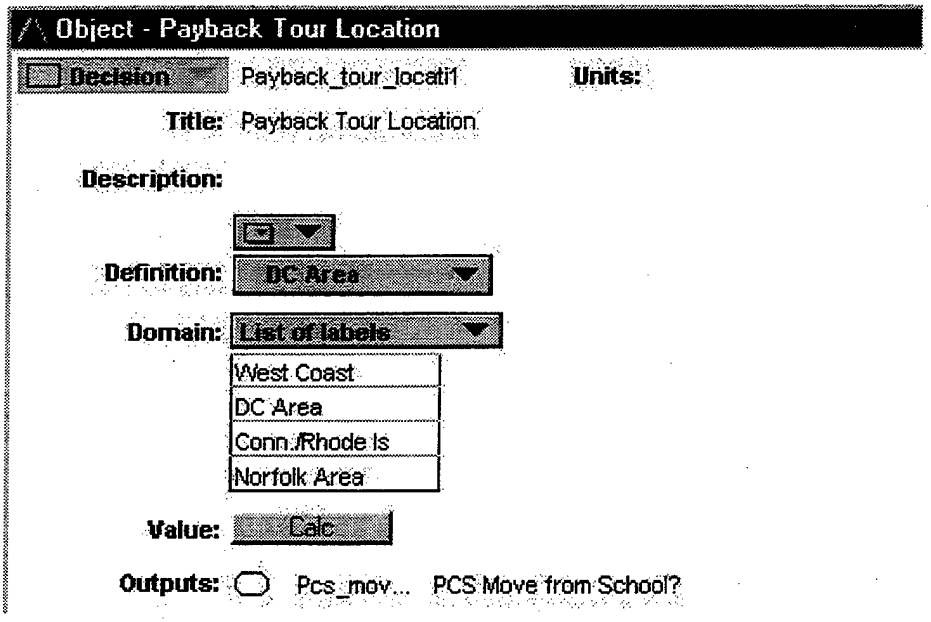
APPENDIX C. DECISION SUPPORT SYSTEM PROTOTYPE



