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THE PROGRAM MANAGER'S SUPPORT SYSTEM (PMSS) AN
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THE PROGRAM MANAGER'S SUPPORT SYSTEM (PMSS)

AN EXECUTIVE OVERVIEW

and

SYSTEMS DESCRIPTION

by

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PMSS DIRECTORATE
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January 1987
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PREFACE

The Program Manager's Support System (PMSS) is an application of decision support systems technology to the defense acquisition program management environment.

The purpose of the PMSS is to provide a management tool for managers in a program management office to assist them in their decision-making process and to help them execute their project in a more effective and efficient manner.

The PMSS is intended to support the defense Program Manager and his/her first echelon staff; for example, the Chief Engineer, the Plans and Programs Officer, the Configuration Manager, the Integrated Logistics Support (ILS) Manager, etc. The PMSS also can be utilized by other managers in the acquisition community, for example, by headquarters level executives, program management officer in major projects, and field activity managers.

The PMSS will:

-- Be an integrated software system operable on various hardware systems. The target hardware is low-cost microcomputers. (The system also is being designed to work in conjunction with minicomputers.)

-- Provide a capability to 1) integrate program management functional areas of responsibility, 2) generate program alternatives and impacts caused by various management actions and technical activities, 3) assess these impacts on the program management responsibilities, and 4) utilize other decision-making support methodologies.

-- Provide educational tools to facilitate the teaching of program management functions at educational institutions involved with defense systems acquisition program management.

The PMSS consists of two major parts, functional modules and the integrated PMSS. Functional modules are software programs that can be used as stand-alone programs to assist in program management areas of responsibility such as planning, acquisition strategy development, program management plan generation, cost estimating, scheduling, Program Objectives Memorandum (POM) development, budget generation, budget

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execution monitoring, financial management, systems engineering, production planning, integrated logisites support planning, test issues identification, Test and Evaluation Master Plan (TEMP) generation, TEMP evaluation and monitoring, configuration management, document generation, document evaluation and monitoring, program office staffing and organization, etc. These modules support specific functions of program management operations.

The integrated PMSS will provide a capability called Program Overview, which shows in a color-coded (green, yellow, red) mode, the overall status of the program by the program hierarchical information categories. This provides the program manager an "instant" visual picture of his/her program status and quickly pinpoints program areas that require further management attention. The integrated PMSS, when completed in FY88, will provide capability for a program manager to tackle unstructured problems and address "What if . . . ?" and "Should I . . . ?" questions. The integrated PMSS will integrate the functions of the functional modules so that a program manager can look across his/her entire program and address such questions as "What is the impact on my program if I get a 10% cut?" or "What is the impact on my program if the technology I need slips six months?", or "What is the impact on my program if there is a schedule delay?", etc. The integrated PMSS looks across and within all functional areas of responsibility to assess the impact on the program and help the program manager develop alternatives for recovery.

The PMSS also will provide executive support aids such as briefing presentation aids, electronic mail, calendaring capability and telephone dialers. It also will include support capabilities such as word processing, spreadsheets, data-base management and decision tools.

The PMSS is NOT a management information system nor is it the decision-maker. It is a manager's tool to assist the program manager in his/her decision-making process. The PMSS will permit the integration of the user's experience, judgment and intuition to allow the user to evaluate available alternatives and, ultimately, aid the user to make better, more timely decisions.

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EXECUTIVE OVERVIEW
OF THE
PROGRAM MANAGER'S SUPPORT SYSTEM (PMSS)

The College

The Defense Systems Management College (DSMC) is a Department of Defense (DOD) institution dedicated to providing education to the defense acquisition community and, in particular, program management office (PMO) personnel. Education is provided in the program management policies, philosophies, skills, and techniques necessary for the effective and efficient execution of defense weapon systems acquisition projects.

In addition to its educational mission, DSMC has a research mission. Research in applied management science is conducted to support the above educational mission and to support the DOD acquisition community.

The third DSMC mission is dissemination of information to the DOD acquisition community.

A Need for Decisions

The defense systems acquisition process is a complex process comprising six decision-making disciplines, many functional areas of responsibility, and five acquisition phases. The defense program manager (PM), in executing an assigned program within this environment, is faced with many non-routine and unstructured decisions. Although management information systems (MISs) can provide the program manager with some of the information needed in the decision-making process, such systems predominately supply only historical data and current project status, usually with an abundance -- and many times an overabundance -- of unprocessed information. A need exists, therefore, to enhance the program manager's decision-making process by examining future courses of action, assisting in answering the "What if" and "Should I" questions, and distilling the available data into meaningful alternatives.

One Solution

A DSMC research project was established to address this need. This project applies decision support system (DSS) technology to the defense systems acquisition program management environment. This research project is called the Program Manager's Support System, or simply, the PMSS.

PMSS CHARTER

- **Support the School of Systems Acquisition Education in the development of curricula that implement the Program Manager's Support System (PMSS).**
- **Improve the decision-making process of defense program managers.**
- **Identify and understand the factors that affect and influence the decision-making process.**
- **Orient personnel in the defense program management environment in ways to improve the decision-making process.**
- **Provide information to the defense program management community to facilitate the decision-making environment.**
- **Encourage research in the decision science disciplines.**
- **Share accumulated knowledge with the decision sciences community.**

Figure 1

The PMSS Charter

The PMSS project was conceived in-house in the DSMC Department of Research and Information (DRI) in early FY 1982. In August 1983, a PMSS Directorate was created within DRI to manage this project. The charter for the PMSS Directorate is shown in Figure 1.

PROGRAM MANAGER'S SUPPORT SYSTEM

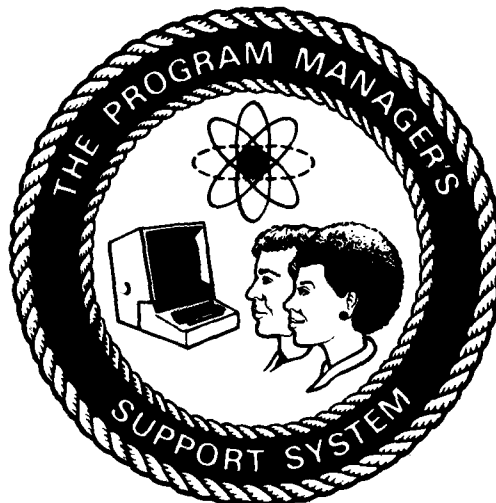


Figure 2

What is the PMSS?

A comprehensive depiction of the PMSS is contained in the PMSS logo shown in Figure 2.

The PMSS will:

- Be an integrated software system, operable on various hardware systems.
- Provide a capability to 1) integrate program management functional areas of responsibility, 2) generate program alternatives and impacts caused by various management actions and technical activities, 3) assess these impacts on the program management responsibilities, and 4) utilize other decision-making support methodologies.
- Support the defense program manager in his/her decision-making process.
- Provide educational tools to facilitate the teaching of program management functions and skills at DSMC and other educational institutions involved with defense systems acquisition program management.

The PMSS will not be:

- The decision-maker.
- A management information system.

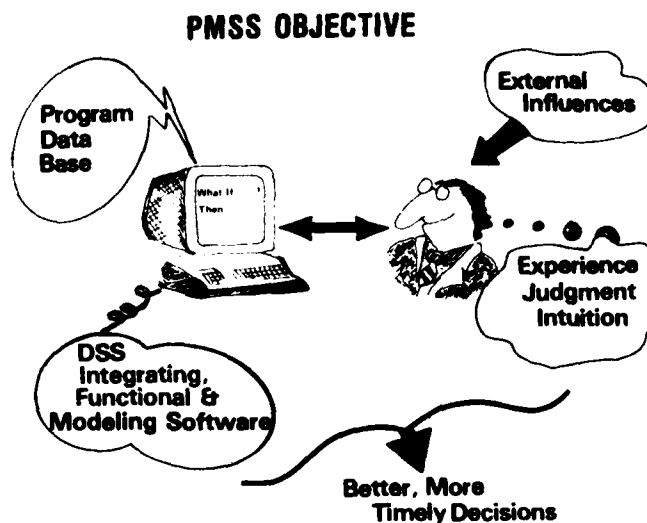


Figure 3

PMSS Concept

The overall PMSS concept is delineated in Figures 3 and 4.

As depicted in Figure 3, the PMSS envisions the interactive use of a small, inexpensive computer system by a manager. The manager, in the context of the PMSS, may be the program manager, or a functional area specialist or manager in the program management office. This would include, for example, the Chief Engineer, the Plans and Programs Officer, the Configuration Manager, the Integrated Logistics Support (ILS) Manager, etc. -- in other words, the first echelon staff of the PMO.

The PMSS will operate on a data base of program information which may be derived from extractions from the project management or supporting activities' MISs, or from direct inputs to the PMSS data base.

Various elements (decision support systems integrating software, functional modules, analytical models of several kinds) provided as part of the PMSS will operate on this data to permit the manager to ask "What if . . . ?" and "Should I . . . ?" questions and to generate alternative courses of action for his/her consideration. By integrating the results with the external influences imposed upon the program and by applying his/her experience, judgment and intuition, the program manager will be able to evaluate the available alternatives and, ultimately, make better and more timely decisions.

DECISION-MAKING INTERACTIONS

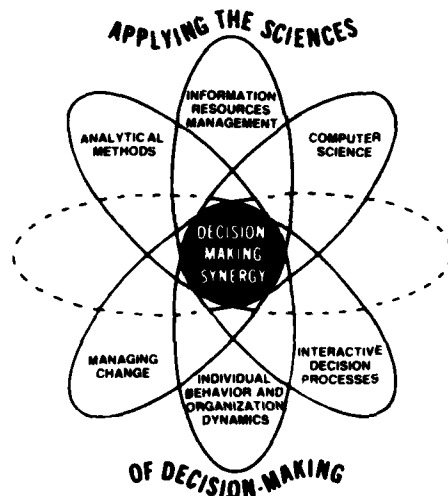


Figure 4

Decision-making Interactions

The second element of the PMSS concept is shown in Figure 4.

