Managing safety culture throughout the lifecycle of nuclear plants MANSCU

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Background of MANSCU-project

During the past years the expectations and regulations concerning human and organizational performance and safety culture have developed and power companies and regulators have started to work with safety culture issues in a more systematic way.

However, the effectiveness of the practices for managing safety and creating a good safety culture have been questioned: repeated events, Fukushima Daiichi, challenges in the new build and modernization projects and some theoretical developments, such as resilience engineering…

Fukushima accident pointed out how organisations may become blind towards their own management practices and thought patterns. It also emphasised the importance of a culture which prepares for the unexpected.

Fukushima accident also pinpointed the importance of understanding the role of various actors for nuclear safety culture; the regulator, headquarters, technical support organisations

Similarly, the new build projects and major modernisations highlight the challenges of establishing shared views and practices among the multicultural network of actors

The goals of MANSCU project

- The objective of the MANSCU project was to create knowledge that can be used in developing safety management approaches in such a way that they would better take into account the following aspects of safety culture development:
  1) Support the development of sufficient *understanding and knowledge of nuclear safety* and risks as well as nuclear industry specific working practice demands.
  2) Take into account the needs of *other contexts than the operating units*. Especially design activities and complex networks of subcontractors.
  3) Support *organisational alertness (mindfulness)* to new risks or other unexpected conditions which are based on either technical or social phenomena. It also means avoidance of complacency and constant effort of continual improvement.

Research strategy of MANSCU

- MANSCU carried out Nordic studies concerning safety culture and safety management based on the practical needs of the industry and regulators. MANSCU included tasks focusing on:

  A) Effectiveness and applicability of current safety management approaches

  - **HUMAX** task evaluated the expected and experiences benefits of Human Performance Programmes in maintenance activities
  - **MOREMO** task evaluated resilience engineering tools for identifying and supporting local adjustments in the maintenance field work

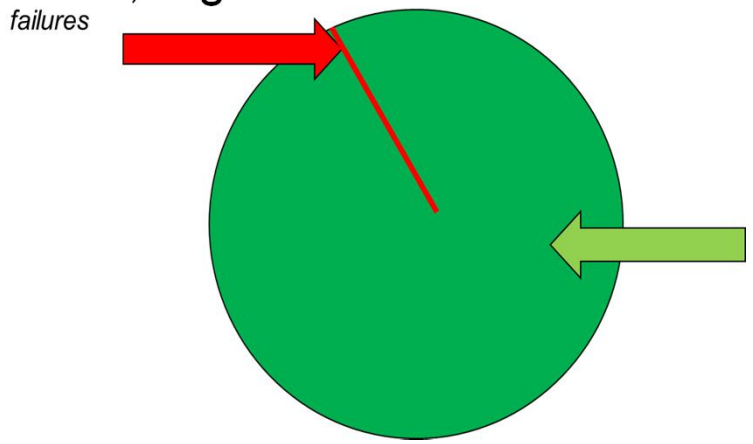
  B) Safety culture challenges in various lifecycle stages

  - **DESIGN** task identified safety culture features in design activities
  - **SAFETY CULTURE IN A NETWORK OF SUBCONTRACTORS** was studied based on literature and lessons learned from OL3 and the design studies – conceptual model building