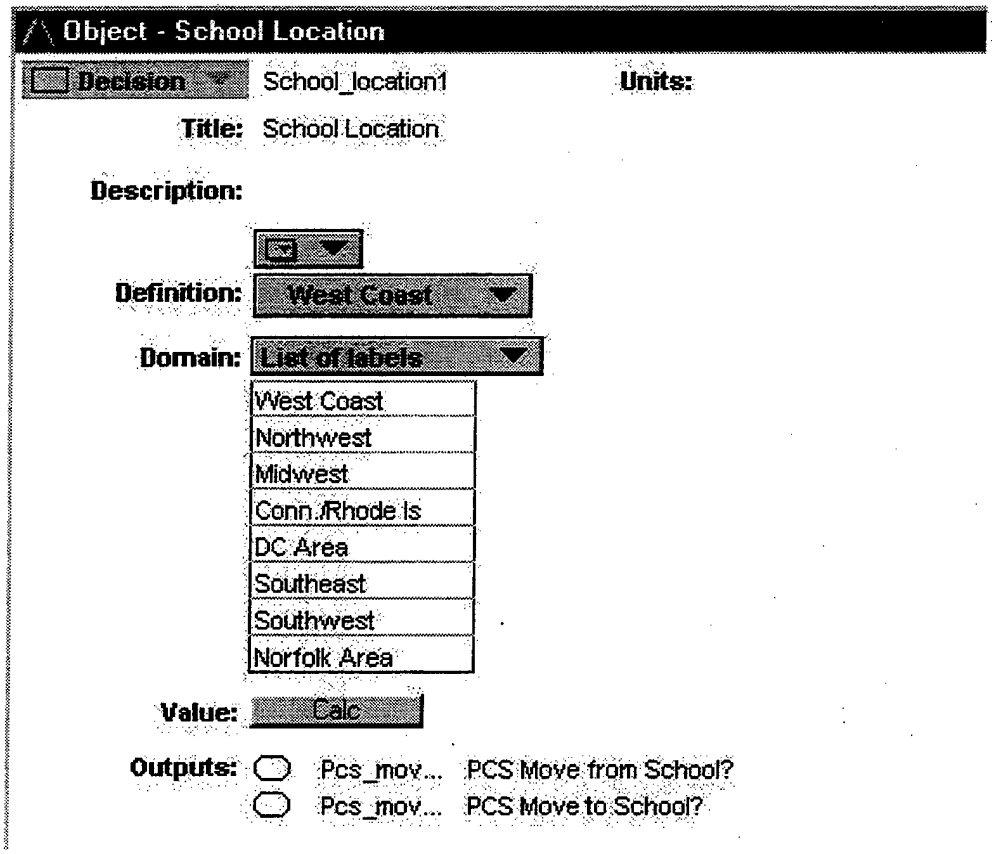
User Interface



School Assignment Module, Influence Diagram



Decision Variable Node Details, Payback Tour Location



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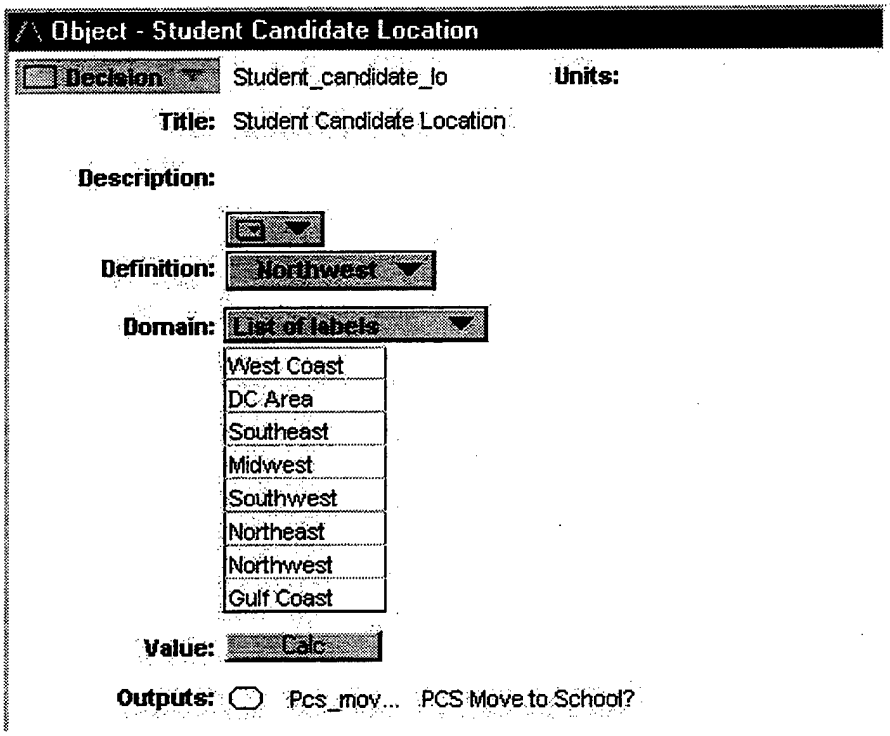
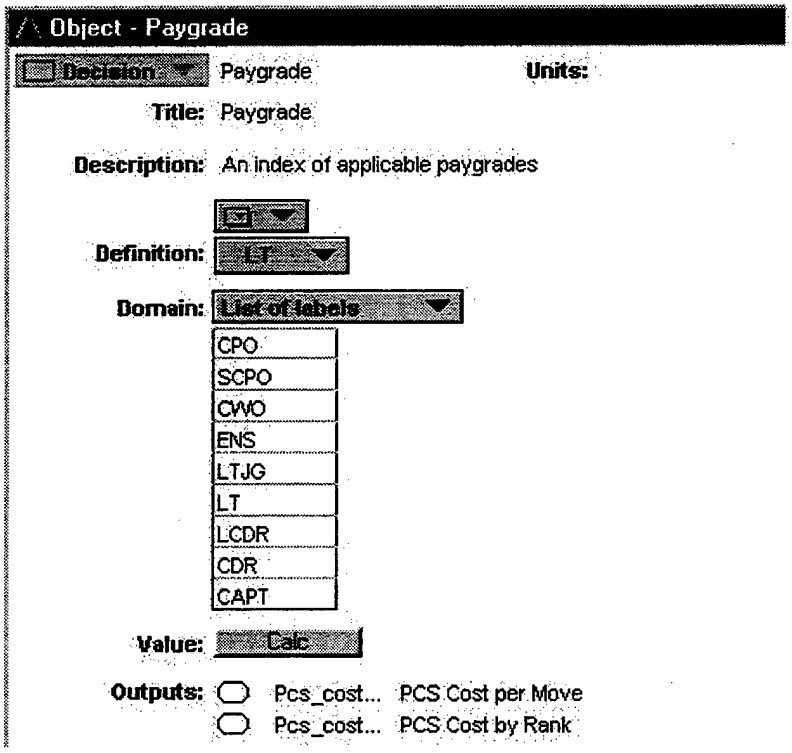


Decision Variable Node Details, Student Candidate Location



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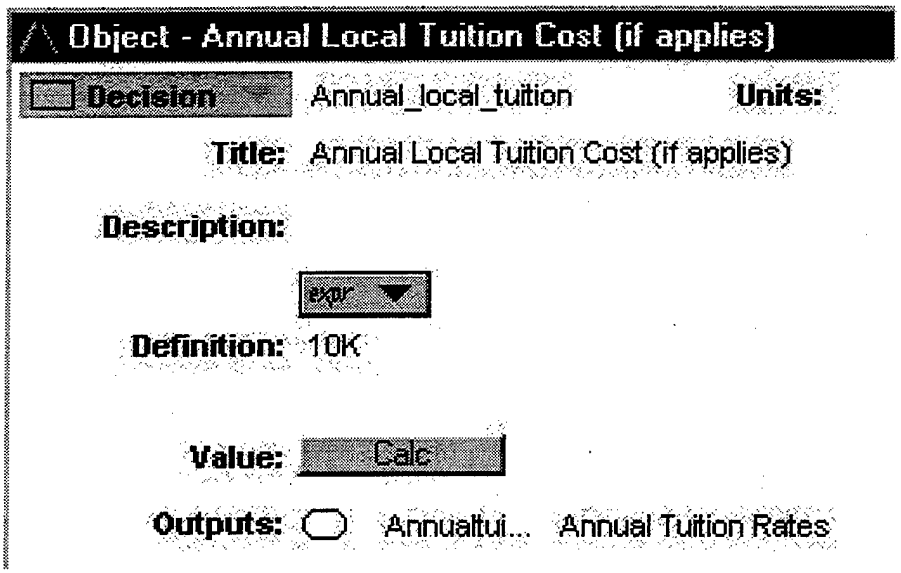
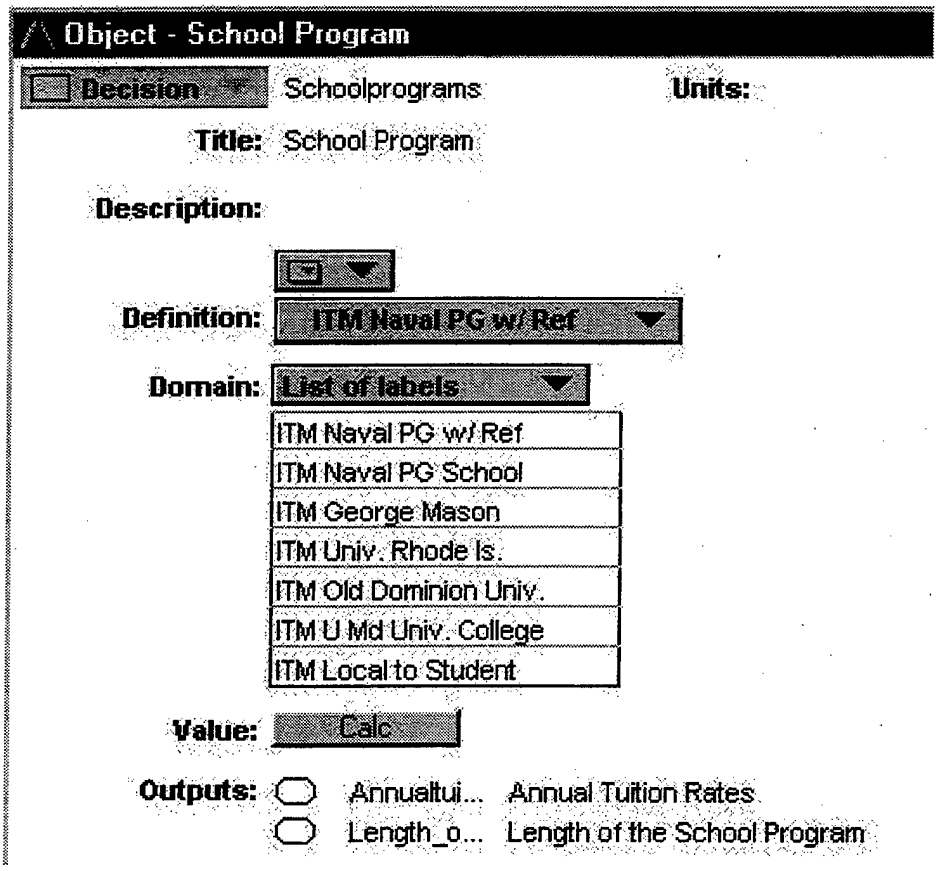
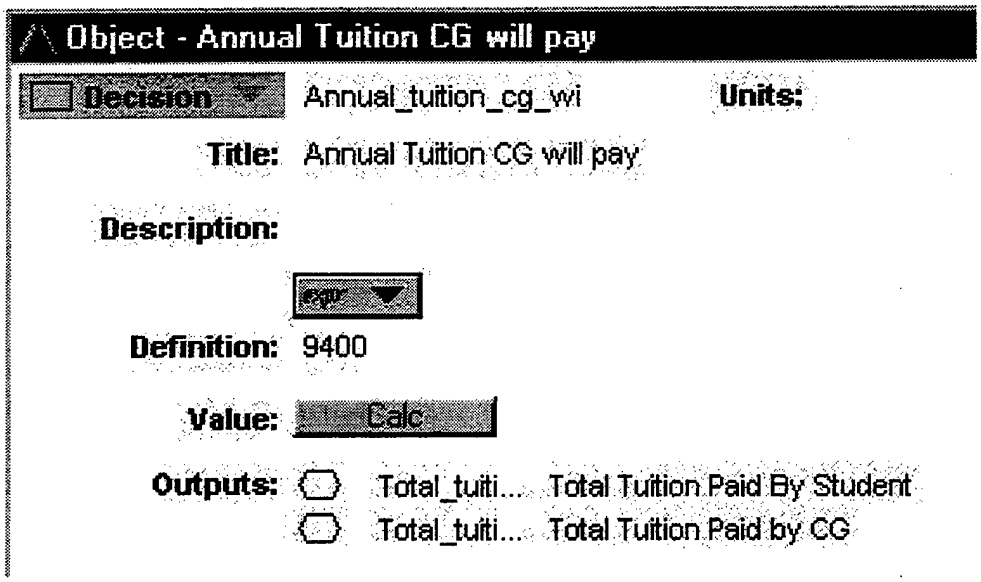