Everyone makes decisions. Executing the results of that activity is sometimes an easy task, particularly if the decision only affects the decision-maker. At other times, it is a complex task involving the difficulties of getting other people to act in certain ways.

The primary disciplines that affect the decision-making environment in the modern, technologically oriented world are shown in Figure 4. These disciplines involve some "hard technologies" -- analytical methods and computer science; "soft technologies" -- interactive decision processes and individual behavior and organization dynamics which bring the people into the process; and two "umbrella philosophies" -- information resources management and managing change.

Of more importance than any of these individual disciplines is the impact of their interaction as they function together, and the synergy generated by those interactions. Hence, for a successful implementation of the PMSS, all of the above disciplines, and the interaction of these disciplines, must be appropriately integrated into the PMSS concept.

PMSS DIRECTORATE (DRI-S)

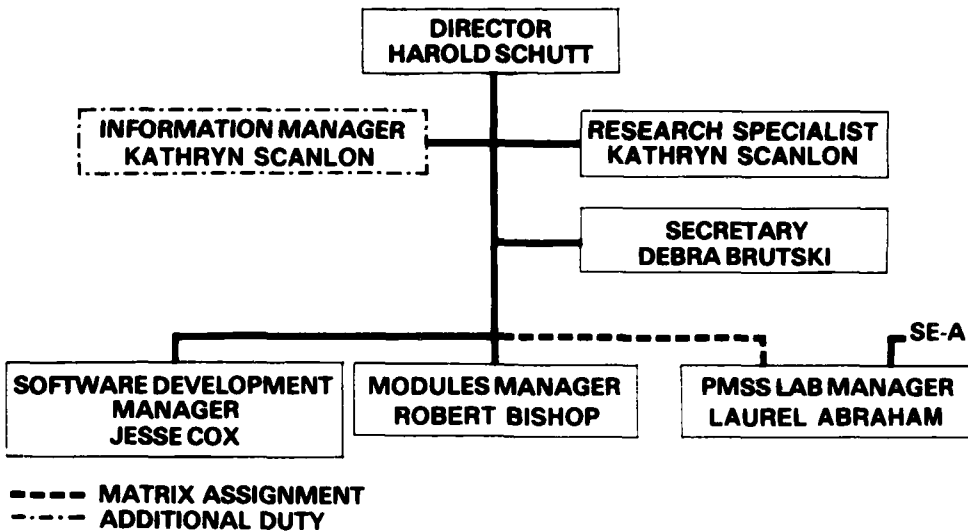


Figure 5

PMSS Organization

The current organization of the PMSS Directorate is shown in Figure 5.

The Software Development Manager is responsible for the overall architecture -- the top-down approach -- which involves the development of the PMSS integrating software and related decision science research projects.

The Modules Manager is responsible for development of functional modules supporting the PMSS. Functional modules form a part of the integrated PMSS and also can be used individually. This represents the bottom-up approach in the PMSS development.

The Research Specialist provides supporting research in the discipline areas affecting the PMSS project.

The Information Manager is responsible for the operations of the DSMC Software Distribution Center and handles all requests for PMSS and DSMC software programs.

The PMSS Laboratory Manager is responsible for operations of the PMSS Laboratory (described later) and provides on-site software evaluation and support.

The PMSS Directorate is developing the PMSS which includes the integrated system and the separate functional modules. As the system and modules are developed, the Directorate provides support in the use, refinement and operation of PMSS.

DEFENSE PROGRAM MANAGER'S RESPONSIBILITIES

- | | |
|---|--------------------------|
| • Functional Areas | • Capabilities |
| • Administrative Management | • Risk Management |
| • Program Overview/Status Management | • Cost Estimating |
| • Project Planning | • Scheduling |
| • POM Development and Budgeting | • Monitoring |
| • Financial Management | |
| • Contracting | |
| • Government Activity Tasking | |
| • Technical Management | |
| • Configuration Management | |
| • Integrated Logistics Support | |
| • Deployment and Operational Status | |

Figure 6

DEFENSE PROGRAM MANAGER'S RESPONSIBILITIES

One of the initial activities of the PMSS project was to conduct a survey of DOD program managers to examine their information requirements and existing information systems. This resulted in the definition of the 11 program management functional areas of responsibility and the need for the four capabilities shown in Figure 6.

This breakout, including all subfunctions falling within each area, represents overall responsibilities of the defense program manager and was used to formulate the baseline for the initial PMSS design.

PMSS UNIQUE CHARACTERISTIC

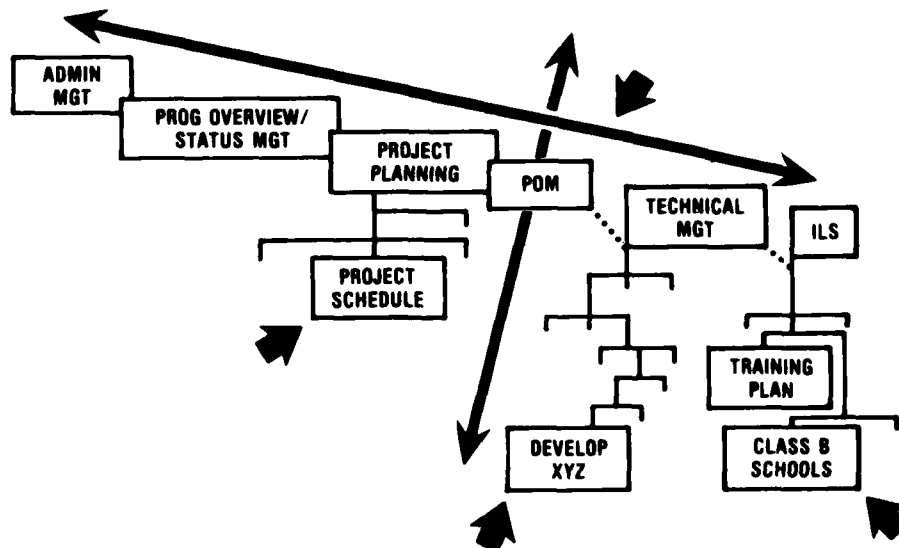


Figure 7

PMSS Unique Characteristic

Many management information systems have been developed to support specific functional areas of responsibility; e.g., budgeting, configuration management, ILS, etc. These MISs support key people in the program management office and assist them to perform their duties.

An integrated decision support system has not yet been developed that extracts and integrates data from all these functional areas in support of the program manager/program management office decision-making process. Yet, the program manager is concerned with all elements of his/her program and needs to see the "big picture" and know the impact of one area on another.

This is the unique characteristic that is a key part of the PMSS concept. As depicted in Figure 7, it is the capability to assess rapidly the impact of program perturbations both across and within all functional areas of program management responsibility as related to the program manager's decision-making areas of interest.

This program impact analysis function -- the integration across and within all areas of concern to the program management office -- is the unique and most important function of PMSS.

PMSS OVERALL APPROACH

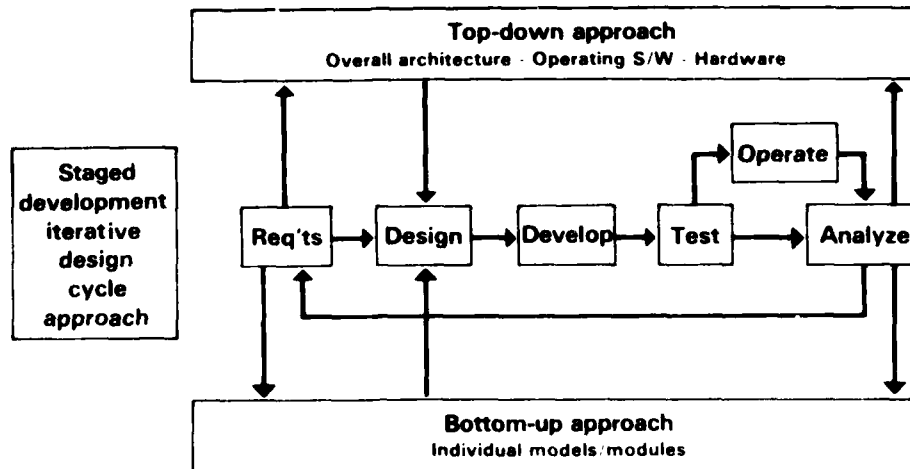


Figure 8

PMSS Overall Approach

Two simultaneous approaches are being employed to develop the PMSS. A top-down approach is providing the overall architecture design -- the boundaries of the system, what can be accomplished and, equally important, what cannot be accomplished. This includes the development of integrating software for the integrated PMSS. A bottom-up approach also is being executed. This concerns development of functional modules which, when integrated together, provide the main PMSS functionality. Figure 8 depicts these two approaches which will be integrated as the PMSS evolves from stage to stage.

In addition, Figure 8 outlines a third key approach being used in the PMSS development process. That is the use of the staged development iterative design cycle approach or, for short, the iterative design cycle.

The iterative design cycle approach is to build a "small" system addressing a portion of the problem, use and test it, re-evaluate the requirements, redesign the system, rebuild it, and repeat this process until the system is as required. The designer/builder and the user work side-by-side to develop the system.

There are many approaches to the development of decision support systems. Some are successful; some are not. In general, however, those that followed the iterative design cycle approach have been successful. Therefore, based on that track record, and the unstructured/semistructured and changing characteristics of the program manager's decision-making processes, this approach is being employed in the development of the PMSS.

The following sections address the design and development of the integrated PMSS and the functional modules. The integrated PMSS will include capabilities, in addition to the integration of the functional areas of program management, to provide convenient support to the user of the PMSS.

The discussion will start with the integrated PMSS.

