ENVIRONMENTAL QUALIFICATION: THE IMPACT ON HUMAN PERFORMANCE REQUIREMENTS

by

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INTRODUCTION

The magnitude and duration of implementing Environmental Qualification (EQ) in sixteen in-service nuclear generating units involves the effort of more than 4000 individuals over the life of the program. The cooperation and communication among various organizational units is essential to ensure success. In the analysis phase of the program, it became evident that a significant performance gap existed between current and required levels of skills, knowledge, and attitudes of current staff.

DISCUSSION

For each of the organizational units impacted by the Environmental Qualification Program, the capability gap and, hence, the amount and the type of training required was different. It was determined that, in order to eliminate the capability gaps, a number of initiatives would be required, including organizational change strategies, procedural changes, team-building, and training. In order to address these requirements, a performance engineering approach was taken, commencing with an analysis of performance requirements. See Figure 1.

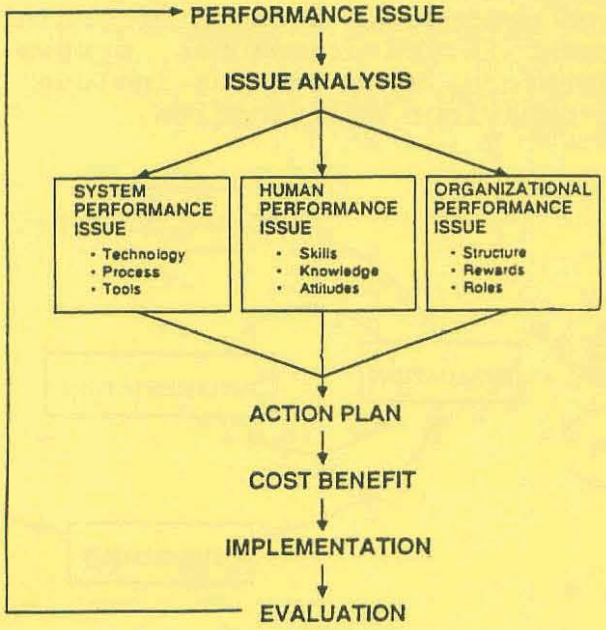


Figure 1: Performance Analysis Model

While recognizing that system and performance issues must be considered in any issue analysis, the thrust of the training effort is focused on the human performance factors, with particular attention being given to the attitudinal and skills and knowledge components, which are appropriately addressed through training programs. As part of this effort, existing training was reviewed for its applicability. It was recognized that, for CANDU applications, training materials

developed in the United States for Environmental Qualification would not meet the needs of Canadian units without significant modification. Therefore, a complete needs analysis was carried out to identify the specific training required for CANDU systems and for the existing Canadian regulatory environment.

STRATEGY

A team was created to identify the requirements, procedures, roles and responsibilities, etc., together with the training required for implementation of the EQ Program (Figure 2). Experienced members of the team provided the subject matter expertise required to identify the specific training objectives that would be required for other members of their own unit, or external groups. This resulted in the design of a multi-media training curriculum, tailored to the specific needs of each work group, or 'target population'.

The training curriculum was based on recognized principles of instructional design (Figure 3) using industry standards: INPO 85-006, Ontario Hydro Policy 113, and ASME standards. Ontario Hydro has been using the systems approach to training design since 1979, and the Nuclear Regulatory Commission has recently promoted this approach (Reference: 92-5; NRC Proposes New Requirements for Training and Qualification of Nuclear Power Plant Personnel, January 1992). Consequently, although the EQ training design commenced in late 1990, before the NRC proposal was issued, the training in Ontario Hydro is well developed and documented from a regulatory and audit point of view.

Because of the serious implications of poor performance (employee/public safety, financial and public relations implications, etc.), it was important to address the attitudes as well as the more technical and procedural aspects of training for those employees with involvement in the procedures, systems and equipment involved in EQ. Therefore, some modules include specific techniques aimed at behaviour modification.