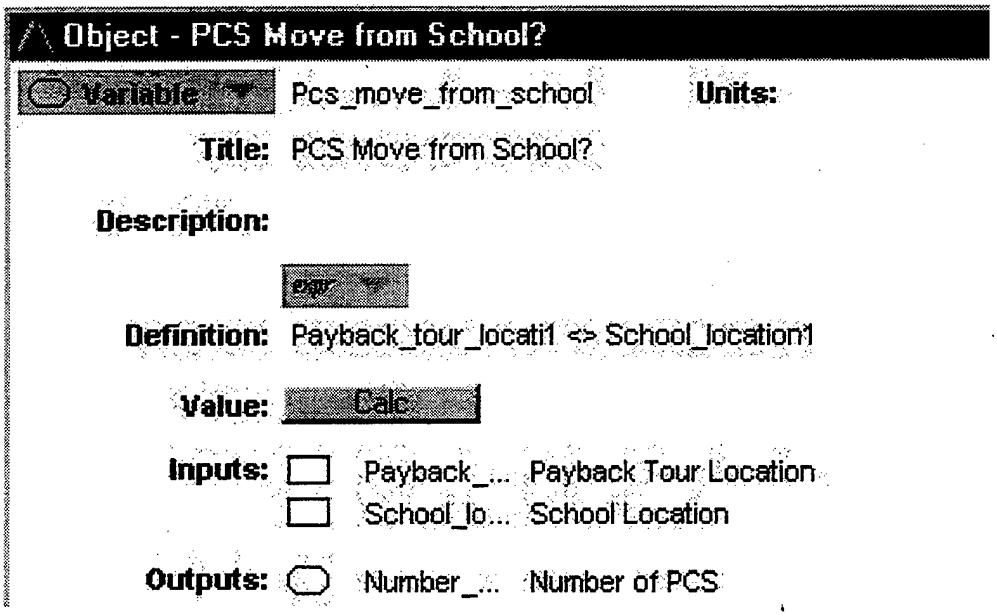
Decision Variable Node Details, Annual Local Tuition Cost



Decision Variable Node Details, School Programs



Decision Variable Node Details, Annual Tuition CG will pay



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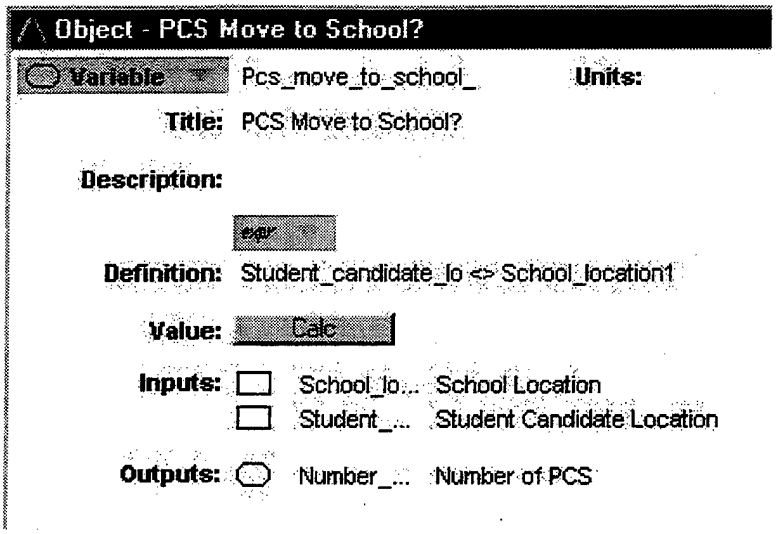