Selected highlights of MANSCU

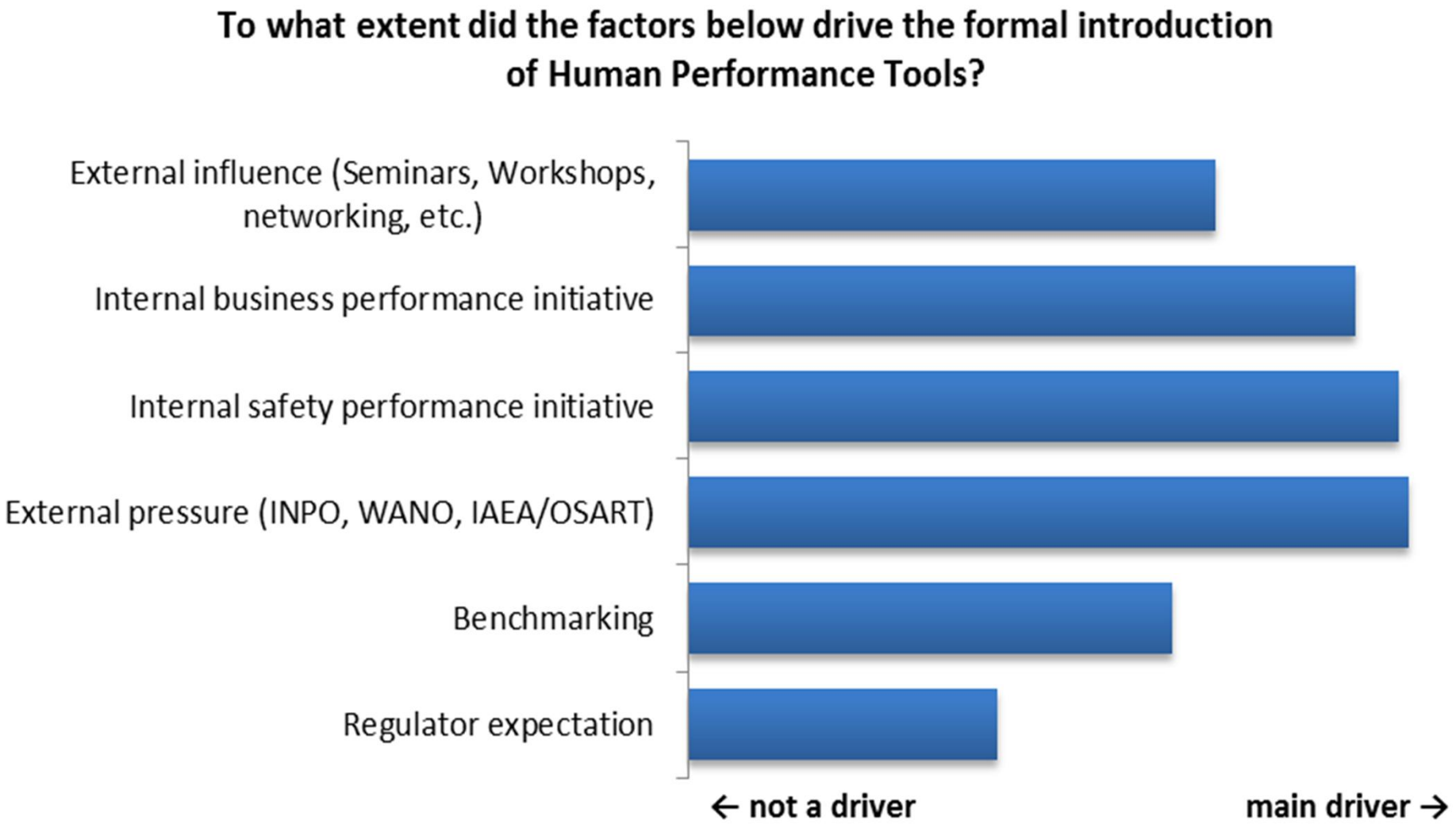
HUMAX TASK

- An international study of the impacts of currently popular Human Performance Programmes.
- Human Performance Programmes are a systematic way to implement tools which aim at "*preventing human errors* and to *strengthening controls"* (DOE 2009).
- Human Performance Tools are mixed set or methods or principles which the employees are expected to apply in their everyday work, e.g. :
  - Pre-job Briefing
  - STAR (Stop, Think, Act, Review)
  - Peer checking
  - Three way communication, phonetic alphabets
  - Task observation
  - Post-job-debriefing



- HUMAX conducted case studies at three Nordic plants and a survey to Human performance experts around the world (see Oedewald et al . 2014, 2015)

In nuclear domain many safety management approaches, such as Human performance tools, are disseminated internationally by peer networks

