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MICROCOMPUTER APPLICATIONS FOR THE PLANNING PROCESS AT  
THE NAVY ACCOUNTING AND FINANCE CENTER(U) ORKAND CORP  
SILVER SPRING MD 16 MAY 83 TR-83W-033 N00014-83-C-0116

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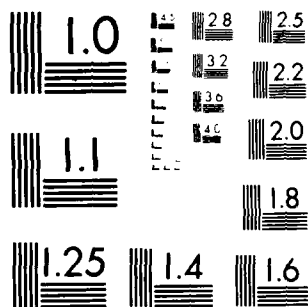
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***THE ORKAND CORPORATION***

SILVER SPRING, MARYLAND

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May 16, 1983  
Contract Number: N00014-83-C-0116

Prepared for:

Planning and Systems Evaluation Division  
Navy Accounting and Finance Center  
Crystal Mall No. 3, Room 507  
Washington, D.C. 20376



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TABLE OF CONTENTS

<u>Section</u>		<u>Page</u>
I	INTRODUCTION	I-1
II	MICROCOMPUTER APPLICATIONS	II-1
	Word Processor and Graphic Functions	II-1
	Applications	II-1
	Implementation	II-2
	Decision Tree Analysis	II-2
	Applications	II-2
	Implementation	II-3
	Network Analysis	II-5
	Applications	II-6
	Implementation	II-7
	Modeling Techniques	II-9
	Applications	II-10
	Implementation	II-11
III	SOFTWARE PACKAGES AVAILABLE	III-1
	Software Evaluation	III-1
	Application Software Available	III-2
IV	CONCLUSION	IV-1



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## I. INTRODUCTION

NAFC is responsible for publishing and maintaining the Master Plan document which sets forth the long range plans for financial management systems development. The overall objective of the Master Plan is the effective coordination of the development and implementation of improved and integrated financial management systems throughout the Department of the Navy. To increase the effectiveness of the Master Plan effort, The Orkand Corporation was contracted to complete an assessment of the baseline planning environment at NAFC and develop recommendations that would improve the planning process. During The Orkand Corporation's evaluation of the planning effort at NAFC it was found that there are numerous planning tasks that can be completed with increased effectiveness and efficiency using an automated system.

The strategic planning process at the Navy Accounting and Finance Center (NAFC) involves the collection, development, and evaluation of a large amount of complex data gathered from numerous sources. Microcomputer applications are available to NAFC that will ease the workload and provide the planning staff additional time to develop supplemental information for management's use in decision-making.

Under the requirements of contract number N00014-83-C-0016, Assessment of the Planning Process for Development and Update of the Financial Management Improvement Program, The Orkand Corporation has identified several microcomputer applications of potential benefit to the Planning Branch at NAFC. This report describes the potential applications of an automated system, along with generic procedures for implementation.

The applications suggested in this report were selected on the basis of their practicality and consistency with current planning procedures at the Planning Branch, including the DON Strategic Financial Management Master Plan structure. Several of the applications described are based on prospective planning procedures that the Planning Branch may implement in the future, including contingency plans, resource estimates, and project development critical paths.

Chapter II of this report discusses the potential uses and implementation procedures of four software packet applications: word processing and graphic functions; decision tree techniques; network analyses; and modeling techniques. Chapter III discusses procedures for evaluating available software packages and provides a list of software packages currently available which perform the functions discussed in Chapter II.

## II. MICROCOMPUTER APPLICATIONS

This chapter focuses on specific microcomputer applications which can be used by NAFC during the planning process and the documentation of the Master Plan. The applications discussed in detail in this chapter include:

- Word Processor and Graphic Functions;
- Decision Tree Analysis;
- Network Analysis; and
- Modeling Techniques.

### WORD PROCESSOR AND GRAPHIC FUNCTIONS

The discussion on word processor and graphic applications which follows encompasses generic functions of microcomputers which do not require substantial technical expertise for development or implementation. The features described in this discussion include text editing, data storage, and graphics.

#### Applications of Word Processor and Graphic Functions

Word Processing. The Planning Branch at NAFC can utilize a word processor software system to update, edit, rearrange and store plan narratives, reports, milestone schedules, planning schedules, and system inventories. This automated system will facilitate the concept of a "living" plan because it can be readily updated to reflect frequent changes.

A word processing system can be used during the Plan's control and updating processes as a monitoring device or a "tickler" system. A file can be developed on the planned milestone schedules of the projects currently in process. With this file, the Planning Branch can monitor the progress of a project by initiating updating procedures when a milestone deadline has occurred. A file can also be developed on the planning process schedule so that Master Plan deadlines and deliverables can be monitored.