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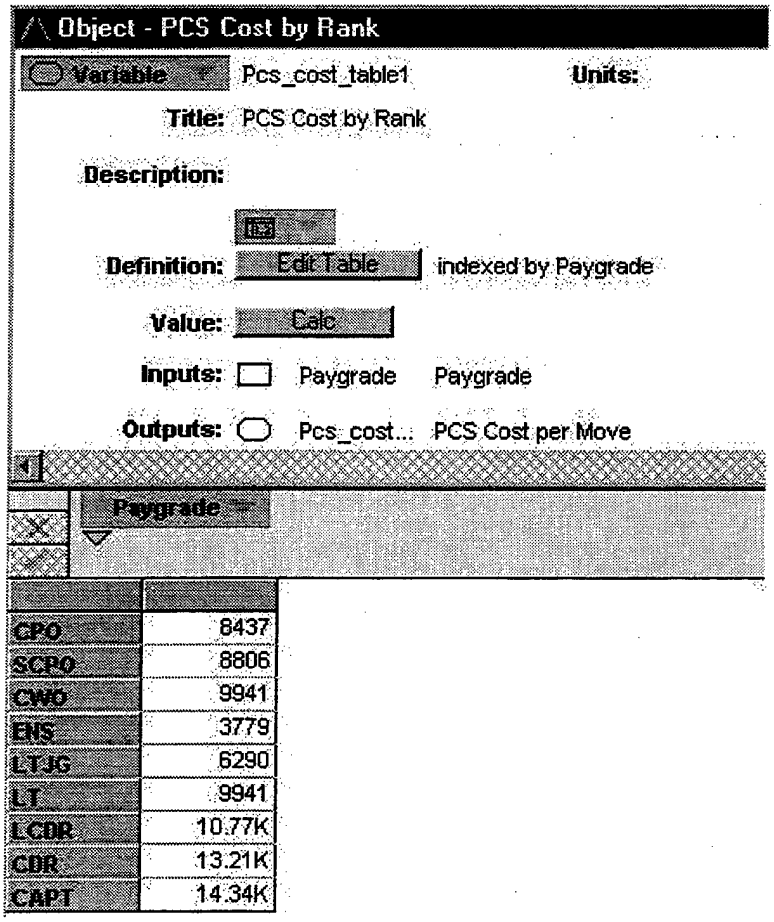
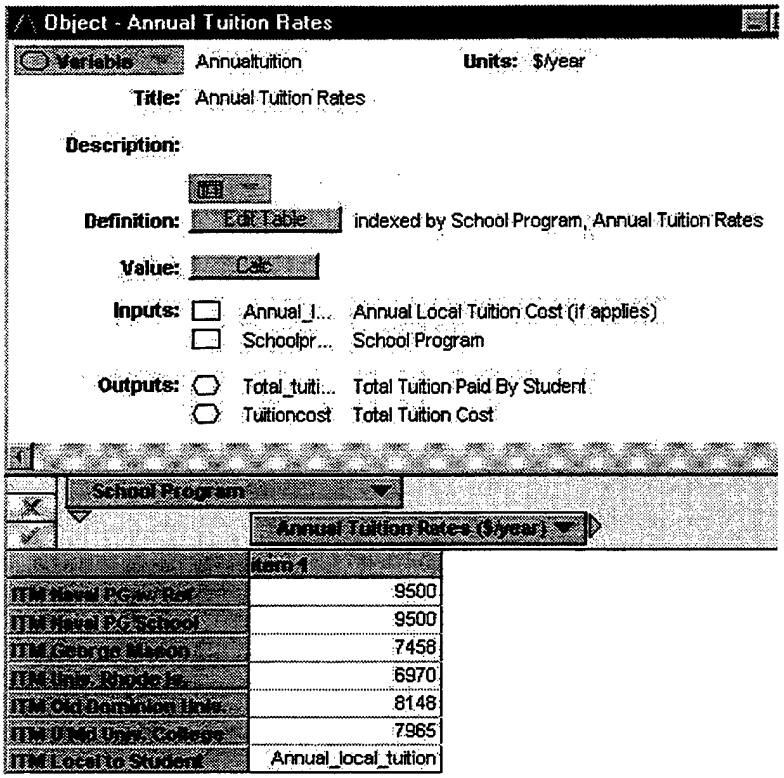


GeneralVariable Node Details, PCS Cost by Rank



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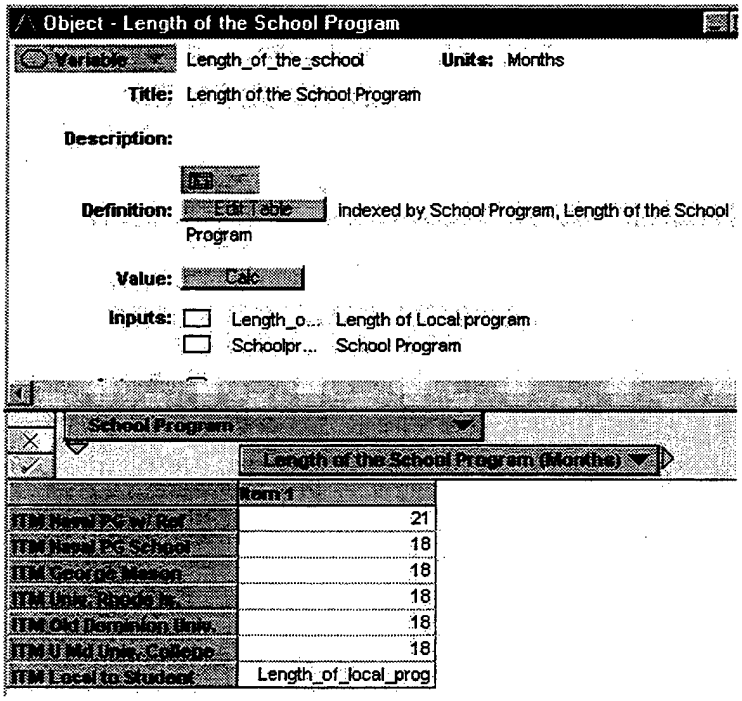