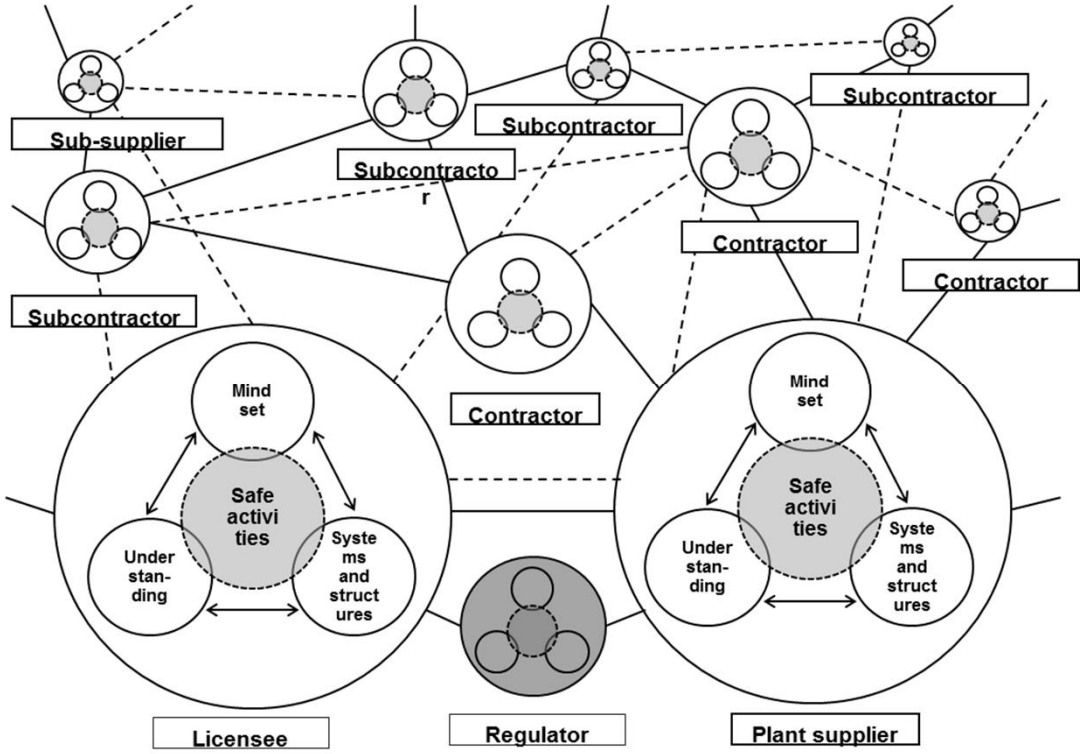


HUMAX TASK (cont.)

- Results suggested that:
  - There is a strong belief among nuclear organisations that reducing human errors is important for nuclear safety because minimizing errors would reduced significant plant events.
  - However, many organisations expect and perceive also other than nuclear safety impacts from Human performance programmes; less rework, less occupational incidents, less issues with the regulators, improved effectiveness
  - However, the impacts were seldom reliably measured
  - Personnel in Nordic plants hold fairly positive attitudes towards the Human Performance programmes, but very critical opinions do exist
  - Possible downsides include that field work becomes slow and laborious, frustration, workers pay more attention to the tools that the task itself, “they’ll stop using their brain”
  - National culture may impact the perception of the benefits and downsides of the tools
  - Implementation process is a key for success
- HUMAX gave recommendations to the industry on how to design their Human performance programmes, and facilitated the industry’s knowledge of the criticism towards the human error or individual person focused safety management approaches. Studied also the possible negative side-effects to the safety culture.

Selected highlights of MANSCU
- Network safety culture

- In nuclear industry the licensees are expected to develop a good safety culture and apply systematic safety management.
- However, many of the activities (big modernizations, design, construction of new builds) are not carried out by the licensee but by a network of subcontractors
- How to apply the concept of safety culture in a dynamic, temporary, multicultural, multilocation activities?



Network safety culture and continuation of MANSCU

- The lessons learned indicate that:
  - Instead of trying to focus on safety culture of each of the subcontractor companies, the entire network should be taken as the unit of analysis
  - Theoretical lessons learned from network governance and complex adaptive systems are applicable
  - Different activities (design, construction, commissioning, decommissioning) have distinct safety culture challenges
  - National culture can affect safety culture but there can be even more pronounced impacts between organisational and domain cultures
  - Project management, contracts and allocation of responsibilities are crucial for safety culture in the shop floor
  - *The lessons learned will be utilized in SAFIR 2018 MAPS-project, which continues from this theme*

