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Lancaster University (ULANC)
The Research Centre for Energy, Environment and Technology (Ciemat)
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ASSISTANT

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Teollisuuden Voima Oy (TVO)
Forsmark Kraftgrupp AB (FKA)
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Learn Safe

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1 Executive summary

The main objective of the LearnSafe project was to create methods and tools for supporting processes of *organisational learning* at the nuclear power plants. Organisational learning has become increasingly important for the nuclear industry in its adaptation to changes in the political and economic environment, changing regulatory requirements, a changing work force, changing technology in the plants, and the changing organisation of nuclear power plants and power utilities. The danger during a rapid process of change is that minor problems may trigger a chain of events leading to actual degrading of safety and/or diminishing political and public trust in the safety standards of the particular nuclear power plant, utility or corporation.

The focus of the project was senior managers at nuclear power plants and power utilities who are responsible for strategic choice and resource allocation. This focus was selected with the understanding that their decisions, approaches and attitudes have an important influence both on safety and economy of the nuclear power plants. The LearnSafe project has developed methods and tools that can be used in the management of change and in ensuring efficient organisational learning.

The project was set up in two major phases, which covered both empirical investigations and theoretical considerations. The first phase placed a focus on *management of change* and the second on *organisational learning*. The empirical part of the first phase of the project collected senior manager views on challenges that are facing nuclear power plants today. This data set contains about 800 statements collected from nearly 200 persons in five countries, ten nuclear power plants and one international organisation. The analysed data was used for an assessment of strategies, plans and actions for coping with the challenges. These were furthermore developed to concrete suggestions for improvements targeted to major stakeholders in the nuclear field.

The empirical part of the second phase of LearnSafe focused on facilitators and hindrances for organisational learning. This data set consists of nearly 1000 statements from more than 100 persons in five countries and ten nuclear power plants. This data set has been analysed to identify major groups of facilitators and hindrances to organisational learning. The LearnSafe results also include descriptions of methods and tools that can be used by the nuclear power plants themselves in assessing and improving their performance. LearnSafe has collected and documented good practices for safety management.

One important feature of the project has been a continuous interaction between researchers and managers in addressing issues of organisation and management that are important for safety and efficiency. This has further been facilitated by spin-off tasks in which participating nuclear power plants have expanded some of the early results from the LearnSafe project for interesting questions of their own. Several such spin-off tasks have been completed, reported and discussed in small workshops at the nuclear power plants.

The LearnSafe project has developed and used several models connected to management and organisations. These models can prove useful in structuring managerial activities that aim at ensuring continued safety at the nuclear power plants. An open final seminar was held 28-29 April 2004 to disseminate project results. The proceedings of the seminar have been made available at the LearnSafe web-site <http://www.vtt.fi/virtual/learnsafe/>. A closed web-site has been used during the project to facilitate communication between LearnSafe partners.

2 Synthesis report

2.1 Introduction

The main objective of the project was to create methods and tools for supporting processes of *organisational learning* at the nuclear power plants. The focus of the project has been the senior managers at the nuclear power plants and at the corporate levels who are responsible for strategic choices and allocation of resources. The LearnSafe project was established on the basis of an earlier successful project called ORFA "Organisational factors; their definition and influence on nuclear safety".¹ The LearnSafe project has in the same way as the ORFA project established a platform for bringing research forward.

The LearnSafe project has had an important contribution to the continuing safety of the nuclear installations in Europe by addressing management and organisational issues. In its exploration of innovative management concepts the project has contributed to maintaining a high level of expertise and competence in the nuclear field. Project results have shown to be of interest also outside the nuclear field within other safety critical industries. A better understanding of systemic issues connected to organisation and management can have a large influence on safety and economic competitiveness. It is believed that these issues are crucial in achieving a proactive approach to the lifetime management of existing nuclear installations.

The data collection in the empirical part of LearnSafe was governed by the following six research questions of which the first three related to the first phase of the project and the last three to the second phase of the project.

- Q1: What are the perceived emerging challenges in the management of nuclear power plants?
- Q2: How do senior managers cope with emerging challenges in the management of nuclear power plants?
- Q3: What improvements could be made in respect to coping with emerging challenges in the management of nuclear power plants?
- Q4: What kind of features and attributes characterise learning organisations?
- Q5: What are the most common hindrances to organisational learning and how can they be removed?
- Q6: How are various company cultures and sub-cultures influencing organisational learning?

The LearnSafe project used several data collection methods, which include questionnaires, Metaplan sessions, structured interviews, group discussions and case studies. The main part of the collected data consists of a series of qualitative statements. A large group of managers ranging from utility top managers, upper nuclear power plant managers to functional managers from several plant functions participated in the data collection exercises.