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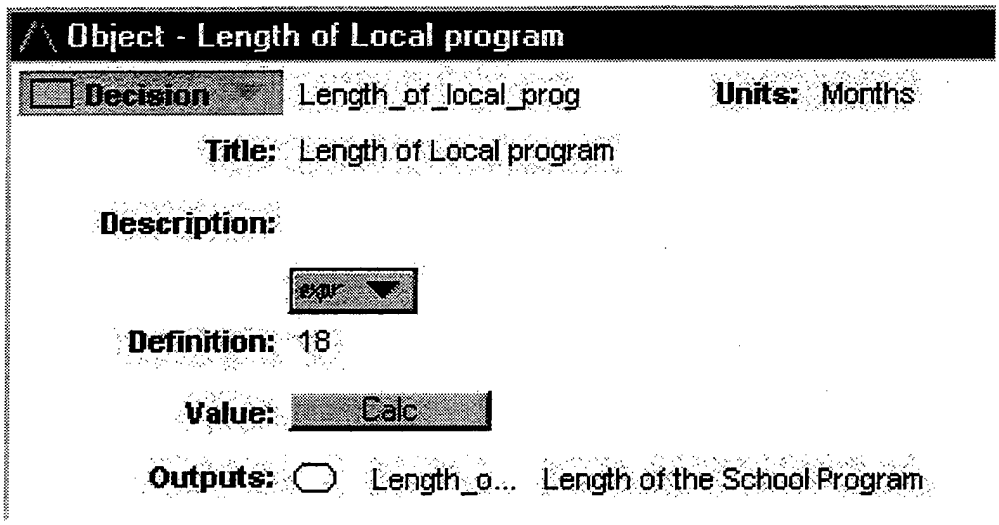
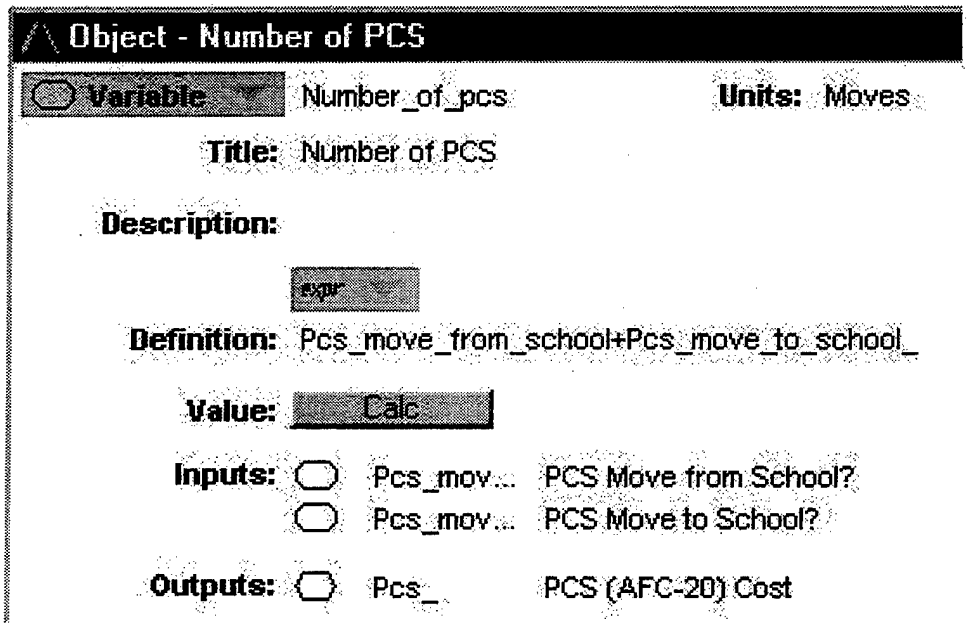
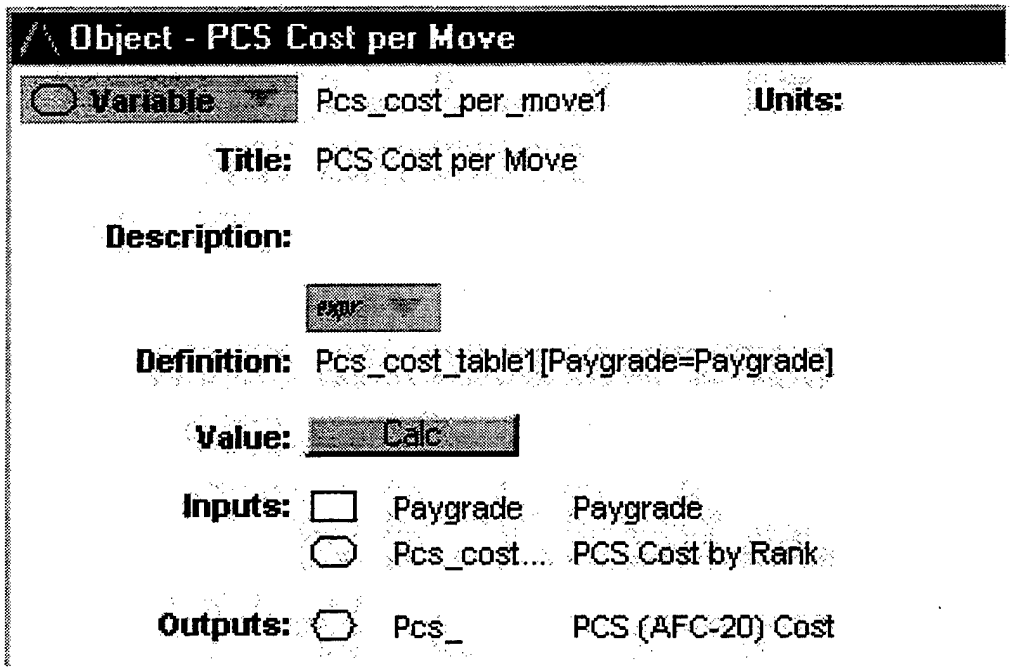