ADDITIONAL READING

- Gotcheva, N. & Oedewald , P. 2015. SafePhase: Safety culture challenges in design, construction, installation and commissioning phases of large nuclear power projects. SSM Research report 2015:10 Available at www.stralsakerhetsmyndigheten.se.
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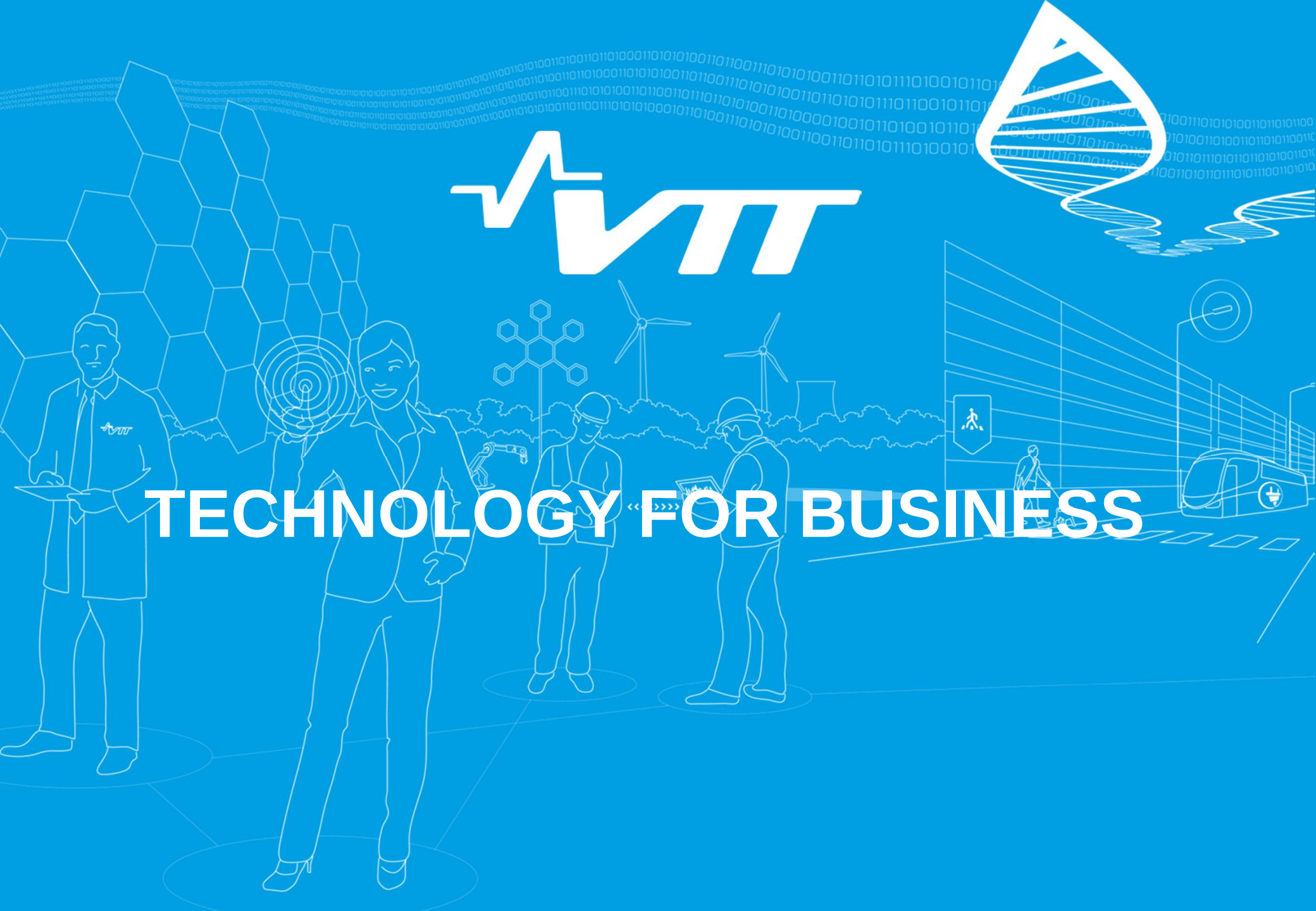
- Oedewald, P. & Gotcheva, N. (in press). Safety culture and subcontractor network governance in a complex safety critical project. Reliability engineering and system safety.
- Oedewald, P., Gotcheva, N., Viitanen, K., Wahlström, M. (In press). Safety culture and organisational resilience in nuclear industry throughout the different lifecycle phases. VTT Technology,
- Oedewald, P. 2012. Network safety culture. Presented in IAEA Technical meeting on Safety culture in pre-operational phases. 26-30 November 2012, Cape Town.
- Oedewald, P. & Macchi, L. 2012. Evaluating organization's potential for being able to manage varying conditions. Presentation at the IAEA technical meeting on Managing the Unexpected – From the perspective of the individuals, technology and organization. 25 -29 June 2012, Vienna, Austria.
- Oedewald, P., Skjerve, AB., Axelsson, C., Viitanen, K. & Bisio, R. 2015. Human performance tools in nuclear power plant maintenance activities - Final report of HUMAX project. NKS report 328. Roskilde, Denmark.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