2.2 Challenges in the management of nuclear power plants

The collected data set from the first phase of LearnSafe consists of nearly 800 statements in response to the research question Q1. They reflect views on challenges that face the nuclear

¹ Geneviève Baumont, Björn Wahlström, Rosario Solá, Jeremy Williams, Albert Frischknecht, Bernhard Wilpert, Carl Rollenhagen (2000). Organisational Factors; their definition and influence on nuclear safety, VTT Research Notes 2067, Technical Research Centre of Finland, Espoo.

power plants of more than 200 persons at 10 nuclear power plants in five countries and at one international organisation.

The challenges were grouped under the following headings:

- Economic pressures.
- Human resource management.
- Nuclear know-how.
- Rules and regulation.
- Focus and priorities.
- Ageing, modernisation and new technologies.
- Public confidence and trust.
- Organisational climate and culture.

The challenges in the first group reflect the competition caused by deregulation that has led to the need for cost reductions and adaptations to new conditions. The second group reflect concerns with maintaining the competency, which is needed at the nuclear power plants. The third group addressed the decreasing number of vendors and concerns for the competency of contractors and suppliers. New regulatory requirements and concerns with the excessive need for bureaucracy and paperwork were addressed in the next group. The fifth group of challenges addressed the need for selecting focus and setting priorities. The next group made reference to the need for maintaining plants in good technical condition. The societal acceptability of nuclear power was addressed in the seventh group and the last group of challenges touched on motivation, attitudes and safety culture.

The challenges were further used to collect strategies, plans and actions the plants are using to meet the challenges. Further analysis gave various suggestions for improvements grouped according to major stakeholders in the nuclear field.

2.3 Facilitators and hindrances of organisational learning

The collected data set from the second phase of LearnSafe reflect views on facilitators of and hindrances to organisational learning in nearly 1000 statements given by more than 100 persons. The collected data paints a picture of conditions within which the nuclear power plants operate.

The analysis of the data set produced eleven clusters, which were characterised as follows:

- Objectives, priorities and resources.
- Formal systems and practices.
- People's attitudes and orientation.
- Corporate culture and traditions.
- Communication, guidance and appraisals.
- Maintaining touch and focus.
- Openness and trust.
- Work community.
- Encouragement and rewards.
- Adequacy of means and methods.
- Networking and co-operation.

The facilitators and hindrances of organisational learning have been used to suggest methods and criteria for self-assessments of organisational learning. They have also been used for a report on good practices at the nuclear power plants.

2.4 Conclusions and recommendations

The results of LearnSafe project include an inventory of organisational challenges at nuclear power plants and facilitators and hindrances of organisational learning. These results support the creation of an understanding of crucial components of safety management at the nuclear power plants. An understanding of systemic issues connected to human errors and organisational deficiencies can have a large influence on safety and economic competitiveness of nuclear power on a broad scale. These issues will be crucial in achieving a successful lifetime management of existing nuclear installations.

The contacts between the research organisations have been excellent during the whole project. LearnSafe has brought together a unique blend of researchers and practitioners. The involvement of nuclear power plants in five European countries has made it possible to address similarities and differences in organisational structures and work practices. The partnership has been close and has benefited from very open internal communication.

The LearnSafe project has demonstrated the need for additional research on issues connected to organisation and management, because they are the most important remaining factors, which contribute to events and incidents at the nuclear power plants. New research is suggested to be carried out under the heading of safety management, because it is an overriding area for activities by which safety of nuclear installations is maintained and improved. The LearnSafe project has shown that a combination of empirical and theoretical research can help in establishing scientific and technical platform by which safety requirements and proposed organisational designs can be assessed.

Present understanding of human and organisational factors unfortunately gives a poor scientific platform to decide on what can be considered as sound requirements for activities within safety management. There is a gap between theory and practices in understanding how people and organisations influence safety. Ongoing research in human and organisational factors in the nuclear industry is fragmented with minor interactions between research groups. Academic research has been quite theoretical, whereas practical guidance in the field has a poorly grounded scientific base. A stimulation of multi-disciplinary research in nuclear safety has a large potential of improvements in the prevention of minor events that may develop to incidents.

A Network of Excellence "Strategies and Practices of Safety Management (SafeMan)" has been proposed with research activities in the following broad areas:

- Leadership and management.
- Communication.
- Processes for decision making.
- Experience feedback and organisational learning.
- Competency.

ANNEX 1. Members of the LearnSafe team

The following persons from the five main partners have collectively contributed to the collection and analysis of data and thus to the results of the LearnSafe project.

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