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This report provides a summary of the technical results achieved and the issues encountered during the first quarter and outlines the projected activities for the next quarter.

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INTRODUCTION

This document represents the first quarterly technical report under contract MDA972-92-C-0010 for contracts deliverable item 0002AB.
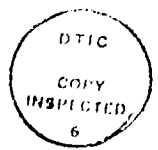
OBJECTIVES

The primary technical objectives of this quarter of the project were to:
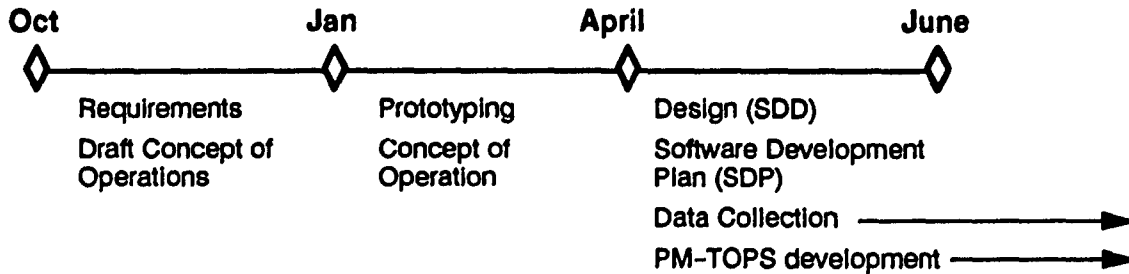
- Define the requirements for and scope of the Program Manager's Associate

- Analyze the available case-based reasoning software development products

- Define a general software design and concept of operations

- Begin implementation of the TASC Acquisition database for inclusion in case libraries

- Begin implementation of a demonstration prototype

TECHNICAL PROBLEMS

The primary technical problems during this period relate to the trade studies task and the slippage in the development schedules for the CBR product chosen as the development environment. After the analysis of the available tools, Remind was chosen as the development environment on the basis of its richness of representation, retrieval strategies and case comparison and adaptation facilities. Unfortunately, Remind has just gone into beta-testing and was in alpha during much of our analysis. An overall control system is being developed on the Sun platform to switch between case libraries in Remind. This controller must access the Remind procedures for case editing and retrieval through remote procedure calls. Remind will not be available on the Sun platforms or have a remote procedure call facility in place until the March to April timeframe. The impact of this is that interaction between the overall control system and Remind will not be achieved on schedule. A replan is in progress to accommodate this slip and still achieve the overall schedule objectives.

GENERAL METHODOLOGY

The timeline below describes the sequence of tasks leading to a PM–TOPS operational prototype.

Oct	Jan	April	June
◊———————————	————————◊————————	————◊————————————	————————◊

Requirements   Prototyping   Design (SDD)

Draft Concept of   Concept of   Software Development
Operations   Operation   Plan (SDP)

Data Collection ——————————▶

PM-TOPS development ——————▶

The general development methodology being used during the first year's effort is rapid prototyping. The process starts with a rough set of requirements as described in the draft concept of operations document. After an initial implementation (March Demo), requirements are refined or extended and functions that address them are layered into the system as part of the system design activity. The demonstration system is then leveraged to reflect the design with the end year objective of delivering an operational prototype for PM–TOPS.

The process used to define the overall requirements for the PMA involved internal interviews by members of the TASC team skilled in acquisition management and system/software engineers. The acquisition process was discussed both from the acquisition manager's viewpoint as well as from the perspective of the current DODI 5000.2. While a complete analysis of every function of each element was beyond the scope of this project (and is the focus of others) the overall structure and function of each element of the Program Management Office was defined and ranked on the basis of:

- Potential cost to and impact on an acquisition
- Complexity of planning and execution within the functions
- Applicability of CBR to support major tasks

At the completion of this task, the Test Planning and Execution function was selected as the best initial candidate for prototype development.

Available software products for supporting the effort were evaluated using in–house acquisition data. Three products, Remind, Esteem, and CBR Express, were used as development environments in which the test acquisition data was implemented as case libraries. Data was

successfully imported into each of the p..ducts an.. a variety of CBR functions were executed using the data. As a result of this activity, R...... was chosen as the overall CBR development environment.

After the selection of Remind, but before the first serious prototyping effort, an overall system concept was developed using video animation and storyboarding. The purpose of the task was to build a video description of how the operator would interact with the target system to retrieve useful information as a baseline for the demonstration system (and demonstration plan) and as a description of functionality toward which to build.

Once the animation was completed, the full TASC acquisition database was imported into the Remind shell and augmented (where data was missing) with internally consistent test data.

Construction of the user interface and system framework control structure for switching off from one library to the next was done in parallel with the data importing effort.

TECHNICAL RESULTS

The draft concept of operations is being augmented and in review within TASC. The demonstration plan has been completed in draft and is also in review.

The primary technical achievement to date has been the importing of the acquisition data and the manipulation of it using the CBR functions. All three forms of retrieval have been performed using the data including: templates (similar to SQL queries), nearest neighbors, and inductive clustering.

Two elements of the interface are nearly complete. The question editor has been designed and implemented on the Sun while the case editing facility is nearing completion.

IMPORTANT FINDINGS OR CONCLUSIONS

An important finding that relates to the use of the inductive clustering mechanism in Remind is its relative slowness. We performed various clustering tests on 100 randomly generated acquisition samples (15 features with an average of 10 legal values each) which took roughly 10 minutes. While we have not yet determined the implications of these results, this order of performance would limit the usefulness of re-clustering during normal system operation.