When a change in the milestone schedule is discovered through the monitoring process, the Planning Branch can evaluate the impact of the change on that project's other milestone completion dates and the completion dates of other interrelated projects through network analysis (discussed later in this chapter). If the network analysis shows that the delay will retard completion of other milestone dates, the monitoring file can be updated with the revised completion dates.

Graphics. An automated graphics package can create a number of charts and graphs including: Gantt charts, PERT charts, bar graphs, curves, or pie charts. Graphic presentations provide a simplified and highly visual display of otherwise complex information.

Most graphic capabilities require a specific software application package separate from word processing functions. In addition, colored graphics and/or complex graphs require supplemental hardware designed specifically for graphic purposes. Through the use of graphics, the Planning Branch can display complicated arrays of data in a manner which may be easily understood. NAFC management will be able to visualize trends and relationships faster with a set of curves rather than a list of prime numbers presented in tabular formats. Additionally, with a set of charts NAFC management can quickly see the significance of new data or changing relationships.

An automated graphics system facilitates rapid production of displays and provides the capability to generate alternative presentations easily and quickly. When updates are needed, the system will automatically create a revised graph or chart based on the updated information.

#### Implementation of Word Processing and Graphic Functions

Training is a primary area of concern during the implementation of a word processor and/or graphic software system. The planning staff needs to be sufficiently trained so that they are comfortable with the equipment. Once the staff is adequately familiar with the system, they will be able to effectively develop and manipulate the data to construct the necessary reports and/or graphs as needed.

The monitoring or tickler system files must be continually reviewed and updated by the planning staff. Frequent reviews of the files on milestone schedules and the planning process schedule will alert the staff regarding upcoming deadlines. These reviews bring into focus potential problem areas and also provide for the continual updating of the project schedules and the Plan document.

#### DECISION TREES

Decision tree methodology is a method of planning to achieve objectives by identifying and choosing among available alternatives. Use of a decision tree to aid decision-making assists the planner in considering various courses of action, assigning resource estimates to the alternatives, evaluating the results by probability factors, and making comparisons.

#### Applications of Decision Tree Techniques

The decision tree method can be used in any phase of the NAFC planning process which requires identifying and selecting between alternative processes and/or projects. This includes analyzing alternative strategies, developing

contingency plans and examining systems interrelationships. The decision tree approach forces the project managers, directorates and the Planning Branch individuals involved in a project to evaluate the feasible alternatives by examining the decisions involved in each alternative and their impact on future events. In addition, by examining the probabilities of different events, the planner can develop a more realistic view of the actual probability that a particular decision will lead to the desired outcome.

A decision tree analysis is primarily used to examine a decision's impact on future events. It forces the directorate and NAFC-121 to evaluate the long term effects of a decision. Resource estimates and probability factors may be incorporated into the decision tree if necessary. In a contrast, a network analysis, as described later in this report, is primarily used to examine time parameters.

#### Implementation of Decision Tree Techniques

The construction of a decision tree generally requires three primary steps. The first of these steps involves identifying the alternative decisions and the possible outcomes for each decision. With this step completed, the people involved in the planning process will have a graphic picture of the alternatives under consideration and their outcomes. This graphic picture will aid NAFC management during the strategy approval process.

The second step involves estimating the probability of each outcome. The system will use the probabilities to calculate an expected value. Probability factors can be developed for the occurrence of an event and/or the resource estimates involved in the activity. Directorate and project manager involvement is necessary to develop realistic probability factors.

The third step involves analyzing the decision tree to identify the "best" alternative based on the lowest resource costs or probable outcome and the probability that the outcome will occur. The "best" alternatives will be included in the draft Master Plan sent to senior management for approval.

The description of the steps involved in constructing a decision tree illustrates the simplistic nature of this type of analysis. Basically, the decision tree analyses will provide NAFC with a graphic presentation of the outcomes of the decision required under each proposed strategy and the probability of their occurrence.

