AN INTEGRATED AUDIT SYSTEM BASED ON THE SAS SYSTEM

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ABSTRACT

Within the Quality Assurance Organization of Southern California Edison Company, a SAS-based integrated Audit System has been developed for use in scheduling and conducting audits. The Audit System provides comprehensive report, log, schedule and matrix capabilities for accessing current and historical audits conducted. This paper describes the major components of the system, features available to management and engineering personnel, and its evolution from a small prototype to an integrated tracking and reporting system.

INTRODUCTION

Southern California Edison (SCE), as a Utility, produces electricity from 9 different technologies - Solar, Biomass, Cogeneration, Geothermal, Hydro, Wind, Fossil, Photovoltaic and Nuclear (3). The integrated Audit System is designed, developed and implemented to the requirements of the Nuclear Quality Assurance program at SCE. The primary emphasis of the program is to serve as an auditing and control function.

Quality Assurance (QA) is defined as a planned and systematic process of all actions necessary to provide adequate confidence that the quality program conforms to established technical requirements. Two challenges face any organization involved in establishing a quality program (5):

- Every organization must concentrate on improving the quality of the process that produces the product rather than trying to improve product quality.
- Continual quality improvement must be assured throughout every organization of the company.

These challenges are often addressed with the management philosophies of three quality experts, Dr. W. Edwards Deming, Dr. Joseph M. Juran and Philip B. Crosby. Each of these experts describes a quality culture comprising a delicate balance between management commitment, structure and strategy, training, quality measurement, removal of problem sources, and encouraging ongoing improvement. Specific contributions by Dr. Deming include "Deming's Circle and 14 Points" (2), by Dr. Juran include "Journey from Symptom to Cause" (4), and by Mr. Crosby include "Quality Improvement Process" (1). Many at Southern California Edison believe that the combination of their quality methods and the features provided by the integrated audit system create an environment that Deming, Juran and Crosby are proposing.

THE AUDIT PROCESS

Before we can describe the audit process, it is necessary to present a formal definition of what an Audit is. Webster defines an Audit as a "formal or official examination and verification or a methodical examination and review." In practice, the audit is used as a management tool to assure that the quality program is being implemented. SCE's audit program consists of a detailed systematic review of all the aspects that are involved in operating a nuclear power plant. These aspects include designing, purchasing, constructing, fabricating, handling, shipping, storing, cleaning, preserving, erecting, installing, inspecting, testing, operating, maintaining, repairing, refueling and modifying activities of San Onofre Nuclear Generating Station (SONGS) Units 1, 2 and 3 (3).
The audit process includes the review of requirements, matrix development of procedures, detailed schedules of when audits are to be conducted, and the logging of audit reports. We recognize the importance of measurement to track progress and assure that the plan stays on course. Consequently, the Audit System was designed and developed to provide these necessary measures to track progress and assure that the quality program remained in conformance to the established requirements.

METHODOLOGY USED

To better encourage, develop and incorporate user creativity, we adopted a user-oriented software development methodology; i.e., to foster user prototyping (6). We selected this approach based on three criteria.

1. We wanted a team composed of representatives from all levels of the organization to share in the analysis, design, development, testing, and implementation.

2. We wanted a system that was easy to use, "user-friendly".

3. We wanted an integrated system to support existing and future processing requirements.

The introduction of these criteria presented interesting roles for management, users and analysts. Management had to clarify objectives, authorize users to participate, encourage and attend frequent review meetings and assume leadership for the project. Users had to make a commitment to the project by dedicating resources such as time and knowledge. Analysts acted as a catalyst to the project by presenting alternatives to users and informing what was and was not feasible to do with the computer. It should be mentioned that most of the QA Information Systems evolved using a prototyping methodology with a considerable amount of success. Readers are encouraged to read J. Epperson's paper for a detailed description of how SAS software is used in the QA Department at the San Onofre Nuclear Generating Station (3).

AUDIT SYSTEM COMPONENTS

Four (4) components comprise the Audit System: Report, Log, Schedule and Matrix. Because of the integrated structure of the Audit System, information that is added, deleted and/or modified are automatically applied throughout the system. This reduces the risk associated with data integrity problems. Currently fifty (50) QA Engineers are being tracked by the Audit System.

The Audit Report component consists of textual information taken from the original (hard-copy) document. It contains evidence that the Quality Program is in compliance.

The Audit Log component provides a method of tracking audits via start and finish dates.

The Audit Schedule component is a comprehensive planning tool. It is used to schedule the frequency of audits according to the importance of the objectives; i.e., quarterly, semi-annual and annual.

The Audit Matrix component provides details of the procedures which implement the QA program. It identifies the organization, upper tier Quality requirements, and the implementing procedures.

DESIGN CHARACTERISTICS

Specific requirements had to be incorporated into the design of the Audit System. The major requirements follow:

- Ability to access information using keyword and date range search tools
- Ability to present information in report and graphic formats
- Design of user-friendly menus, prompts, and messages
- Ability to integrate existing and future data bases
- Design for change control.
The Audit System evolved from a prototype to a completely integrated system over a two year period. We have implemented the design on an IBM 3090 OS/MVS mainframe computer using Time Sharing Option (TSO) as the communications monitor. It is written entirely in SAS Version 5 software using base-SAS, SAS/AF, SAS/FSP, and SAS Macro Language.

Base SAS is used as the foundation on which the Audit System's major activities originate. We have used the language and data base features provided by base SAS software to act as the "work horse" for all audit activities.

SAS/AF software provides an application environment for developing user-friendly menus, prompts, and messages in an interactive environment. Audit System users select options from the list of available menu choices.

Validity checks are performed on the user-selected options by using the SAS Macro Language. The Macro Language verifies whether a selected option is out-of-range, invalid, or missing. We used the Macro Language facility to act as the "brain center" for all menu requests and responses. They provide the user-friendly environment that users have grown to love.

SAS/FSP software provides interactive screen formats for users to browse, update, and search audit information. The data entry screens have been designed to mirror the original audit document. This provides data to be entered quickly into the data bases resulting in a streamlined data capture process. Browse and search screens provide users with a "snap-shot" of their data in detailed, summary or statistical formats.

CONCLUSION
The Audit System within the Quality Assurance Organization of Southern California Edison Company provides QA Engineers with a tool to review audit reports, logs, schedules, and matrices on demand. It allows Engineers to plan audits and obtain the criteria needed to verify the quality program. We believe that the Audit System represents true state-of-the-art technology in the Nuclear environment.

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REFERENCES
1. Crosby, Philip B., "Quality is Free and Quality Without Tears," Hitchcock Executive Book Service.