DEFENSE PMs INFORMATION CATEGORIES

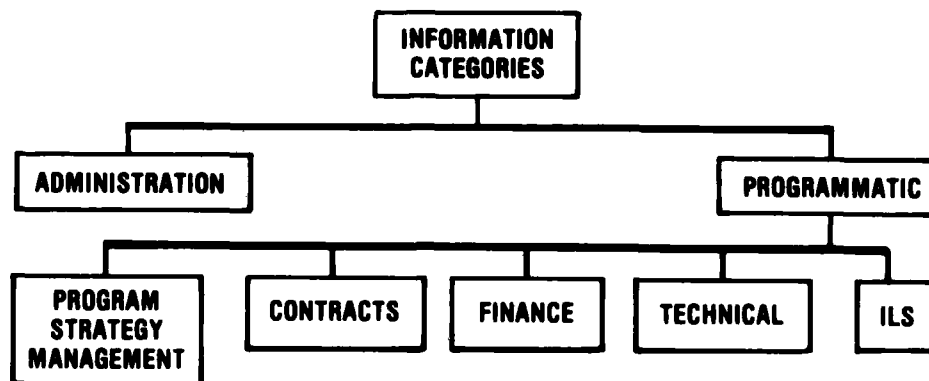


Figure 9

Defense Program Manager's Decision-Making Methodology

As part of the analysis of the program manager's modus operandi, a Program Manager's Action Model was developed to delineate the manner in which a program manager functions. From this analysis evolved the information categories used when solving problems. These categories include administrative information and programmatic information. Administrative information is related to the functioning of the program management office such as personnel, organization and security. Programmatic information is specifically associated with the program and can be further categorized into the areas of program strategy management, contracts, finance, technical, and ILS as shown in Figure 9.

In the analysis of the program manager's functions, it evolved that he/she frequently superimposes a "management perspective template" over the programmatic information when a program decision is required. That program management template (or filter) looks at the information with a view toward how the "current situation" affects the cost, schedule, performance and supportability of the program. These four areas -- cost, schedule, performance and supportability -- establish the uppermost level of requirements for the program manager's decision-making methodology.

A comprehensive analysis of 1) the program manager's responsibilities, 2) needed capabilities, 3) information categories, and 4) management areas affecting the decision-making methodology, provided the baseline for the design of the integrated PMSS.

The integrated PMSS will provide a management tool for the program manager and key staff members to use in the decision-making process. The PMSS tool will, when completed, support the program management process in all stages of program management; that is, birth of the program through concept development, demonstration and validation, full-scale development, production, operations and maintenance and, finally, retirement of the system. The PMSS will support this acquisition process by providing an automated tool to support decision-making activities during the acquisition process. A description of the integrated PMSS is included in the Systems Description portion of this document.

PMSS MODULES DESIGN

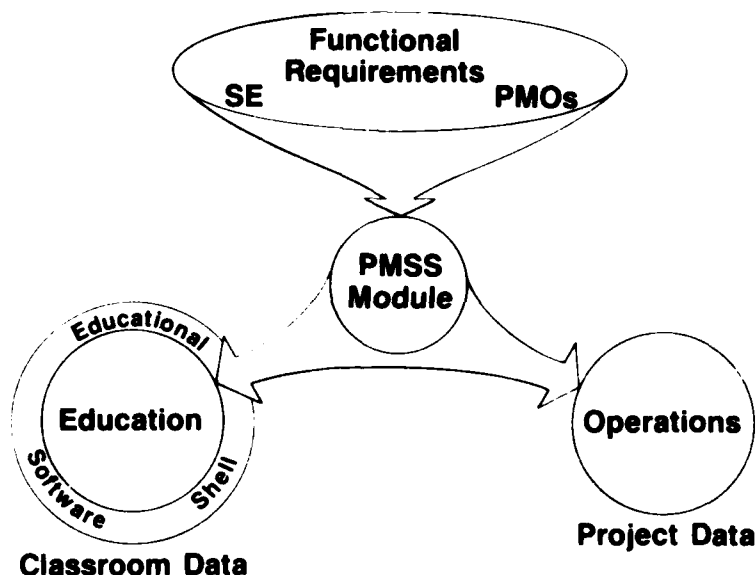


Figure 10

PMSS Modules Design

The PMSS modules, supporting various functions of the program management office, are being designed for dual usage, as shown in Figure 10. Modules will be used in educational environments at DSMC and other DOD educational institutions. Modules used for this purpose may require minor modification for teaching applications. Data appropriate to the local education environment will have to be input for use of the modules in the classroom. The other purpose for the modules is, of course, for operational use in the program management offices. Here a particular program's actual data will provide the data source for operation of the PMSS.

To the maximum extent possible, the desire is that modules designed for these two purposes be alike so that as students move from the classroom to their operational assignments they will see and use the same process in a particular application. Therefore, for the design portion of PMSS module developments, requirements are gathered from the DSMC School of Systems Acquisition Education (SE) and from program management offices. Modules at this stage are called "planned."

PMSS MODULES IMPLEMENTATION

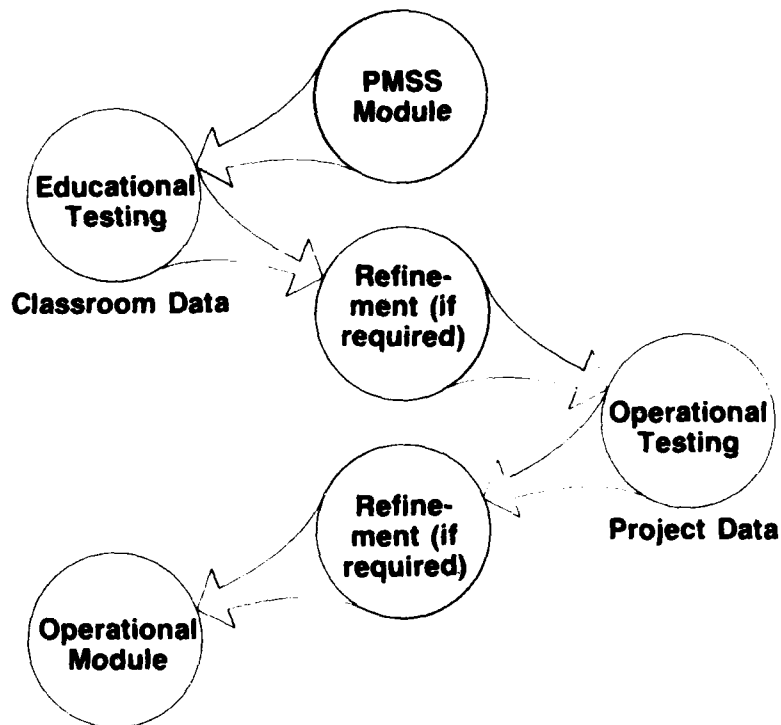


Figure 11

PMSS Modules Implementation

After development, PMSS modules undergo a substantial amount of testing before they are declared "operational." Several program management offices have volunteered to be PMSS test sites. During the development process, the contractor's progress is reviewed through progress reviews and demonstrations which are given to DSMC faculty and representatives from the program management office test sites. Comments and recommendations are fed back into the development process as shown in Figure 11.

When the module is "completed" to the prototype stage, as an initial alpha-test version, it is tested in the classroom and refinements are made, if required. Then, the module is subjected to beta-test field testing and, again, refinements are made if required.

When the module is considered operational, it is given to the PMSS Information Manager for distribution through the DSMC Software Distribution Center.

Further refinements/modifications still can be made, as necessary, to meet users' needs. Changes at this stage normally are funded by the requesting user.

Hence, modules are designated as Operational, Prototype, In-development or Planned.

Summary of Modules

The following table of PMSS modules summarizes their status and purpose. More detailed descriptions are in the Systems Description portion of this document.

The functions that these modules perform will be incorporated into the integrated PMSS when it is completed.

For planned and future module/functions, see the appropriate parts of the Systems Description portion of this document.

- * IBM means IBM PC/XT/AT or compatible and Zenith Z-248.
Zenith means Zenith Z-120 series.
- ** Descriptions of these modules are in the Systems Description portion of this document on the page indicated.

Table 1

(As of October 1987)

Name of Module	Short Name	Brief Purpose	Stage	Equipment*	Availability	Page**
Procurement Strategy Module	PSM	Select a procurement strategy	Prototype	IBM-PC/AT Z-120	Dec '87 Dec '87	34
Schedule and Resource Allocation	SARA	Develop Gantt Chart schedule Do resource allocation	Prototype	IBM-AT Z-120	Dec '88 Feb '88	35
Contract Appraisal System	CAPPS	Monitor contracts	Operational	IBM-PC Z-120 IBM-AT	Now Now Jan '88	36
Schedule Risk Assessment Management	SCRAM	Network development Milestone management Schedule risk assessment	Prototype	IBM-PC/AT Z-120	Dec '87 Dec '87	37
Software Cost Estimating	SWCE	Develop cost estimates for software developments	Operational	IBM-AT (1)	Now	37
Program Office Organization and Staffing	PROS	Develop PMO organization charts, on board counts	Prototype	IBM-PC/AT	Dec '87	38
Government Activity Tasking	GAT	Generate and monitor tasking to government activities	Prototype	IBM-PC/AT	Dec '87	38
Documentation Configuration Control	DOCC	Monitor documentation status	Prototype	IBM-PC/AT	Mar '88	39
Automated Program Planning and Documentation	APPDV	Generation and monitoring of ASP/pMP PS/P FEVP SEVP ILSP RAMP	Prototype	IBM-PC/AT Z-120	Jan '88 Jan '88	40

Table 1 (continued)

Name of Module	Short Name	Brief Purpose	Stage	Equipment *	Availability	Page **
Parametric Cost Estimating	PACE	Conduct parametric cost estimates	Prototype	IBM-PC/AT Z-120	Dec '87 Dec '87	41
TEMP Auditor	TEMP Auditor	Evaluate TEMPs	Prototype	IBM-PC/AT	Dec '87	41
Project Control System	PCS	Conduct PMO financial management	Prototype	IBM-PC/AT (2)	Now	42
Budget Preparation and Execution	BP&E	Develop budgets Monitor progress	Prototype	IBM-PC/AT Z-120	Dec '87 Dec '87	43
Test Issues Management Evaluation	TIME	Conduct pre-TEMP planning	Prototype	IBM-PC/AT	1989	43
Cost Analysis Strategy Assessment	CASA	Conduct LCC analysis	Operational Modified	IBM-PC/AT Z-120 IBM-PC/AT	Now Now Apr '88	44
Venture Evaluation Review Techniques	VERT	Conduct risk analysis	Prototype	IBM-PC/AT Z-120	TBD TBD	45
Quick Cost	Quick Cost	Conduct quantity cost trade-off analysis	Prototype	IBM-PC/AT	May '88	46
Competition Evaluation Module	CEM	Conduct production competition analysis	Operational	IBM-PC/AT	Now	46

(1) Needs Symphony Version 1.1 to run; not provided with module

(2) Needs Lotus 1-2-3 Version 2.0 to run; not provided with module; requires customization per site.