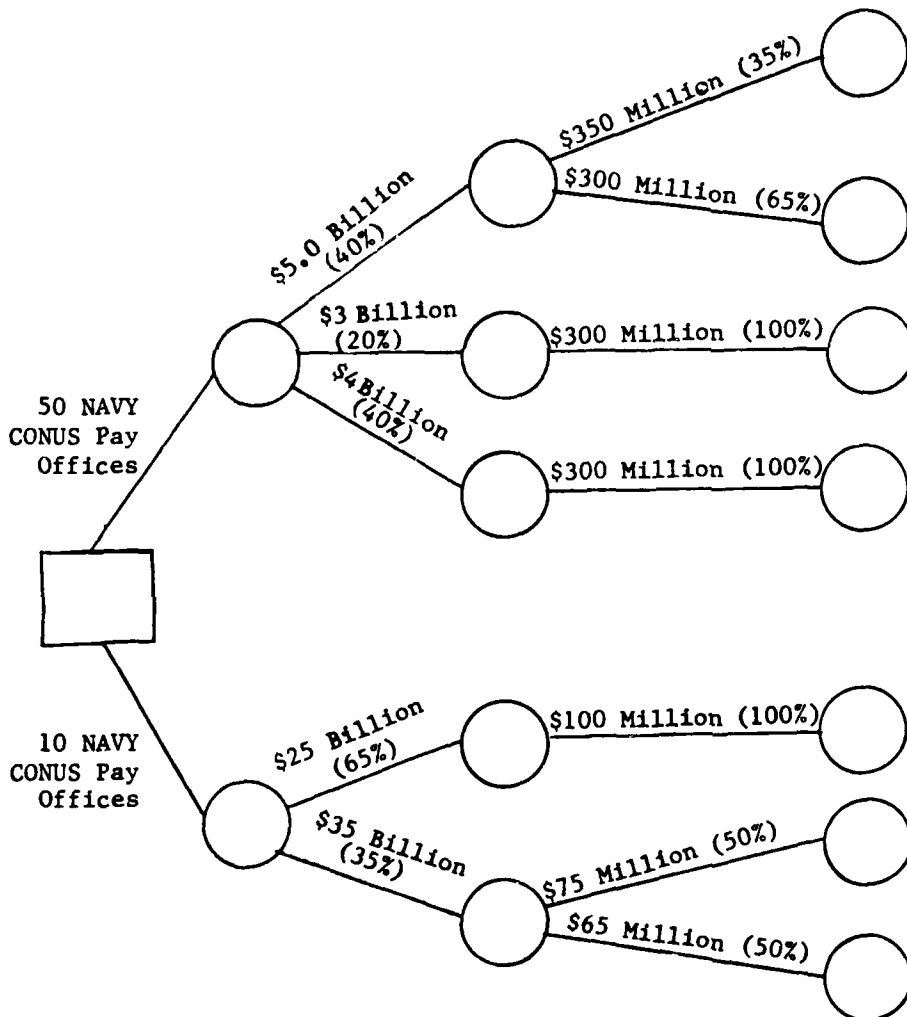
Shown in Exhibit 1 is a simplistic example of a decision tree structure. The squares represent a choice mode where more than one alternative is available to the decision-maker. The circles indicate a chance mode. Each line leading up to a chance mode is assigned a probability of occurrence and dollar costs. Thus, the decision tree results show the possible outcomes from each decision along with the associated costs and probability of occurrence for each outcome. The example of consolidating NAVY CONUS pay offices shown in the exhibit is purely hypothetical, it has been developed for illustrative purposes only. This example is very simplistic, in an actual NAFC application there will be numerous choice and change modes. The complexity of the decision tree will make an automated system a necessity.

Exhibit II  
Decision Tree Example

Consolidation of NAVY CONUS  
Pay Offices

Consolidation  
Costs

Annual Operating Costs  
for 10 years, Costs Inflated  
by CPI each year.



There are numerous other decision-making techniques similar to the decision tree approach which may also be useful as microcomputer applications at NAFC. Examples of such techniques include: expected value analysis; minimum-maximum criteria analysis; Bayesian Decision Theory; linear programming; and cross impact analysis. Each of these is similar to the decision tree analysis in that they are designed to evaluate alternative outcomes associated with different decisions and to find the "best" decision.

#### NETWORK ANALYSIS

Network analysis evaluates the interrelationships of the activities and events associated with the overall project. Network analysis can evaluate any of three parameters: time, cost, and performance. The analysis results in the identification of the project's critical path.

This critical path is the set of interrelating activities which represent the path with the longest time-frame to the completion of the project. Delays along the critical path will cause delays in the entire project. NAFC planners and/or project managers can evaluate the critical path to identify areas where the time-frame can be shortened to move up the project's completion date or to alert management when slippages occur along the critical path. Similarly, other paths are monitored to identify slippages which may change the critical path.

There are numerous network techniques available. The methods differ in the degree of complexity and the parameters that are analyzed. The Gantt chart plots the project's individual tasks against time so that actual progress can be compared with the scheduled progress. The Program Evaluation and Review Technique (PERT) builds on the Gantt idea but shows more clearly the interrelationships of events and activities. PERT examines the time parameter only.