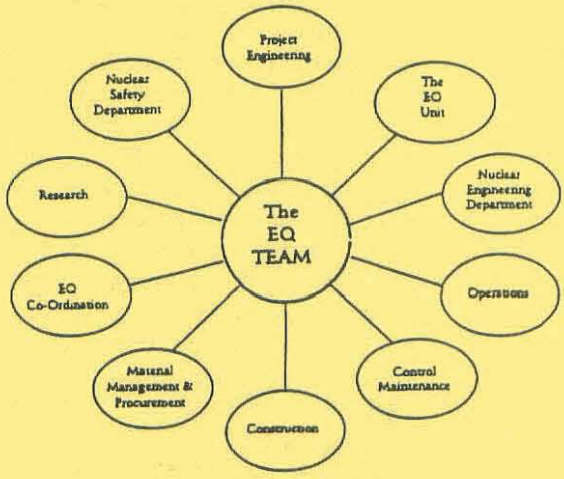


Figure 2: The EQ Team

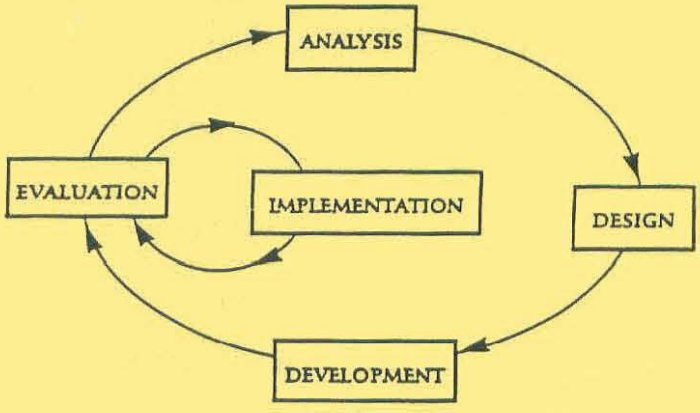


Figure 3: Training Design Process

Because of the importance of tracking individual participant completion of the required training modules, a strategy was developed to manage training records, thereby helping to identify gaps in skills, knowledge and attitudes of individuals and groups. This system will ultimately assist in any auditing processes.
The modules specified during analysis are as follows:

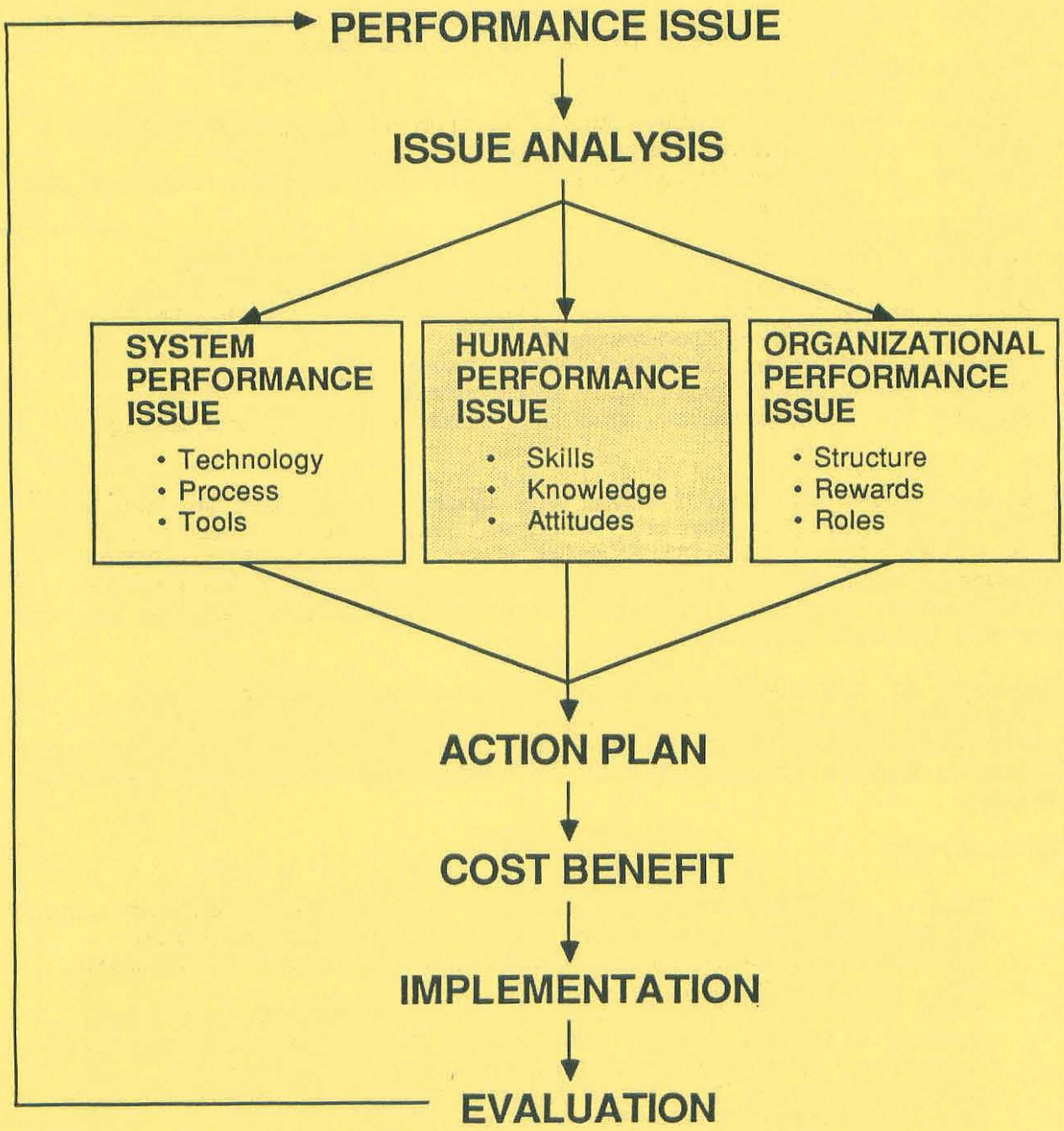
- Module 1A: Introduction to Environmental Qualification and the Consequences of Safety System Failure
- Module 1B: Environmental Qualification Methodology
- Module 2: Material Properties
- Module 3: Environmental Qualification Testing and Analysis
- Module 4: Equipment Installation and Orientation
- Module 5: Environmental Qualification Information Sources and References
- Module 6: Walkdowns
- Module 7: Environmental Qualification Documentation
- Module 8: Maintaining Environmental Qualification
- Module 9A: Environmental Qualification Spare and Replacement Parts - Procurement
- Module 9B: Control of Spare Parts Inventory
- Module 10: Quality Assurance Procedures
- Module 11: Environmental Qualification Drafting and Design Drawing