* IBM-PC means IBM-PC, IBM-XT, Z-150, or compatibles

* IBM-AT means IBM-AT, Z-248, or compatibles

* Z-120 means Z-120 (Z-100) only

PMSS PROJECT SCHEDULE

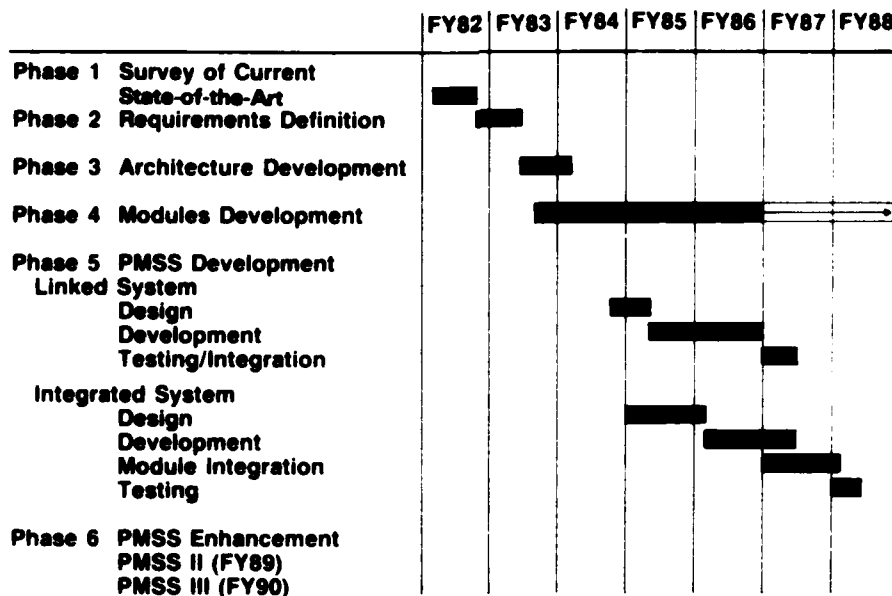


Figure 12

PMSS Project Schedule

The overall project schedule is shown in Figure 12. Modules are being developed and initial products from these developments are being delivered, as described in the previous sections. Program management offices are invited to submit requirements for new, needed software support; to send requests for development of the planned modules; or to send requests for refinements of prototype or operational modules. Descriptions of these modules are included in the Systems Description portion of this document.

The evaluation of the architecture development contracts resulted in the PMSS Software Development requirements. A multicompany team is developing the linked PMSS system and the fully integrated PMSS system per the schedule shown above. Prototype versions of these systems are tested as they are developed. A prototype of the integrated system will be available for program management office testing about March 1987. The final, fully integrated system is scheduled to be available in late FY88.

As the system is used, it is expected that enhancements will be required. These are planned for subsequent years.

PMSS IMPLEMENTATION AT DSMC

PROGRAM MANAGERS DECISION SUPPORT CENTER

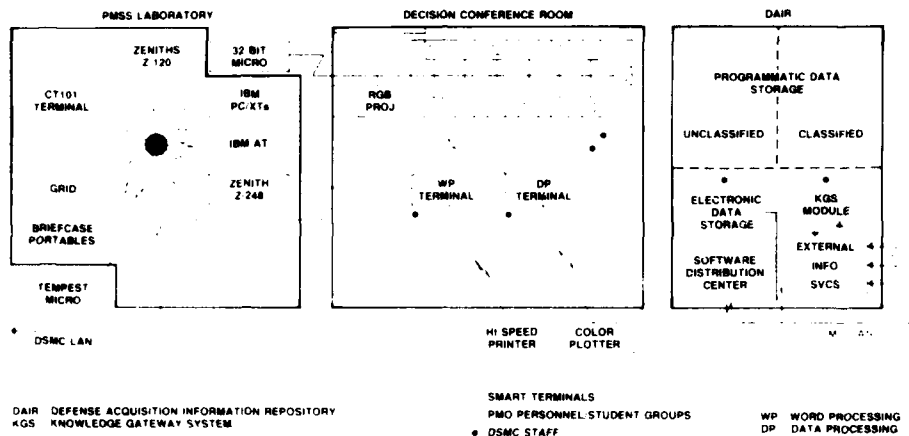


Figure 13

PMSS Implementation at DSMC

The implementation of the PMSS at DSMC will primarily be through the Program Manager's Decision Support Center which comprises three facilities as shown in Figure 13.

A major research objective of the PMSS program is to determine how much of an overall PMSS can be implemented on a stand-alone microcomputer system costing about \$10K to \$15K. Hence, one part of the Decision Support Center is a PMSS Laboratory. The purpose of the laboratory is threefold: first, to test the PMSS concept; second, to have a facility to design, build, debug, test, and operate modules of the PMSS; third, to test the microcomputer capabilities and capacities in the PMSS environment. Standard, off-the-shelf software packages will be tested in the laboratory for application in the PMSS environment.

A second part of the Decision Support Center is the Decision Conference Room. It will be used by student groups to solve classroom exercises or by program managers and their staffs to solve real problems. In either case, users bring the technical content of their problems and exercise them by using the PMSS. They are supported by facilitators assisting in the process portion of problem-solving.

The third part of the Decision Support Center is the Defense Acquisition Information Repository (DAIR). The DAIR is the collection of programmatic data on selected defense system programs that provide the necessary data base for operation of the modules and PMSS.

The PMSS Laboratory has been implemented. A prototype of the Decision Conference Room, called the Automated Classroom (ACR), has been constructed for testing of the concept. The collection of material for the DAIR has been initiated and will continue during the life of this project.

SE-PMSS INTERFACES

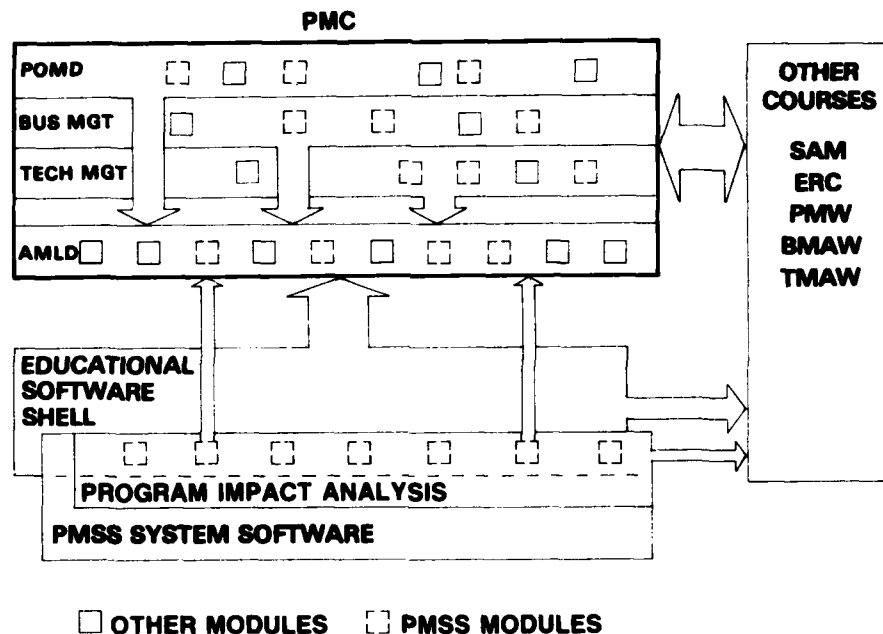


Figure 14

PMSS Use at DSMC

At DSMC, the Program Management Course (PMC) is the primary educational vehicle. Students learn program management knowledges and skills from three departments in the college: Policy and Organization Management, Business Management, and Technical Management. Students integrate and apply these knowledges and skills in the Acquisition Management Laboratory Department (AMLD). In their educational environment, students run the full spectrum from attending lectures to conducting exercises.

The PMSS modules and integrated system can be used to complement the educational experience by providing a management tool for the student to use to conduct his/her classroom and laboratory exercises. The PMSS provides the software tool to aid the student in the solution of the management problem. In that respect, the DSMC student is using the PMSS in the same way he/she will use PMSS as an action officer in a program management office or other activity of the acquisition community.

The PMC course is being revised to teach program management material in two segments. The first segment is a 6-week program concerning fundamental knowledge and skills of program management. The second segment, lasting 14 weeks, places the student in a simulated program management office environment and teaches how to do program management by having him/her progress through the life cycle of a simulated project.

The PMSS is being designed to provide the software management tool to support the simulated program management project. The PMSS can be used in the other DSMC courses in the same manner as shown in Figure 14.