PERT/COST is a technique designed to allow management to minimize the overall cost of a project by assigning costs to each activity. The costs are dependent on the activity's time in process. PERT/COST evaluates both time and cost parameters. The Graphical Evaluation and Review Technique (GERT) is also time and cost oriented but incorporates more stochastic flexibility. The Venture Evaluation and Review Technique (VERT) is designed to analyze the time, cost, and performance parameters.

The key advantage offered by a network analysis is that it will force the NAFC directorates to think in terms of the entire project and its interaction with other projects in terms of time or cost. In addition, because of the monitoring potential of the network, the system provides an excellent source of motivation.

Another advantage of using network analysis during the planning process at NAFC is that the data required to create the network represents a major contribution toward the definition and control of the projects included in the Master Plan. Also, if probability factors or three-way time estimates (best case, worst case, and most likely case) are used, the technique requires the

directorates and the Planning Branch to evaluate the degree of uncertainty involved in the development of a project.

#### Network Applications

An automated network analysis system can be utilized by NAFC in a variety of steps involved in the planning process. The applications discussed in this report include: developing the planning process schedule or POA&M; scheduling the milestones completion dates; evaluating the impact of a change in milestone completion dates; and monitoring project progress.

Developing the Planning Process Schedule or POA&M. NAFC can use a network analysis system to schedule the planning process to ensure the timely completion of the Master Plan. Evaluating the critical path of the planning process through a network analysis requires activity information including: an estimate of the process time necessary for each planning activity; a determination of the sequence of the activities; and a determination of the activities that are dependent on the completion of other activities. The critical path information will enable NAFC to manipulate the completion dates of appropriate planning activities to satisfy the delivery date of the Master Plan.

Scheduling of Project Milestone. An automated network analysis system can also be utilized to schedule milestones to satisfy DON-wide accounting system objectives. For example, if one of the Master Plan objectives is to integrate disbursing and accounting functions into 15 Financial Information Processing Centers by 1987, the data available from the automated network can be used by management to determine if there is a need to manipulate the completion times of the activities along the critical path to ensure integration by the year designated in the objective.

Evaluating the Impact of Change in Milestones. With increased emphasis on the integration of Navy accounting systems, the Planning Branch can use an automated network system to determine the impact of a delay in a milestone for one project on the completion dates of dependent milestones from other projects. The automated system can calculate the impact of a change on the completion of each interrelated project. This updated information should be transferred to the completion dates documented in the Master Plan. This process enables NAFC-121 to easily update the Master Plan with any change in the milestone schedule.

Monitoring Project Progress. The milestone schedule developed through the network system can be used as a control device to monitor the project's progress and also as a performance evaluation device for management. A network analysis can incorporate resource and performance parameters, in addition to the time variable. These parameters can also be utilized in control and evaluation procedures.

The schedules developed through network analyses can be used as a control and monitoring device to track the actual Plan progress. The automated system can be used to quantify planned versus actual progress. Actual activity completion dates can be input into the network system to determine the impact

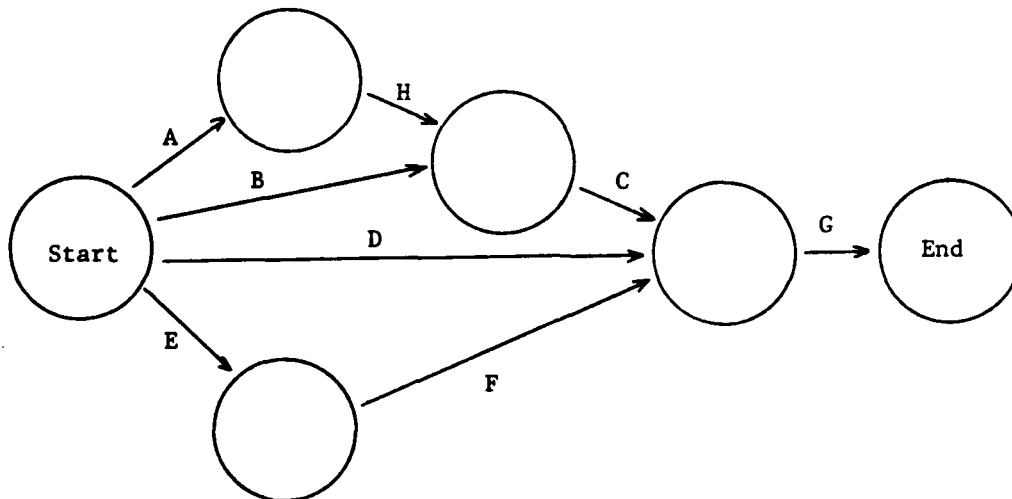
on other activities' completion dates. If there is a change in some of the completion dates based on the revised critical paths, the planning staff can evaluate how the process times of critical path activities can be manipulated to satisfy NAFC time-frame requirements.