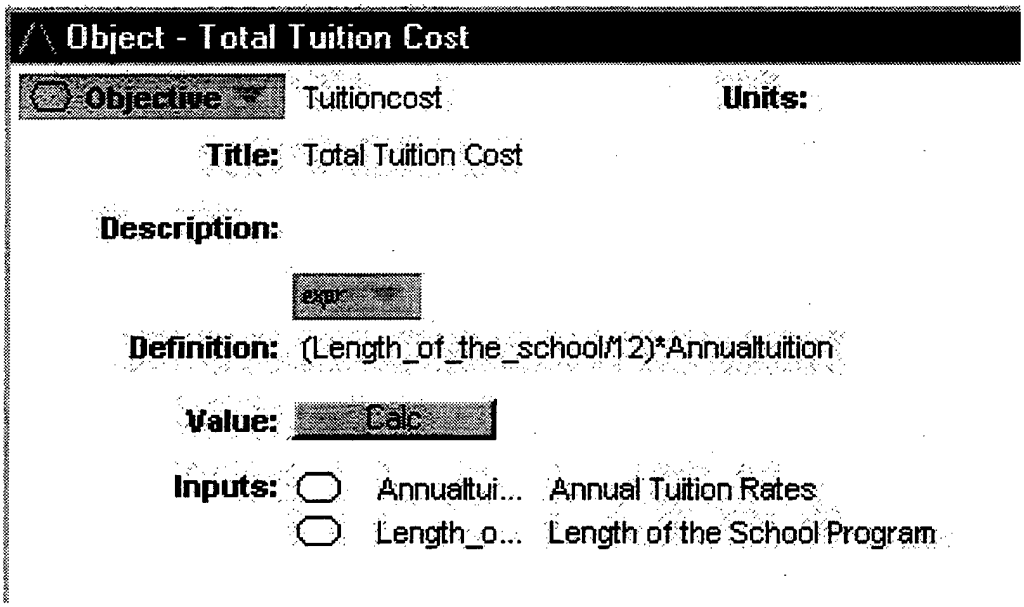
Decision Variable Node Details, Length of Local Program



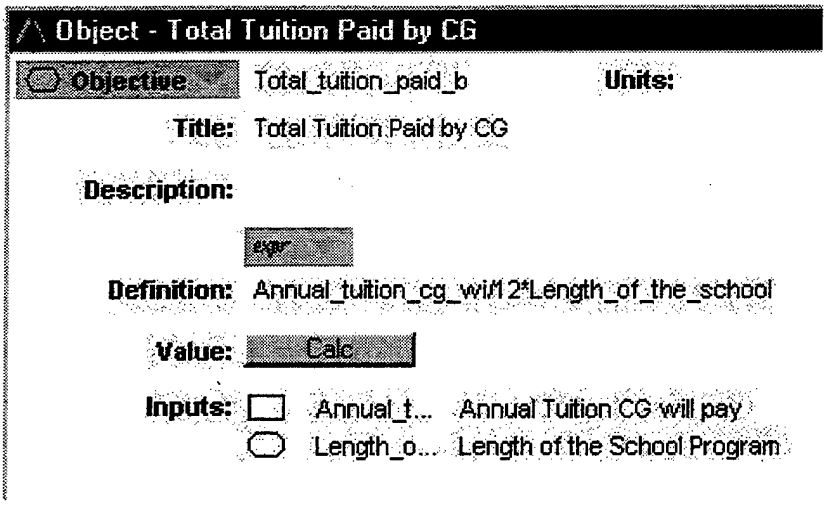
GeneralVariable Node Details, Number of PCS



GeneralVariable Node Details, PCS Cost per Move



Objective Variable Node Details, Total TuitionCost



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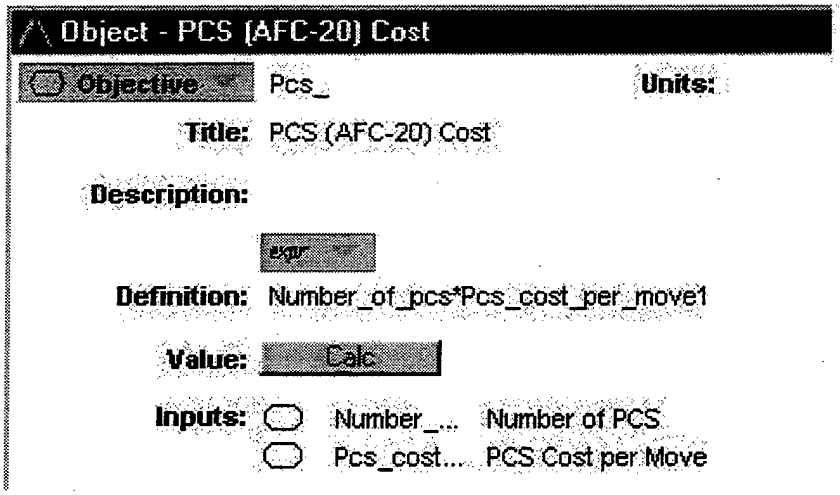
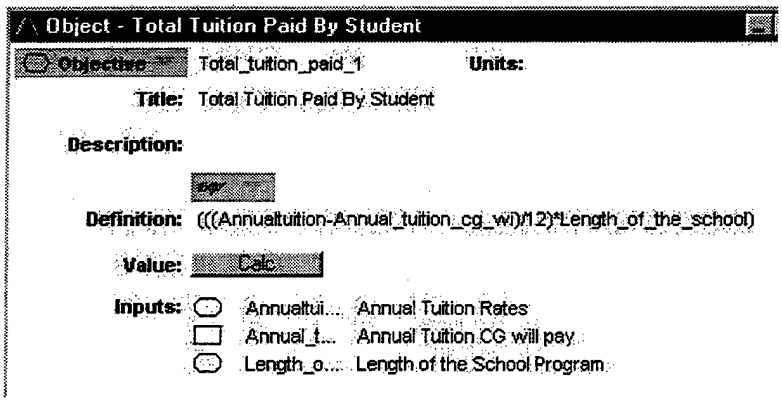