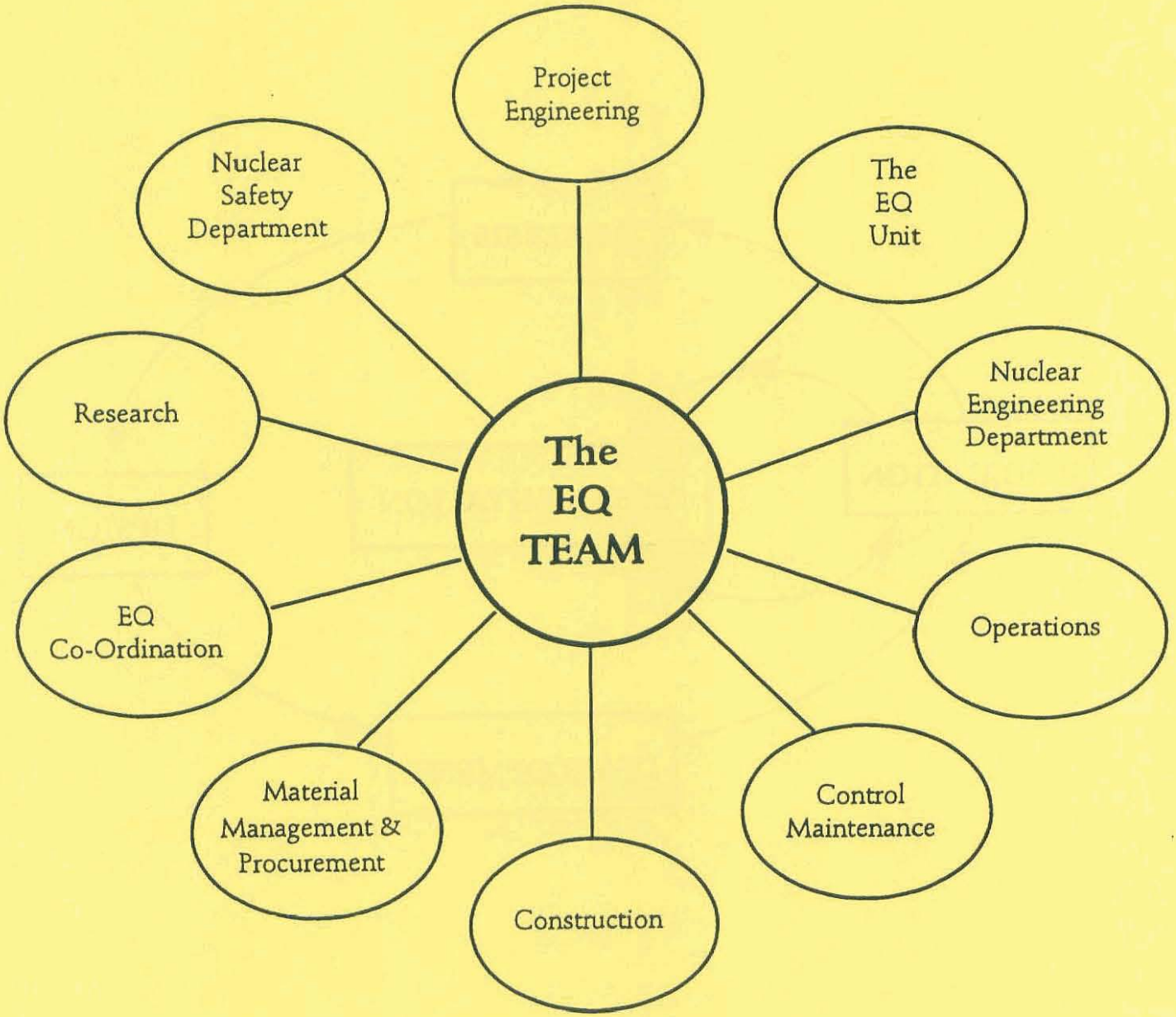
The strategies used to deliver the training modules include a video made specially for the program, and other videos purchased from external sources. Strategies also include participative lectures, mock-ups and simulations, text with self-scored assignments, together with criterion-referenced objective mastery testing of each module.