#### Implementation of Network Analysis

Since NAFC is primarily concerned with the time parameters of each project and how the timing of the activities of each project interrelate with other projects' activities, this report will focus on the implementation of a PERT network system which evaluates only the time parameter.

The first step in implementing a PERT network at NAFC is to define, in terms of time, all activities and milestone associated with each project included in the Master Plan. An activity represents the time and resources (manhour and/or dollar) necessary to progress from milestone to milestone. A milestone or event represents the completion of a specified segment of the project. This step requires direct participation and involvement from the individual NAFC directorates so that comprehensive time estimates on each project task can be determined.

The second step involves developing a draft PERT network. The activities should be related to each other in order of their occurrence. As many activities as possible, based on the input from the NAFC directorates, should be performed at the same time. An example of a PERT network is shown below. The circles represent milestones and the lines represent the activities leading up to the completion of the milestone.



This draft pictorial version of the network is for the analyst's purposes only, to ensure that the events and activities follow the desired sequence and are in a logical pattern. This step is not necessary for the development of data for input into the system. Step three described below develops the data for input into the automated network system.

Step three involves estimating the process time of the individual activities. Usually three time estimates are developed: 1) the minimum or most optimistic, the best case; 2) the maximum or most pessimistic, the worst case; and 3) the most likely case. Probability factors are assigned to each case. The system will calculate a mean or expected time value, variance, and standard deviation for each activity based on the probability figures and time values entered. An example of the data developed for input is shown below.

Table 1  
PERT Network Data Input

Activity	Previous Activity	Minimum Time (A)	Maximum Time (B)	Most Likely Time (C)	Probability		
					A	B	C
A	-	8	12	9	.3	.3	.4
B	-	10	13	12	.1	.3	.6
C	A,B,H	6	9	8	.2	.1	.7
D	-	12	16	14	.1	.1	.8
E	-	13	16	15	.1	.4	.5
F	E	7	10	8	.1	.1	.8
G	C,D,F	5	8	6	.1	.3	.6
H	A	0	0	0	.4	.1	.5

NAFC can utilize their systems inventory and the network analysis to make sure that each system interface has been considered. A network system can provide output reports on an individual project basis or on the sum total of all the projects included in the Master Plan. The system will calculate a critical path and slack times for the network. If NAFC needs to adjust a project completion date, they must manipulate the process time for the milestones along the critical path.

If the system is given a specified calendar starting date and time estimates for each activity, it can determine the calendar date for an event completion and the probability of achieving that date. The calculated probability for an event achievement date is based on the probability of the time estimates input for each activity, assuming the activity times approximate a normal curve.

The output can be utilized to evaluate the sequencing of events or determine ways to shorten lead times along the critical path. In the control process, the critical path provides a benchmark against which the effect of delays in any particular milestone can be measured. Even though the previous discussion describes a PERT network in terms of a NAFC systems project, it is also pertinent to the development of the planning process schedule or POA&M.

Due to the nature of the PERT network, the analysis has some shortcomings. Because PERT is a deterministic critical path analysis, the calculations assume that each path is independent on all other paths. The procedure does not account for the probabilities that merging paths may come in late to the path being analyzed. Stochastic networks, such as GERT or VERT, utilize a Monte Carlo simulation technique to account for the probability of delays in interacting paths. However, these programs are much more complex and expensive to run.

PERT/COST will allow NAFC to evaluate the costs of a project in terms of manhours and/or dollars, and the costs associated with accelerating the activities along the critical path. This analysis begins by segmenting the project into identifiable activities as in any network system. Then the amount of time which minimizes the cost to complete each activity is determined as well as the additional cost to speed up the completion of each activity. The cost function for each activity is U-shaped; if the process time is increased the activity cost will increase due to additional manhours, equipment rental, etc., and if the activity process is accelerated the costs will increase due to overtime pay, etc. Estimating activity costs as a function of time may be quite difficult. However, once this information is available, it is a routine matter to determine the activity times which minimize the total cost to complete the project.