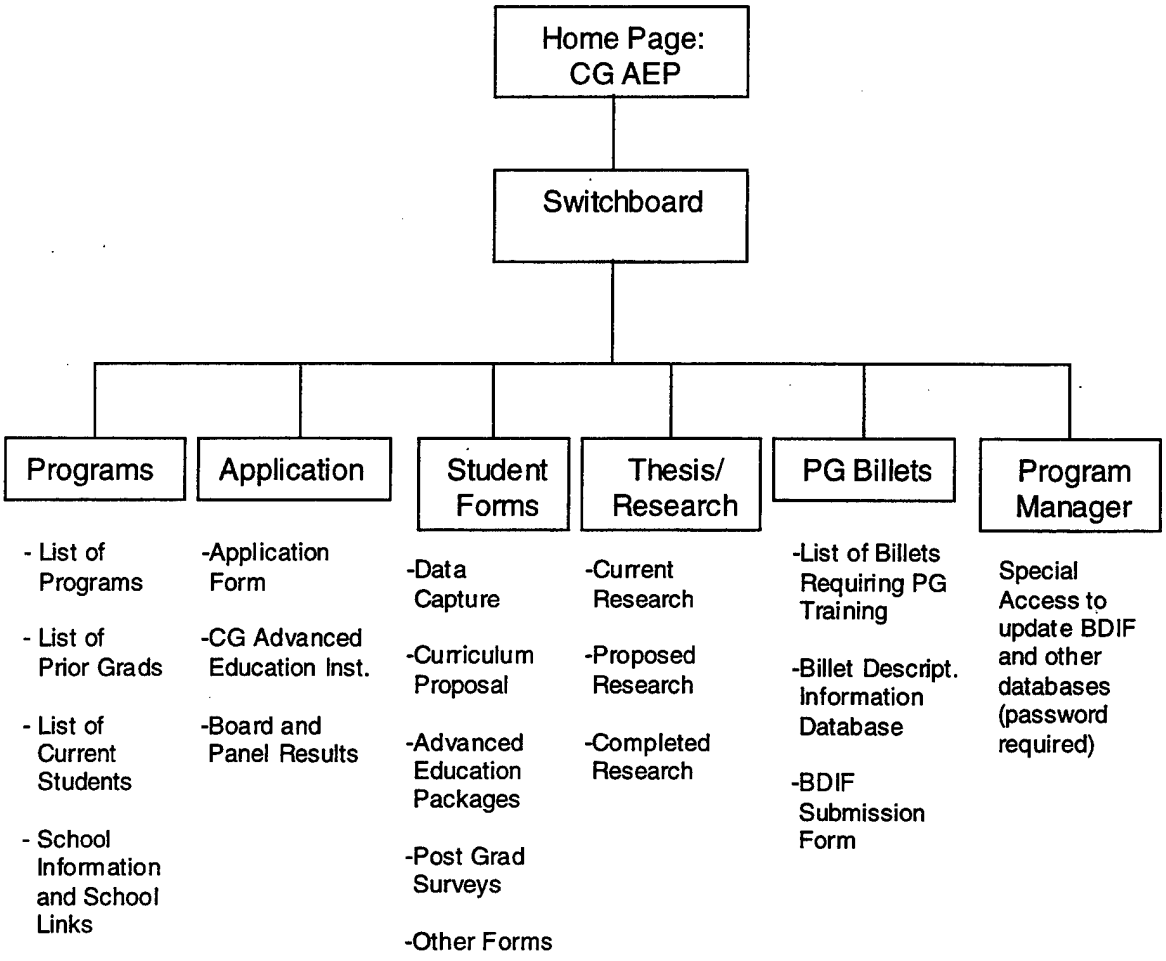
ObjectiveVariable Node Details, PCS (AFC-20) Cost



ObjectiveVariable Node Details, Total Tuition Paid by Student

APPENDIX D. COAST GUARD ADVANCED EDUCATION WEB SITE

Coast Guard Advanced Education Web Site Organization



This web site is posted at URL: www.uscg.mil/hq/g-w/g-wt/g-wtt/g-wtt-2/policy/adved.htm

APPENDIX E. QUESTIONNAIRE

Coast Guard's Advanced Education Program Questionnaire for Program Managers and Assignment Officers

Preface: LT Marc Sanders and LT Lamar Johnson, graduate students and the Naval Postgraduate School, are completing a thesis concerning a redesign of the Coast Guard Advanced Education Program's business processes. At an earlier stage of study, they created the CG Advanced Education Website (www.uscg.mil/hq/g-w/g-wt/g-wtt/g-wtt-2/policy/adved.htm). Their intent is to update the processes used in the management and assignment of students to take advantage of the Coast Guard's increased information technology infrastructure (i.e. the CGWEB, CGDN, and CGSWII).

The main intent of this questionnaire is to gauge the attitudes and opinions of the decision-makers in the processes that effect graduate students, the Program Managers and the Assignment Officers. Respondent answers will remain anonymous to those outside the study, however, as some follow up may be necessary, and since these questionnaires are going out to a fairly small group, we ask that you provide us with means to contact you regarding your answers.

Feel free to continue any comments on the back or on separate sheets. Please mark any continuations with the applicable section and question numbers.

1. Section 1: Personal Information

1. Name: _____ Rank: _____
2. Email: _____ Office Phn: _____

2. Section 2: Positional Information

1. Job Title: _____ Office: _____
2. Please indicate all of your responsibilities in order of precedence with a % of time spent on each responsibility.

%	Responsibility	%	Responsibility

(* Attach job description block of OER)

3. Which Graduate Programs are you concerned with/responsible for?

_____ _____

_____ _____

_____ _____

4. How many students (average/approx.) do you have in your program(s)?

_____ _____

_____ _____

_____ _____

5. How many Coast Guard billets (average) are there for your programs?

_____ _____

_____ _____

_____ _____

_____ _____

6. What percentage of your time and effort do you spend on activities relating to graduate student management?
(This percentage will be compared with the relative importance of the job.)

3. Section 3: Information Technology

1. Where do you consider yourself to be on this continuum of computer users? Which statement most closely describes your level of computer use? (circle one)
   A. I've lived in a cave for the last 20 years and have never seen or touched a computer.
   B. I dislike computers. I use the computer as little as humanly possible, and am not interested in using it more than I have to.
   C. I know very little about computers and don't use them very much.
   D. I use a computer often at work, you know - word processing, email a spreadsheet or two, but that's about it. My kids use the one at home more than I do.
   E. I use the computer at work. I have a computer at home, but mostly for video games, email and web surfing. Grandma loves it when I email her pictures of the kids.
   F. I'm a closet computer geek. I spend a lot of time playing with computers besides work and web surfing.