PMSS PROGRAM OBJECTIVES

- **Modules/System for Classroom Use**
- **Modules/System for Operational Use**
- **PMSS Support**
 - **Software Packages**
 - **User/Programmer Manuals**
 - **Installation Assistance**
 - **Consulting**
- **PMSS Software Distribution**
 - **Maintain CM for Software**

Figure 15

PMSS Program Objectives

The four basic objectives of the PMSS program are shown in Figure 15.

The first objective is to develop modules and the PMSS system for classroom use in PMC and other DSMC courses, on campus and at DSMC regional sites.

The second objective is to develop modules and the PMSS system for use in program management offices and other activities of the defense acquisition community. As a part of the PMSS development process, program management office test-sites have been selected to evaluate the modules before they are designated as operational modules.

The third objective is to develop materials necessary for a program management office to implement the PMSS as it is developed in the future. These include:

-- The software packages themselves, developed to operate on the current standard hardware configurations in the military services. These include IBM PC/XT/AT, Zenith Z-120 and Z-248 systems. For other special configurations, users should contact the PMSS Directorate.

-- Complete user and programmer documentation. User manuals are provided with every software package. Programmer manuals are distributed only to those activities working on the applications. If a user is interested in working on a module for another application, contact the PMSS Directorate.

-- Installation assistance is available if required. The PMSS Directorate attempts to develop the user manuals so this is usually not necessary; however, sometimes assistance is required. In this regard, users finding problems with the documentation are asked to contact the PMSS Directorate.

-- Finally, consulting on the PMSS and the capabilities it provides.

The fourth objective of the PMSS program is to establish the necessary capabilities for DSMC to perform configuration manager functions for the PMSS in order to maintain control of the software and to ensure that all users can obtain maximum utility of the PMSS software. Recommendations for changes and improvements to the PMSS from all sources are welcomed and solicited. The DSMC has established a Software Distribution Center to maintain configuration control of the system to ensure maximum usefulness for all who need the system. The manager of the DSMC Software Distribution Center should be contacted for these items.

In Summary

The above discussion presents an executive overview of the PMSS. The ultimate purpose of the PMSS is to aid the program manager in the effective and efficient management of his/her project through education and direct use. Therefore, we welcome your comments and suggestions.

Please sent them to:

Mr. Harold J. Schutt
Director, PMSS Directorate (DRI-S)
Defense Systems Management College
Fort Belvoir, Virginia 22060-5426

or call us at (703) 664-4795 or 664-5783, or AUTOVON 354-4795
or 354-5783.

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**SYSTEMS DESCRIPTION
OF THE
PROGRAM MANAGER'S SUPPORT SYSTEM (PMSS)**

PMSS FUNCTIONS

- Program Impact Analysis
- Program Overview/Status
- Functional Analysis/Support
- Management Aids/Tools
- Executive Support

Figure 16

PMSS Functions

In order to support the decision-making efforts of the program manager and his/her staff, the PMSS must provide the five basic functions listed in Figure 16. Program Impact Analysis is deemed to be the most important; it is the capability to assess rapidly the impact of program perturbations both across and within the areas of interest to the program manager/program management office. This capability will assist the program manager in responding to unplanned changes and also can be used for program planning by testing possible program conditions and analyzing the potential resultant impacts derived by this PMSS function. This function assists with the "What if....?" questions.

The Program Overview/Status function provides the capability to determine easily and quickly the program status based on the six information categories described previously. Red, yellow and green indications are given for each of the categories based on criteria that is adjustable by the program manager. This function also allows the program manager to pursue a category of interest through several levels of a hierarchical data structure, each providing status indications, leading to a data summary sheet modeled after standard reporting formats.

The Functional Analysis/Support function is a set of modules that will give the program manager and staff additional capabilities related to specific functional areas. Three types of support will be provided by this function. The first is the

capability to process functional data in specialized ways to provide the program manager better insight into program performance, more complete planning tools, and better means to identify and analyze problem areas.

Another type of support provided by the functional modules will assist in identifying and analyzing the implications of applying various acquisition management procedures (e.g., multiyear procurement, preplanned product improvement), give guidance for development of applications, provide background information such as examples and "lessons learned," test the program for applicability, and provide step-by-step procedures for implementation of the application. This capability supports "Should I . . . ?" questions.

The third type of support includes program management aids that provide administrative type assistance for the program management office but do not analyze program data. These include modules that present checklists of various procedures and requirements, assess office organization and personnel status, and provide standard report generation.

The Management Aids/Tools function includes generic software packages like spreadsheets, word processors and briefing aids that allow the user to create specific decision and management aids unique to specific needs.

Executive Support functions provide assistance with routine tasks each program manager performs. These functions include capabilities such as a calendar, electronic mail, travel plans, telephone list and dialer, action-item lists, and suspense items lists.

PMSS SOFTWARE DEVELOPMENT CONTRACT EVOLUTIONARY PHASES

- **Operational PMSS Definitization**
- **PMSS Software Development**
 - 3 Tasks
- **Functional Module Development**
 - 2 Tasks
- **Program Impact/Functional Module Integration**
 - 3 Tasks
- **Final Test and Demonstration**

Figure 17

PMSS Software Development Contract

In FY 1983, three parallel and competitively-awarded contracts were executed to develop the PMSS architecture. Results were consolidated by DSMC into the requirements for the software development contract for the integrated PMSS.

On 28 September 1984, a competitive contract was awarded for the PMSS software development. It contains ten tasks to be performed over 3½ years, representing various evolutionary phases as shown in Figure 17. Three tasks concentrate on the PMSS software including the basic architecture, user interface, system executive, external interface, resource and command manager, and decision-support kernel.

Two additional tasks concentrate on the development of specific functional modules while three more tasks include program impact analysis development and functional module integration. This effort is aimed specifically at helping a program manager set up a new program, ensuring that all phases of the acquisition process are addressed. It also will assist a newly reporting program manager re-evaluate his/her program, no matter what the current phase is. The remaining two tasks include a system definitization effort, and the final test and demonstration.

As the contract progresses, emphasis will be placed on two key areas -- the program impact analysis and the user interface. Artificial intelligence techniques will be explored with the goal of developing an effective and efficient life-cycle analysis capability, and a user interface adaptable to specific users.

PMSS SOFTWARE ARCHITECTURE

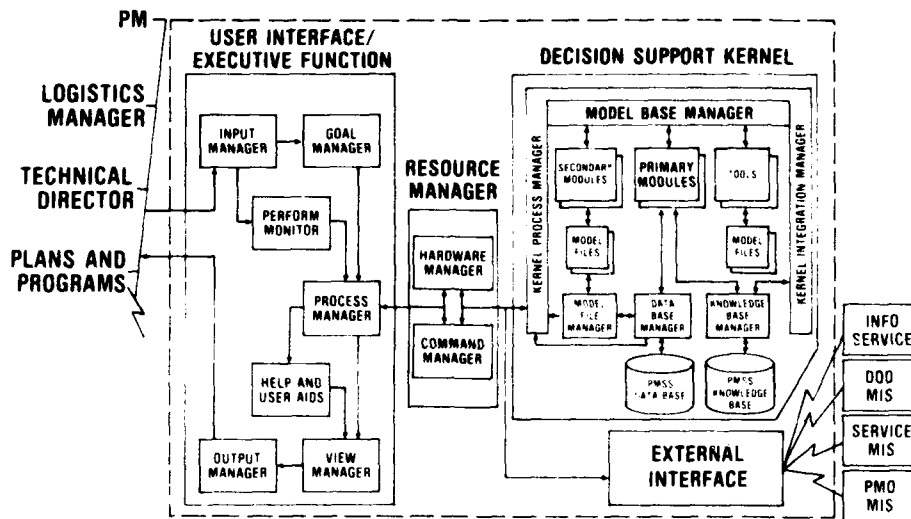


Figure 18

PMSS Software Architecture

The PMSS is being designed along the lines of a decision support system (DSS) with the three major elements of a user interface module, a model base and a data base. The PMSS software architecture, delineated in Figure 18, consists of a user interface/executive module, a resource manager, a decision support kernel and an external interface module.

The PMSS user will interface with the PMSS through the user interface/executive module which includes seven submodules: input manager, goal manager, performance monitor, user interface process manager, view manager, output manager, and help and user aids. The resource manager, acting as interface between the user interface/executive, decision support kernel and external interface, coordinates and allocates hardware resources and builds actual system commands.

The Decision Support Kernel is the heart of the PMSS. It contains a kernel process manager, kernel integration manager, model base manager which interfaces with all of the PMSS functional modules, module file manager, knowledge base manager, data base manager, module files, and the PMSS data and knowledge bases. The application of artificial intelligence in the decision support kernel to support the program impact analysis function is being investigated.

The external interface provides the program manager the capability to query other automated systems ranging from the program management office's own management information system to external information services such as Defense Technical Information Center (DTIC), CompuServe, etc. This module will contain a knowledge gateway system (KGS) to translate the user's needs into the proper protocol and query the appropriate databases/systems so the user will not have to learn about each. The external interface also may be used to update the PMSS database from the management information systems used by the program management office.

Next, PMSS functional modules will be discussed.

FY83 PMSS MODULES

- **Procurement Strategy Module (PSM)**
- **Schedule and Resource Allocation (SARA)**

Figure 19

FY83 PMSS Modules

Concurrent with the top-down activity related to the architecture development, the bottom-up approach, or module development effort, has also been progressing. In FY83, two PMSS module developments, as shown in Figure 19, were initiated. The purpose and status of each follows.

Procurement Strategy Module (PSM)

The purpose of the Procurement Strategy Module (PSM) is to assist acquisition management personnel in selecting a procurement strategy that can be pursued during each phase of a specific defense system's life cycle. For example, the module provides the user with an indication of the time and cost implications of pursuing a strategy of prototyping a complete system in the demonstration/validation phase as opposed to just building subsystems. Likewise, the time and cost implications of using multiple sources, versus a single source in the development phase, is addressed.

The user inputs specific program parameters and the module compares these with a historical data base of real program data to identify the most attractive strategies for the weapons system under development.