Based on the quarterly NAVCOMPT 7000-23 Financial Management Systems Development Project Progress Reports received from the directorates and the information gathered through the monitoring system (described earlier in this chapter), the Planning Branch should continuously update the activity time factors and milestone completion dates to reflect actual performance. If these shifts cause a change in the projects' milestones completion dates, the Master Plan document should be updated to reflect the changes. In this way, the Master Plan will remain an up-to-date, "living" document.

#### MODELING TECHNIQUES

Modeling techniques can deal with complex interactions involving large quantities of data and can show how various decisions in one project will affect other projects' facilitation, integration and coordination. Modeling can illustrate the risk and timing implications of alternative strategies. As a tool in the planning process, the fundamental purpose of modeling is to attempt to make a valid prediction of how potential strategies will perform in advance of actual implementation. As an analytical aid to the decision-making process, modeling may also make it possible to infer previously unconsidered attributes about the system being planned. Modeling techniques are available in a wide range of complexities. This report will discuss those techniques which will be relatively easy to implement by NAFC.

There are three primary types of modeling techniques: deterministic, probabilistic, and simulation. A deterministic model is used for cases of certainty where the cause and effect relationships are clear. A probabilistic model is utilized in cases where risk exists and there is uncertainty

regarding the variables' relationships. A simulation model is utilized in cases where a great deal of randomness exists among the variables. In these cases, the model is designed to answer "what if" questions.

#### Modeling Applications

Automated modeling techniques can be utilized by NAFC in a variety of the steps involved in the planning process. While some modeling applications can be manually performed, the availability of an automated system will greatly enhance the Planning Branch's capability of modeling more complex problems.

Evaluation of Alternative Systems. Through the use of modeling techniques, the Planning Branch will be able to evaluate each alternative system design under numerous environmental, operational or budgetary assumptions. This enables NAFC-121 to develop strategies which are responsive to the "most likely" scenario. An automated model requires only a change in input data to evaluate any change in assumptions and eliminates the manual reworking of schedules or calculations.

Development of Analyses. Modeling lends itself toward the development of cost/benefit, risk, and sensitivity analyses for the assessment of system options. Sensitivity and risk analysis involves the examination of alternative strategies under different assumptions. These analyses can be used to determine the systems that are particularly sensitive to changes in the environment.

The Planning Branch can use these data to develop future system enhancements which reduce the financial and accounting systems' vulnerability to a change in environment. These analyses provide for a discussion in the Master Plan on the kinds of situations which could significantly lower the value of the plan, including precautions which could reduce the risks. The precautions are determined based on tests of the options' sensitivity under various assumptions.

During the phase of the planning process concerned with the evaluation of system strategies, potential benefits such as service improvement, cost reduction, and cost prevention can be identified through a cost/benefit analysis. To evaluate the benefits of implementing a particular system, a comparative analysis must be completed of present versus prospective cost and system capabilities including both the one-time savings which results from system reconfiguration as well as recurring operating economies.

In addition, the Planning Branch can use the model to manipulate the timing of project milestones and resource estimates to determine the most efficient method of future system implementation.

Development of Contingency Plans. Given the uncertainty inherent in long range planning, it is beneficial to develop contingency plans to take into account likely future events. These contingency plans can be developed by modeling the impact of multiple scenarios on the long range plan. Then, when there is a major shift in the Navy environment, the relevant contingency plan can be put into effect, increasing the flexibility of the Master Plan.

Examples of Modeling Applications. Two examples of modeling applications relevant to NAFC will be discussed: 1) a cost effectiveness analysis; and 2) an information flow analysis.

Cost Effectiveness Analysis Modeling Example - This example on cost effectiveness will focus on the analysis of an effort to consolidate processing centers. To evaluate alternative consolidation strategies based on a cost criteria, the analysis should consider the initial investment, the operating costs, the salvage value of real assets and the timing of these costs. An automated model will eliminate the manual recalculations required in an interactive process where numerous assumptions are tested.

In this example, a complete analysis may include the manipulation of assumptions such as: the number of processing centers; the number of personnel; the telecommunication costs; and the computer costs. The results of the analysis will be a determination of the optimal number of processing centers.

Futher analyses can result in a determination of the most cost effective computer system for the processing centers, a centralized system or a decentralized system. Once a cost effectiveness model is developed, it can be utilized with some manipulations, to analyze other cost effectiveness problems both within NAFC-12 and in the field operations.

Information Flow Modeling Example - An example of an information flow analysis relevant to NAFC is the development of a model to simulate the payment authorization process prior to disbursement. By looking at historic records and questioning the individuals involved in each step of the process, it is possible to simulate the amount of time and labor required to complete a payment disbursement. The model can go so far as to take into account sick leave, vacation leave and vacant positions of the employees involved in the disbursement area.