2. What do you think about the capability of the present information technology infrastructure in the Coast Guard? (CGWEB, CGDATANET, CGIntranet, CGSWIII, etc)

(Circle one)
Inadequate Adequate Good Excellent Too Much

Comments (about CG Infrastructure):

4. Section 4: Student Management (Assignment Officers may skip this section)

1. What do you feel is your level of involvement in the student management processes (student, school, curricula selection)? (Circle one) Not involved Partly involved Very involved

2. What is the size of the budget you have to work with (total or per student) for creating graduates including PCS costs, tuition, etc.

_____ _____
_____ _____
_____ _____
_____ _____

3. What is your sense of the efficiency and effectiveness of the present processes of student selection, school selection, and curricula selection in terms of producing quality graduates for Coast Guard billets? In short, how good is the product (graduates) you are getting from the programs and is the money being spent well? Please indicate if there are differences in the effectiveness between individual programs. (Are there other things we should be asking about?)

A. Student Selection Process:

Comments: (about the Student Selection Process)

B. School Selection Process:

Comments: (about the School Selection Process)

C. Curriculum Selection/Development:

Comments:

D. TAB (Training Allowance Billet) management:

Comments:

4. Are Coast Guard funds being used efficiently to produce graduates?

Comments:

5. Are the processes presently in place for the management of graduate students organized, haphazard or somewhere between?

Comments:

Suggested improvements:

6. Do you have access to timely and complete information when you need to make student management decisions? For example: Should I let this person go to a more prestigious institution (partly on their own funds), or should I require them to attend University X, where the Coast Guard has several students and a curriculum set up? Or when can I allow this person to start school? Can I allow them a refresher quarter?

Comments:

7. Do you find yourself lacking (or blocked from) important information that you believe should be easily accessible?

Examples/Comments:

8. Do you have any measurements of success or effectiveness for your PG programs (i.e., percentage of the forecasted number of billets filled, number of forecast billets versus actual billets, tuition versus PCS cost tradeoffs, etc)?

9. Do you believe the increase in payback commitment (from 2 to 3 times) has effected the number and/or nature of those who apply for PG school? How?

10. Are your programs getting enough, too many, or not enough quality applicants?

11. Are your programs getting enough, too many or not enough graduates?

12. Is the demand (open billets) being filled by the number of graduates? If not, is the demand being filled some other way? If so, how?

13. Do you track graduates beyond their payback tour?
If so, what percentages of graduates continue on in the specialty area after the payback tour? (please guesstimate if you have no numbers)

14. Do you see any value to being able to identify graduates beyond their payback tour?

15. Is there a problem retaining graduates in your program area(s) once paybacks are complete?

16. Do you have any problems tracking payback time for graduates?

5. Section 5: Student Assignments (for both Assignment Officers and Program Managers)

1. Do you have access to timely and complete information when you need to make student assignment decisions? (How much the PCS will cost, Does the billet require PG training, Does this person have the right PG training, etc)

2. Do you find yourself lacking (or blocked from) important information that you believe should be easily accessible?

Examples/Comments:

3. How do you measure success at the end of an assignment season (regarding PG student assignments)?

4. Do you have problems identifying officers with PG training once they are past their pay back tour?

5. Do you use the Experience Indicators in the USCG Register/PDS? If so, how?

6. Is the number of graduating PG students adequate to fulfill the demand (PG required billets)?

7. Do you have problems filling billets (beyond traditional payback billets) that require advanced education?

8. Are you aware of the CG AEP web site? Yes / No
(www.uscg.mil/hq/g-w/g-wt/g-wtt/g-wtt-2/policy/adved.htm)

9. If so, how did you become aware of the web site?
ALDIST From G-WTT Other _____

10. Do you have any feedback for us regarding the CG AEP web site?

6. Section 6: Scenario (for both Assignment Officers and Program Managers)

We are looking for the range of opinions among program managers and assignment officers in this scenario. This is certainly not a graded test – your opinion is what counts here.

What experience indicator would you assign to these two officers?

Officer A:

1992 OCS Graduate. Has a BS in EE. Very good OERs.
First Tour (2 yr): TISCOM
Second Tour (3 yr): Group LE/SAR Controller - Duty
Third Tour (2 yr): Information Technology Mgt (ITM) program at Navy PG school
Fourth Tour (4yr): C2CEN (payback)

Experience Indicator: __ __ __ __ __ __ __ __
Comments:

Officer B:

1989 Academy Graduate. BS in EE. Very good OERs.
First Tour (2 yr): DWO WMEC
Second Tour (2yr): OPS WMEC
Third Tour (4 yr): District RCC Controller – Duty
Fourth Tour (2 yr): ITM at Navy PG School
Fifth Tour (4 yr): Pacarea Branch Chief, System and Security

Experience Indicator: __ __ __ __ __ __ __ __
Comments:

2. What career choices would you offer/recommend to this officer for his/her next tour?

Officer A:

_____ _____
_____ _____
_____ _____

Officer B:

_____ _____
_____ _____
_____ _____

Thank you for completing the survey. Please return the survey to G-WTT or mail to:

LT Marc Sanders
CG AEP Survey
383A Bergin Drive
Monterey, CA 93940

Or Email to: mfsander@nps.navy.mil

LIST OF REFERENCES

1. Hammer, M., "Reengineering Work: Don't Automate, Obliterate" *Harvard Business Review,* July/August 1990.
2. Davenport, T., and Short, J., "The New Industrial Engineering: Information Technology & Business Process Reengineering" *Sloan Management Review*, pp. 11-27, 1990.
3. Hammer, M., and Champy, J., *Reengineering the Corporation: A Manifesto for Business Revolution,* Harper, 1993.
4. Davenport T., *Process Innovation: Reengineering Work through Information Technology,* Harvard, 1993.
5. Rivera, J., and Diamond, P., *Extend simulation software for the next millennium*, Imagine That Inc., 1997.
6. Gogg, Thomas J and Mott, Robert A., *Improve Quality & Production with Simulation*, Palos Verdes, California, JMI Consulting Group, 1995.
7. Bhargava, H. K., Krishnan, R., and Whinston, A. B., "On Integrating Collaboration and Decision Analysis Techniques," Journal of Organization Computing, vol.4, no. 3, pp. 1-23, 1994.
8. O'Brian, J. A., *Management Information Systems: A Managerial End User Perspective*, pp. 338-375, Irwin, 1993.
9. Alter, S., Information Systems: A Management Perspective, pp. 97, Addison-Wesley, 1992.

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