The PSM operates on an IBM PC/XT and a Zenith 120 series microcomputer and should run on most MS-DOS based microcomputers. The program is written in FORTRAN 77 and does not require color or graphics. The module is a prototype module.

At the present time, the data base consists of only two categories of defense systems -- tactical missiles and electronic subsystems. The opportunity exists to expand the data base for other types of systems. Military services and the acquisition community interested in expanding the data base into other categories (e.g., aircraft, tracked vehicles, ship systems, etc.) should contact the PMSS Directorate at DSMC.

Schedule and Resource Allocation (SARA) Module

The Army Institute of Research for Management Information and Communications/Computer Sciences (AIRMICS) developed an Automated Program Management System (APMS) for software development managers. The initial system operated on a minicomputer with a high-resolution color microcomputer as a front-end. In conjunction with DSMC, the APMS project has been expanded to provide a resource allocation and program scheduling capability and has been programmed to operate on an IBM XT with a high-resolution color monitor and special color graphics board. This program has been renamed the SARA module which is a planning tool to assist managers in the initial development of, and subsequently making changes to, a program schedule. A work-breakdown schedule is entered, resource categories are designated (up to 13 can be color coded), resource limitations are entered, and the program schedule is constructed in a Gantt Chart format. Resource totals are compared with limitations, category by category, and the schedule is revised, manually or by the machine as the user desires, until an optimum schedule is developed.

The SARA program for use on an IBM XT is in the prototype stage and is hardware limited due to the special color graphics board that is required to provide the resolution necessary for maximum system usefulness. New color graphics boards are available to eliminate this hardware constraint. Funding is required to test these color boards to find an appropriate one, the required high-resolution color monitor, and adjust the code for use with the new color board/monitor. In addition, SARA on the IBM XT is a very slow system because of the language it is written in the amount of input/output required. To make the IBM XT version of SARA acceptable to a user it must be recoded in "C." Funding for the recoding is required to make the module function as a stand-alone IBM XT version module.

The DSMC is not planning further development effort on the IBM version of SARA. This program will be folded onto a proposed program called Program Integrated Planning System (PIPS). See the proposed PMSS modules section for information on PIPS.

A version of SARA, with reduced capabilities, is being developed to work on a Zenith Z-120 system. The prototype of the Zenith version of SARA should be available at DSMC about April 1987.

The estimated costs for modifying the IBM XT version of SARA are: \$15K for the new color board and monitor, and the recoding thereof, and \$50K for rewriting the program in "C" to make it run with an acceptable response time.

FY84 PMSS MODULES

- **Contract Appraisal System (CAPPS)**
(Formerly Contractor Performance Reporting)
- **Schedule Risk Assessment Management (SCRAM)**
(Formerly Risk Management/Schedule Management)
- **Software Cost Estimating (SWCE)**
- **Program Office Organization & Staffing (PROS)**
- **Government Activity Tasking (GAT)**
- **Documentation Configuration Control (DOCC)**

Figure 20

FY84 PMSS Modules

In FY84, module development efforts as shown in Figure 20 were initiated. The purpose and status of each follows.

Contract Appraisal System (CAPPS) Module

The basic purpose of the CAPPS module is to facilitate the use of Contractor Performance Measurement (CPM) data for management decision-making. Numerous computer programs are available to assist the analyst in reviewing CPM data, calculating indices and plotting trends. However, there is a need for an aid to present this data in a manner that truly supports the decision-making of defense program management personnel and others who are not CPM data analysts.

The CAPPS is a software program, with accompanying user documentation, for a module designed to help managers keep abreast of, and quantify, project contract status. The CAPPS provides an analysis of Cost Performance Report (CPR) or Cost/Schedule Status Report (CSSR) data provided by contractors, readily accommodating any work-breakdown structure or functional organization associated with a particular project. The module provides performance "exception" indicators, interpretations of the data presented, and automated trend analysis. The CAPPS makes maximum use of color and graphical presentations and has such features as zoom (to show more clearly the last six months of data) and full explanation screens.

The CAPPS program is available in two versions, one for the IBM PC/XT and one for the Zenith Z-120. The IBM version will run on several compatibles but requires color graphics. The Z-120 version requires that color chips be installed. The module is operational and Version 1.10 has been distributed.

In FY 86, an enhancement to the CAPPS module, resulting in Version 2.00 of CAPPS, was developed. The enhancements added include development of additional analysis capabilities, mathematical checks on new data, key elements based on lowest WBS element, and incorporation of actual data in the explain screens. In addition, monochrome and tabular data versions are included. It is scheduled to be released in April 1987.

Schedule Risk Assessment Management (SCRAM) Module

This PMSS module will provide defense program management personnel with the capabilities of 1) developing network schedules of their program activities, 2) performing schedule management functions (such as determining program status, identifying critical activities, developing work-arounds, etc.) and 3) conducting top-level schedule risk assessments. As a risk management tool, the module will provide estimates of the likelihood of achieving specified program milestones and will assist the manager in developing alternative plans that do meet program objectives. The module is intended for use directly by the manager within the program management office and will provide reports that directly support his/her decision-making.

This module, in the prototype stage, is available. It operates on an IBM-PC/XT/AT (with graphics board) and the Zenith Z-120. Beta-Test version 3.00 will be available from DSMC about April 1987.

The DSMC is not planning further development effort on the SCRAM module. This program will be folded into a proposed program called Program Integrated Planning System (PIPS). See the proposed PMSS modules section for information on PIPS.

Software Cost Estimating (SWCE) Module

As part of the PMSS Software Development contract, certain modules were identified to be developed to ensure availability for PMSS testing. The first one completed is the Software Cost Estimating (SWCE) module. The original module

was developed for a Navy program management office. The original module, developed as a template on LOTUS 1-2-3, is an application of the Constructive Cost Model (COCOMO) developed by B. Boehm. The DSMC SWCE module, a modification of the Navy module, was developed as a template on Symphony to improve its user friendliness. The user can enter or modify several categories of lines of code and any of 14 cost drivers with results shown in terms of estimated effort in thousands of man-hours and estimated development time in months. Two versions are available, one without graphics, and one that graphs sensitivity curves of the cost drivers and comparisons of several user developed "what if" data bases.

The SWCE module is in the prototype stage and is available. It requires Symphony version 1.10 and should run on any system compatible with Symphony. The graphics version requires an Enhanced Graphics Adapter.

Program Office Organization and Staffing (PROS) Module

The Program Office Organization and Staffing (PROS) module is being developed under the overall PMSS Software Development contract. The purpose of this module is to assist with organization and staffing functions which always seem to be time consuming. It is being designed to allow easy development of the program management office's organization chart and to enter various attributes relative to the positions within the organization. Analyses can be conducted on these attributes, such as turnover rates or travel trends, and results presented either through highlighted organization charts or standard graphic charts.

This module is in development and is being designed to run on an IBM-PC/XT/AT or Zenith Z-248. It will require a graphics card. The prototype version is scheduled for completion about March 1987 with the operational version to be completed about July 1987.

Government Activity Tasking (GAT) Module

The Government Activity Tasking (GAT) module is being designed to assist with the planning, budgeting and tracking of tasks assigned to government activities (as opposed to contracting) such as another service, laboratory, field activity, or another agency. Funding of such tasks is usually accomplished via

a Military Interdepartmental Procurement Request (MIPR), Project Order (PO), or Work Request (WR). This module will allow correlation of tasks by funding citation, project, activity, or task.

The GAT is in development. It is being designed to run on an IBM-PC/XT/AT or Zenith Z-248. The prototype version is scheduled for completion about March 1987 with the operational version to be completed about July 1987.

Documentation Configuration Control (DOCC) Module

The Documentation Configuration Control (DOCC) module is a companion to the Automated Program Planning and Documentation module. Its purpose is to determine quickly what parts of which planning documents will require changes as a result of program perturbations. It can be used to plan and estimate workload and costs associated with changes by defining documentation requirements, and it will help ensure consistency among program documentation. The module operates by scanning either the documents or special outlines based on search strategies developed by the user.

The DOCC is another module being developed under the overall PMSS Software Development contract. It is being designed to run on an IBM-PC/XT/AT or Zenith Z-248. The prototype version is scheduled for completion about March 1987 with the operational version to be completed about July 1987.

FY85 PMSS MODULES

- **Automated Program Planning and Documentation Module (APPDM)**
- **Parametric Cost-Estimating (PACE) Module**
- **TEMP Auditor**
- **PMO Project Control System**

Figure 21

FY 85 PMSS Modules

The PMSS module developments that were initiated in FY85 are shown in Figure 21. The purpose and status of these modules follow.

Automated Program Planning and Documentation Module (APPDM)

The objective of the Program Planning and Documentation Module (APPDM) is to develop a generic software program to assist managers in a program management office with planning activities in all appropriate elements of a defense weapon system acquisition program, and then help create the requisite documentation associated with that element's planning activity. The software program will consist of a main program and attachable program files. Each program file will concern a different element. With this type of structure, new program files can be added to the total program as they are developed. Documentation that can be created with this program include: an Acquisition Strategy Plan/Program Management Plan (ASP/PMP), Production Strategy/Plan (PS/P), Test and Evaluation Master Plan (TEMP), Systems Engineering Management Plan (SEMP), Integrated Logistics Support Plan (ILSP), and Risk Analysis and Management Plan (RAMP).

This software program will aid in the development of the above documents in the following two ways: 1) identify, describe, schedule and provide a means to track the progress of the activities that lead to the creation of these documents and 2) provide boiler plate documents that combine with the user's program summary data to create draft documents. These draft documents can then be easily tailored to fit a particular program's needs.

This module is under development and is designed to run on an IBM-PC/XT and the Zenith Z-120. The initial prototype, including the capability to create the ASP/PMP, PS/P and TEMP, should be ready for testing at DSMC in January 1987. In June 1987, the complete prototype (all six plans capability) is due for delivery to DSMC.