Using simulations, different policies can be tested under the same conditions, (number of outstanding vouchers, types of payments, locations of disbursing centers) to determine, for example, which of two alternative policies produce shorter response times or lighter workloads.

#### Implementation of Modeling Techniques

Financial modeling and forecasting software systems are available at every level of user expertise. Software systems are available for mainframes, minis, and microcomputers. Many products offer "fill in the blanks" data entry where users need only to key in commands to do the data manipulating, calculating, and formatting.

Modeling techniques will prove useful to NAFC only if resource estimates are included in the planning process. If costs are not considered in the long range plan, then network analysis will be sufficient to assess time and performance parameters. Decision tree analysis will be sufficient to examine how present decisions concerning alternative strategies will impact future decisions regarding the DON's financial management systems.

The four primary steps involved in using an automated modeling technique are as follows:

1. Define model.
2. Generate data.
3. Use model.
4. Evaluate model.

The first step involves defining the hypothesis and the parameters to be examined. This step is necessary to define what the planners want the model to do. The planners must determine the parameters which will be measured, i.e., time, costs, manhours and/or benefits. To review quantifiable results, the major variables and their relationships have to be identified. The planners must determine what assumptions and constraints will be considered. Also, the planners must decide what type of modeling (deterministic, probabilistic or simulation) would be appropriate based on the criteria discussed below.

A deterministic model can be used if the variables' relationships can be expressed in a mathematical formula. In this case, analysis of alternatives under numerous scenarios can be completed using an electronic spread sheet program. A two dimensional grid can be created with columns representing time periods and rows representing individual projects, general segments, or general strategies. The grid will be filled with parameter figures such as days for completion, dollar costs and/or required manhours. Attached as Exhibit II is an example of a spread sheet developed on an automated system. The figures on the spread sheet are hypothetical numbers, used only for illustrative purposes.

In a probabilistic model, the uncertain variable relationships can be expressed as: a cumulative probability distribution; the probability of equaling or exceeding a given value; or as a distribution. If a probability distribution is used, it can be characterized by specifying the most likely value for the mean, standard deviation, variance, etc.

A simulation model utilizes a Monte Carlo approach to simulate the randomness of the variable when the probability of the event is not known. The model must be run numerous times to determine the statistical characteristics of each alternative that is being examined.

Probabilistic and simulation models require more sophisticated software equipped to utilize probability distribution characteristics or a Monte Carlo simulation to evaluate the data. There are numerous software packages on the market that provide these forecasting and modeling capabilities which are discussed in Chapter III.

Once a specific type of model has been selected the next step involves gathering and generating data. NAFC can utilize historical relationships, both internal and external, to develop trends to forecast future events and/or



statistical characteristics. Directorate input is very important in this phase to assure the development of realistic assumptions or scenarios needed to test the variables during the modeling analyses. The data must be developed so that it will be compatible with the software program.

The third step involves application of the automated model. This entails the input of data, and examining the impact of the variables under multiple scenarios. This step involves data manipulating, calculating and formatting which can be accomplished easily with an automated system.

The fourth step involves evaluating the model results. NAFC must decide on how the results should be molded into recommendations on alternative strategies in order to provide management with adequate information for the decision-making process. NAFC should inform management regarding the alternatives considered, the results of the analyses, the assumptions used and the scenarios examined. Given this information, management will be able to make an informed decision regarding the appropriate alternative.

The alternatives chosen, based on the results from the modeling tests, can be integrated into the Master Plan subsequent to a network analysis. The network analysis will provide a milestone schedule which will be input into the Master Plan. Any changes in the long range assumptions or scenarios which occur during the update process can be input into the model to determine the impact on the alternatives and whether a change in strategies is necessary.

### III. SOFTWARE SELECTION

#### EVALUATION OF SOFTWARE

Prior to starting the software selection process, the NAFC staff should develop a specific list of current and future needs. Since software is available with many different options, these needs should be as explicit as possible. Once these technical specifications have been developed, NAFC can evaluate each product available based on their ability to meet the identified requirements.

The evaluation process begins with comparing software package options to make sure that NAFC's criteria are adequately addressed. Customer references who have hands-on experience are essential to identify the software's strengths and weaknesses. It is also important to evaluate the software documentation to see that it is written to maximize user ease and efficiency. Once the feasible software packages have been narrowed to two or three products, it is necessary to determine which packages are compatible with the hardware at NAFC.