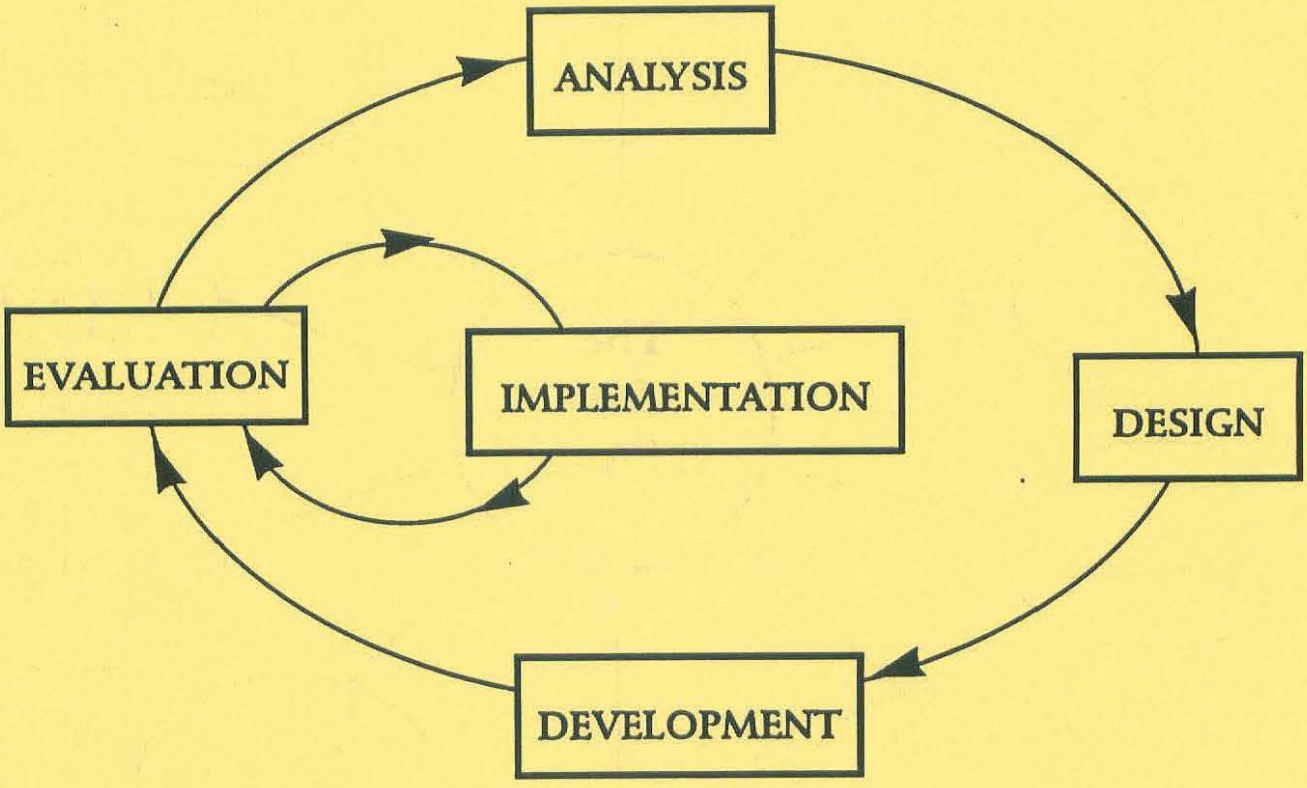
For each of the modules, a computerized system of training evaluation was specified, using optically scanned standard evaluation forms, which provide an index for the delivery of each training module, compared with an historical index for the same module.

CONCLUSIONS

1. That a specific training program must be designed for each of the target groups which have involvement in the EQ Process, including certain external contractors, vendors, etc. who impact EQ.
2. That behaviour modification approaches must be employed during training, which complement the technical/procedural learning, in order to ensure that the attitudes of participants of the training course are commensurate with the importance of the EQ Program values.
3. That training must be implemented and individual performance measured, according to specified and approved Ontario Hydro procedures and to meet present and impending requirements.


PERFORMANCE ISSUE
ISSUE ANALYSIS
SYSTEM PERFORMANCE ISSUE
• Technology
• Process
• Tools
HUMAN PERFORMANCE ISSUE
• Skills
• Knowledge
• Attitudes
ORGANIZATIONAL PERFORMANCE ISSUE
• Structure
• Rewards
• Roles
ACTION PLAN
COST BENEFIT
IMPLEMENTATION
EVALUATION


Project Engineering
Nuclear Safety Department
The EQ Unit
Research
The EQ TEAM
Nuclear Engineering Department
EQ Co-Ordination
Operations
Material Management & Procurement
Control Maintenance
Construction


ANALYSIS
DESIGN
DEVELOPMENT
IMPLEMENTATION
EVALUATION