Parametric Cost Estimating (PACE) Module

The objective of this module is to assist managers in a program management office to develop cost estimates for elements of a weapon system and with the conduct of cost trade-off analyses. The user will be able to select a data base from a pre-loaded set for several categories of weapons systems or any other data base devised. Data-base management functions such as input and change or delete will be available, and the user can manipulate the data for analysis, forecasting and graphics. After a cost estimate has been prepared, it can be passed to the Budget Preparation and Execution module through a direct interface.

This module is in development and is designed to run on an IBM-PC/XT and the Zenith Z-120. The prototype should be ready for testing at DSMC in May 1987.

TEMP Auditor Module

The TEMP Auditor module is an expert system to aid a manager in a program management office; an action officer in a component Acquisition Command or Headquarters; an action officer in the Deputy Under Secretary of Defense (Test and Evaluation) Office; or the Office of the Director of Operational Test and Evaluation. The module helps the user evaluate a Test and Evaluation Master Plan (TEMP) after the TEMP has been written. This module development was funded by the Office of the Secretary of Defense.

The TEMP Auditor module is being written using the M1 expert system shell and is designed to run on an IBM XT.

The TEMP Auditor is currently in development. A prototype of this module is available at DSMC for testing.

Project Control System (PCS) Module

The Project Control System is a spreadsheet-based system designed to assist with manipulating, tracking, and presenting financial data for a program office. It contains capabilities for cost estimates and budget plans at the totals level; also, it is broken down to program management office division, appropriation, program element, and line item levels. Cost estimates are calculated in "base year" (or current year) dollars, and "then year" dollars are derived using the inflation index. A financial plan can be produced using an appropriate weighted index resulting in 1977 "base year" dollar figures. Eleven different reports, including a financial plan, POM feeder, and several cost estimates, can be produced. The system can be used for "What if?" exercises.

The Project Control System was developed for a specific program office but can be modified for use by others. It is a "template" system designed to operate on a Zenith Z-150 using Lotus 1-2-3 Version 2.00. It should run on any Lotus 1-2-3 compatible system that uses DOS 2.XX.

This module development was funded by an Air Force program management office. Program management offices that would be interested in "tailoring" this module for use in their offices should contact the PMSS Directorate at DSMC.

FY86 PMSS MODULES

- **Budget Preparation and Execution (BP&E) Module**
- **Test Issues Management Evaluation (TIME)**

Figure 22

FY86 PMSS Modules

The PMSS module developments initiated in FY86 are shown in Figure 22. The purpose and status of each follow.

Budget Preparation and Execution (BP&E) Module

The objective of the Budget Preparation and Execution Module is to provide a simulation and tracking tool to assist managers in a program management office with program budget formulation, monitoring, and decision-making. Included will be a new non-linear production cost function and guidance and suggestions to assist with managing the budget process. The module will lead the user through all of the steps and considerations necessary for preparing and executing a budget, ensure that all appropriate issues are raised, and will support the manager's decision-making process.

This module is in development. It is designed to run on an IBM-PC/XT and the Zenith Z-120. The prototype for this module should be ready for testing at DSMC in May 1987.

Test Issues Management Evaluation (TIME)

The U.S. Army is funding a software development program to develop a Test Issues Management Evaluation (TIME) module. This module will assist the manager in the identification and development of the test issues for a weapons systems program. This module will serve as a precursor to the TEMP generator module in the APPDM.

This module is in the concept definitization part of the in-development stage and will not be completed until FY 1988.

OTHER DSMC SOFTWARE MODULES

- **Cost Analysis Strategy Assessment (CASA) Module**
- **Venture Evaluation Review Technique (VERT) Module**
- **Quick Cost Module**
- **Computer Aided Technical Management Module**
- **Competition Evaluation Module**

Figure 23

Other DSMC Software Modules

Other Directorates/Departments of DSMC develop software modules for use in their classrooms. A brief description of these, listed in Figure 23, is included below. For information on the availability of these modules contact the PMSS Information Manager.

Cost Analysis Strategy Assessment (CASA) Module

The Cost Analysis Strategy Assessment (CASA) module is a computer program that operate on microcomputers. The CASA was derived from Honeywell's Total Resource and Cost Evaluation (TRACE) family of Logistics and Life-Cycle Cost (LCC) Models. The TRACE models are used only on a mainframe computer.

The CASA module can be used for a number of tasks. They include LCC estimates, trade-off analyses, repair-level analyses, production rate and quantity analyses, warranty analyses, spares provisioning, resource projections (e.g., manpower, support equipment), risk and uncertainty analyses, cost driver sensitivity analyses, reliability growth analyses, operational availability analyses, and spares optimization. With these capabilities, the CASA module also can be used in Design to Life Cycle Cost (DTLCC) studies.

The CASA module consists of six separate computer programs. They are:

LCC	--	Life cycle cost analysis program
SENSE	--	LCC sensitivity analysis program
RISKMC	--	Monte Carlo simulation LCC program
RISKOUT	--	Risk analysis program output
LI	--	Program to output a formatted list of inputs for an LCC data file.
EDITCASA	--	An editor program which presents the inputs in menu fashion for building or revising an input file.

The LCC, SENSE, RISKMC, and LI programs use a common LCC input data file. The RISKMC program requires additional data in a "risk input data file." Data files can be easily created and edited. The RISKOUT program uses a "risk/LCC file" that is generated by the RISKMC program.

The CASA module, with documentation, is operational and available. It is written in FORTRAN 77 and runs on an IBM PC/XT/AT, Zenith Z-120, Zenith Z-150, and other MS-DOS based IBM compatibles. An 8087 math co-processor is recommended to improve the speed of operation.

Venture Evaluation Review Techniques (VERT) Module

The Venture Evaluation Review Techniques (VERT) module is a computerized, stochastic network module designed to simulate decision environments under risk. The VERT provides the program manager with accurate risk information in all three risk parameters (time, cost, and performance) simultaneously. In addition, the network methodology of VERT provides a systematic way to analyze the various tasks required to accomplish a project or mission. An automated menu-driven editor is being developed to make inputs easy. The VERT is being down-sized to run on an IBM or Zenith Z-120 with 512K memory. An 8087 math co-processor is recommended. The module, with documentation, should be available in June 1987.

Quick Cost Module

This module is a computer program designed to respond quickly to the budget question: "What is the impact if we cut your production rate from 500/year to 300/year?" The module shows quantity/rate relationship and the impacts of stretch-outs and inflation changes. It should be used as strategies are considered for splitting buys or changing influences that will impact first unit cost and/or learning curves. It operates on the Zenith Z-120 series and IBM PC and compatible microcomputers with 128K, or larger, RAM. The module is written in FORTRAN and BASIC. The model now exists in a raw state. No funds are available to make it user friendly, to control or structure outputs, and to create user documentation.

Funds of approximately \$20K are needed to make the model user friendly with menu-driven operations and "soft fail" error recovery.

Computer Aided Technical Management Module

This module is a computer program using LOTUS 1-2-3 that has been developed to illustrate design trade-offs. Design choices for an example avionics component include three types of technology, three levels of quality, three types of packaging, and two types of design for maintainability. Weight, volume, and reliability can be varied and the program will re-calculate life-cycle cost. These calculations consider logistic factors such as maintenance equipment, skills and training. The program interacts in near real time to variations in the parameters by printing out yearly and life-cycle costs for item production, spares, and support. It will run on any hardware that supports LOTUS 1-2-3.

Competition Evaluation Module (CEM)

The computerized Competition Evaluation Module (CEM) is one example of several available analytical tools to help decision-makers determine the economics of using production competition. It compares the benefits with the costs of using a competitive production strategy. The module is a mechanism for keeping track of a large number of variables and assumptions, and for performing sensitivity analysis on those variables.

This particular module uses standard progress curve theory as a starting point for analysis. The methodology on which the module is based assumes two changes occur to an initial producer's progress curve when competition is introduced. It assumes the first change to be a downward shift in the curve due to the initial product's price reduction when competition is introduced. It assumes the second change to be a continuing steepening downward, or rotation, of the curve as the initial producer continues to reduce prices more than if competition had not been introduced. The module balances these positive assumptions against the expected cost of establishing production competition -- the progress curve and rate penalties caused by splitting production between two or more sources.

The module is not a "crystal ball" for projecting positive or negative aspects of production competition other than those that can be quantified. It is not a sophisticated tool for making precise statistical projections because the existing data base on production competition is small and of uncertain validity. The module, however, provides a means to work around the data-base problem by facilitating extensive sensitivity analysis. The module performs calculations based on numbers entered by you as the user. The model is operational and will run on the IBM PC/XT and Zenith Z-120 series microcomputers.

OTHER PMSS RESEARCH EFFORTS

- **Decision Styles/Information Usage Research**
- **DSS Bibliography Retrieval System**

Figure 24

OTHER PMSS RESEARCH EFFORTS

The PMSS Directorate also conducts "basic research" in areas which support the PMSS project. Some of these efforts, as listed in Figure 24, are defined below.

Decision Styles/Information Usage Research

The Decision Styles/Information Usage research is related to the development of the PMSS user interface. The goal is to develop more efficient and effective man-machine interfaces by determining correlations among different types of people, tasks, and information format preferences, and then providing a means of adjusting the system's input/output features so that information is presented in an optimum format for the particular user and task.

As part of this research, a generic Decision Styles Inventory instrument, which identifies a person's decision style, has been validated. Two additional instruments, a Values Inventory and an Organization Culture, have been prototyped and tested. These instruments help determine the basis for a person's decision style and the organizational factors affecting it. The Decision Styles Inventory instrument is being modified to represent the DOD program management environment.

A software program has been developed which allows the instruments to be taken on-screen, demographics collected, data stored, and results printed out. These instruments can be used for organizational effectiveness studies and assigning tasks. The program is designed to run on an IBM-PC/XT/AT or compatible and will be available about March 1987.