NAFC should consider the following points during the software evaluation process:

- Is the software compatible with NAFC's microcomputer? Specifically in terms of computer language and memory requirements.
- Are there satisfied purchasers who will testify to the effectiveness of the software?
- Does the software require a technical expertise level which is available or achievable by the prospective users at NAFC?
- Does the software have sufficient flexibility to satisfy NAFC's needs?
- Will the data available at NAFC be compatible with the data required by the software for analysis?
- Can the software accomplish the functions desired at NAFC?
- Will the software become obsolete in the near future?

There will be specific factors which should be considered depending on the specific functions NAFC is looking for, i.e., modeling, graphics, network analysis, etc. If NAFC were considering modeling software, for instance, the following would be considered:

- How many time periods can be included in the model?

- How many logic statements can be used in the model?
- Is the language which is used to build the model easily understood?
- How much freedom does the model provide for tailor-made report formats?
- How many divisions can the model accommodate?

Since new software products arrive on the market on almost a daily basis, NAFC may want to consider utilizing consulting services to assure that they are considering all possible software packages available.

#### APPLICATION SOFTWARE AVAILABLE

Mentioned below are examples of software packages currently available which provide functions that are applicable to NAFC as discussed in Chapter II.

- Multiplan by Microsoft is an electronic spreadsheet that contains 13 columns and 255 rows. It can be used for forecasting, hypothesizing, planning and tracking. The application software allows the operator to build "what if" models without knowing complex modeling language.
- VisiCalc by VisiCorp is a powerful electronic spreadsheet which instantly recalculates all the numbers with any change in the data.
- VisiTrend/Plot by VisiCorp will automatically produce line, bar, pie, area, X-Y, and hi-low charts with numerous variations and options.
- MicroFinesse by Osborne/McGraw-Hill has the ability to create, among others, color histograms, graphs and pie charts.
- Milestone by Organic Software is a critical path method software for finding the optimum schedule and/or comparing costs of different schedules.
- VisiSchedule by VisiCorp instantly shows skill levels, costs, and the critical path among a project's tasks.
- Word Star by MicroPro is a screen oriented text development and integrated word processing system specifically designed for non-technical personnel.
- Model by Lloyd Bush and Associates is an interactive, all-purpose business planning and modeling tool that features "what if" analysis, risk analysis and multiple-matrice modeling.
- The Business Modeler from BMS Incorporated is a comprehensive financial and situation modeling system.

After all available software packages for a particular application have been identified, they should be evaluated based on NAFC's criteria. When the

feasible software packages have been narrowed to two or three products, NAFC must determine which packages are compatible with their hardware.

#### IV. CONCLUSION

This report has described potential applications of a microcomputer system as a planning tool in NAFC-121. The objective of using a microcomputer in the planning process is to provide more timely and accurate data, provide senior management with additional decision-making information, and reduce manual effort. As a result, the Planning Branch will have increased control of the planning process with additional time and capabilities to branch into new areas of planning. In addition, an automated system will facilitate the concept of a "living" plan because it can be updated easily to reflect frequent changes.

Automated word processing and graphic functions allow the Planning Branch to update, edit, rearrange and store Master Plan narratives. The Planning Branch can also develop a "tickler" system to increase their ability to monitor project progress and planning process progress. Graphic capabilities allow the Planning Branch to display complex data in an easily understood manner.

Decision tree methodologies assist the planner in considering various courses of action by examining a decision's impact on future events. A decision tree can be utilized in any phase of the planning process which requires identifying and choosing among alternative processes and/or projects.

Network analyses examine the interrelationship of the activities and milestones associated with the overall project or projects. The network can evaluate any of three parameters: time, cost, and performance. The analysis results in the identification of the project's critical path and slack times. Potential applications for the network analysis techniques include: developing the POA&M schedule; evaluating the impact of a change in milestone completion dates; and monitoring project progress.

Modeling techniques can deal with complex interactions involving large quantities of data and can show how various decisions in one project will affect the other projects' facilitation, integration and coordination. Modeling techniques can be developed to answer "what if" questions by simulating the actions of numerous variables. Applications of model techniques at NAFC include: the evaluation of alternative systems; the development of cost/benefit, risk, and sensitivity analyses; and the development of contingency plans.

Through the utilization of these applications on a microcomputer system, NAFC-121 will provide more timely and accurate information for decision-making while reducing the amount of manual effort required. NAFC-121 can use these applications to increase the flexibility of the Master Plan and thus increase the confidence and commitment of senior management toward the planning effort.

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