Further research, currently unfunded, is required to complete the correlations needed. This research includes conducting controlled tests with a large number of subjects and analyzing the results.

Estimated cost is \$150K.

DSS Bibliography Retrieval System

A DSS Bibliography Retrieval System has been developed to provide an automated, selectable-search, sortable bibliography of information on decision support systems books, articles and literature. The data base now consists of about 1,600 items.

People interested in this topic area are encouraged to send in DSS bibliography information to help us maintain the data base. In exchange for information to be entered in the system, a search will be run for you.

PLANNED PMSS EFFORTS

- Program Integrated Planning System (PIPS)
- Procurement Package Generator
- Acquisition Manager's Assistant
- Use of PCs in Program Management
- Decision Support Systems Conference
- Decision Support Systems Course
- Decision Support Systems Research Projects
- Enhanced Acquisition Expert Systems
- Applications of Artificial Intelligence to Program Management
- Software Evaluation Methodology for Expert Systems Development Tools

Figure 25

Planned PMSS Efforts

Some of the module developments and PMSS efforts that are planned, but currently unfunded, as listed in Figure 25, follow. If your office has an interest in these modules/efforts contact the Director of the PMSS Directorate at DSMC.

Program Integrated Planning System (PIPS)

The program management office planning process comprises many steps to define systems and create supporting documentation. The PIPS will assist the program management office by automation of these steps, which can be accessed sequentially or in random order.

Some steps (functions) will be extracted from existing code in CSNAS (Computer Supported Network Analysis System -- a software program developed by the Air Force Acquisition Logistics Center), SARA (Schedule and Resource Allocation Module), and SCRAM (Schedule Risk Assessment Management Module). Calls will be made to other models such as the Quick Cost model and VERT model, the Budget Preparation and Execution (BP&E) Module, the Program Overview being developed for PMSS, and the Executive Information Display System (EIDS) developed by the Naval Air Test Center. Planned functions in PIPS, and the planned sources, include:

PIPS Steps (Functions)

<u>Step/Function</u>	<u>Source</u>
1. Develop a complete project work breakdown structure (WBS). -- From MIL-STD 881A, as revised, tailored to specific project. -- From scratch.	CSNAS has one WBS program, PACE and SARA have WBS capabilities
2. Define Task Statements for small, medium and large project.	New effort
3. Generate a Network Schedule. -- From model networks by acquisition phases. -- From scratch	SCRAM
4. Develop Gantt Chart time schedule.	CSNAS/SARA
5. Assign Resource (dollar, manpower) limitations.	SARA
6. Adjust schedule to fit resource limitations.	SARA
7. Conduct time-cost trade-off analysis.	Quick Cost
8. Conduct Schedule Risk Analysis.	SCRAM
9. Conduct Cost Risk Analysis.	Quick Cost
10. Conduct Technical, Cost and Schedule Risk Analysis.	VERT
11. Readjust schedule as necessary, by iterating above steps.	
12. Develop budgets.	Budget Preparation and Execution Module
13. Develop Milestone Charts. -- Summary Charts for Management -- Detailed Charts for Tasks	CSNAS/SCRAM
14. (Issue contracts -- not a part of PIPS.)	
15. Track progress.	Program Overview
16. Prepare Reports and Graphical Outputs.	EIDS
17. Iterate as appropriate.	

Estimated cost is \$200K.

Procurement Package Generator

There are several procurement package (RFP, Specification, SOW, CDRL, etc.) generators in military organizations (CGADS at AFSC/ESD, TEMSE/Docwriter at AFSC/SD) that run on mainframes and minis. There is one (ADS for EPA) that runs on a microcomputer (IBM-XT). In this two-phase project, it is proposed to: 1) in phase 1, develop a defense department procurement package generator by an integration and recoding of the existing government owned packages that will run on a PC (IBM-XT/AT, Z-120, and Z-248); and 2) in phase 2, develop an expert system front-end for such a package.

Estimated costs are \$35K for phase 1 and \$100K for phase 2.

Acquisition Manager's Assistant (AMA)

The Acquisition Manager's Assistant (AMA), a prototype application developed within a non-procedural specification environment, is a software program which combines the most recent ideas in software engineering and those of artificial intelligence. The AMA, which is in the development stage, demonstrates the use of this new technology in government acquisition management, specifically the acquisition of defense computer software for the Navy.

The AMA prototype system is designed to demonstrate the feasibility of automating the software acquisition process by providing the acquisition manager with a microcomputer-based workstation which provides access to expert knowledge and automated management tools. These tools are provided in the form of an integrated software package which allows the acquisition manager to plan and schedule activities prior to contract award and to plan and schedule management of software development after contract award. In addition to providing this support on-line, the AMA also uses expert knowledge to aid in selecting and tailoring much of the written documentation required in managing both acquisition and application development.

The estimated cost to complete the AMA effort from a limited prototype model to an operationally usable model is \$95K. Further refinements could be made to the AMA module to enhance provided capabilities. Contact the PMSS Directorate for details.

Use of PCs in Program Management

A high percentage of DSMC students and personnel in program management offices are not computer literate and do not know how to utilize computers effectively for program management functions. The end-point in this effort is to develop a short course on the use of PCs for program management. Development of a short course in FY 88 is planned. As an interim step in FY 87, there is a proposal for a DSMC faculty/program management office conference on uses of PCs in program management to identify where and how PCs are being used in program management offices, what commercial or custom-built programs are being used, and what the requirements for this area are. After the conference, a collection of relevant information could be assembled and a short (one-week or longer, as appropriate) course could be created to teach the use of PCs in program management, and how to use relevant DSMC/program management office software packages.

Estimated costs are \$10K in FY87 and \$100K in FY88.

Decision Support Systems Conference

The initiatives developed in the new DSMC Strategic Planning process include the establishment of a center for decision support systems (DSS) at DSMC. In support of this effort, it is proposed to have an invited participant conference of DSS experts. The experts would review the current state-of-the-art in DSS technology, discuss applications of DSS to program management, outline methodologies for development and implementation of DSS in program management, and identify needed research for applications of DSS to program management.

Estimated cost is \$40K.

Decision Support Systems Course

In support of the center for decision support systems (DSS) effort, it is proposed to create a short course on decision support systems for program management.

Estimated cost is \$200K.

Decision Support Systems Research Projects

Also in support of the center for decision support system (DSS) effort, research is needed in correlation of decision methods with program management and other DSS areas. In addition, a DSS conference (see separate item) is planned which would identify new areas of needed research for applications of DSS to program management. This effort is to provide a planning wedge of funds for the identified research.

Estimated cost is \$100K.

Enhanced Acquisition Expert System

The Navy funded a small project to develop a demonstration Acquisition Expert System (AES) to prove the feasibility and practicality of applying expert systems technology to the acquisition strategy planning problem. The demo AES consists of more than 60 rules and 11 frame data structures, and it runs on an IBM-PC. The Full Scale Engineering Development (FSED) phase for a tactical missile system was used as the test case in the demo AES. As a part of that effort, an expert system development tool called KBIT (Knowledge Base Implementation Tools), a knowledge shell, was developed. The purpose of this project is to enhance the AES to be a more useful tool for DSMC and program management offices for the planning of weapon systems acquisition strategies. This is planned as a two-phase project. One of the efforts to be done in Phase I is the development of a transportable version of KBIT, probably programmed in "C," to provide DSMC and DOD program management offices unlimited copies of KBIT for the development of desired expert systems. Another effort in Phase I is to expand AES from the FSED phase to the production phase. This will provide a prototype AES for the production phase of acquisition planning. In Phase II of this effort, the current FSED phase test case knowledge base will be expanded and linked conceptually to the production phase AES. The output of Phase II will be an enhanced AES and a fully developed KBIT.

Estimated Costs are \$226K for Phase I and \$148K for Phase II.

Applications of Artificial Intelligence to Program Management

In FY86, a Forum on Artificial Intelligence in Management (FAIM '86) was held to identify areas in which AI could be applied to management. In FY87, it is proposed to hold a 2-3 day workshop where 8-10 program managers and 4-5 members of the DSMC SE faculty would present specific problems from their program management offices/classrooms at the initial session. The remainder of the workshop would concern development of solutions to the problems/needs of the classroom by the application of AI tools and techniques. Attendance will be by invitation and limited to 50-60 participants. The workshop is planned for late summer/fall of 1987.

Estimated Cost is \$45K.

Software Evaluation Methodology for Expert Systems Development Tools

There are numerous expert systems on the market. In this project, it is proposed to develop a methodology and evaluation criteria for the selection of expert systems for designated applications.

Estimated Cost is \$63K.

IDENTIFIED FUTURE MODULES

- Production Planning
- Contract Management
- SAR Generator
- Initial Spares/Replenishment Spares Planning
- Travel Management
- Administrative Management
- Checklists
- P3I Planning

Figure 26

Identified Future Modules

As part of the PMSS development effort, an extensive analysis was conducted of the functions performed in a program management office. These functions were then reviewed, combined, sorted, and categorized to determine functions that should be included in the PMSS, and which modules would be most appropriate to perform the functions. Approximately 100 functions, such as budget preparation and cost/schedule analysis, resulted.

Although the analysis of functions is a continuous process, the modules listed in Figure 26 have been identified thus far as additional modules to be developed in the future when funding is available. Additional functions that should be included in existing modules, or in modules already under development, have been identified. In some cases, such as the SAR Generator, software developed elsewhere exists and could be integrated into PMSS with little additional effort. For the remaining functions, new module development, or modifications to other modules, will be required. If your office has an interest in these modules/functions, contact the PMSS Directorate at DSMC.

In Summary

This document, with an Executive Overview and Systems Description, was developed to tell you about the PMSS and give you a report on its status and future plans. Your comments and requirements are solicited.

If you have any comments, requirements or questions, please contact:

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