Building Safety Seminar
Gardermoen 2-3 February, 2009

Work Package 2 and Work Package 3

Project Team: Ann Britt Skjerve, Magnhild Kaarstad, Fred Størseth, Eirik Albrechtsen, Ragnar Rosness, and Tor Olav Grøtan

Overview of Presentation

√ **Problem Description** (√) **Literature Survey** – **Empirical study** – **Reporting** (2010)

- Main theme in this session:

  What research topics should be addressed in the empirical part of WP2/WP3 study?

- Purposes and plans of WP2 and WP3
- Outcomes of the literature survey ("*snapshot*")
  - The literature surveys suggest a range of different directions for the empirical research.
  - Concretization is needed
- For practical reasons, joint data collection in WP2/WP3.

Cooperation WP2 and WP3

- Staff overlap
- Perform literature review cooperatively
  - Knowledge base for the two work packages is similar
- Possibility to perform case studies/ interviews/ observations together
  - Different types of analyses
- Save time for contact persons (ENI, operators, IO-centres)
- Closer connection between work packages
- Improved quality – double check internally.

Work Package 2 Objective

Overall purpose:

- to develop new knowledge and methods that can improve the understanding of human and organizational decision-making, in particular decision makers' ability to handle conflicting objectives related to safety. (Overall plan for the Building Safety project)

Specific objective:

- to develop principles for organization of decision-making processes in co-operation rooms to facilitate that safety goals are adequately balanced vis-à-vis other goals. (WP2's Problem Description)

Work Package 3 Objective

Overall purpose:

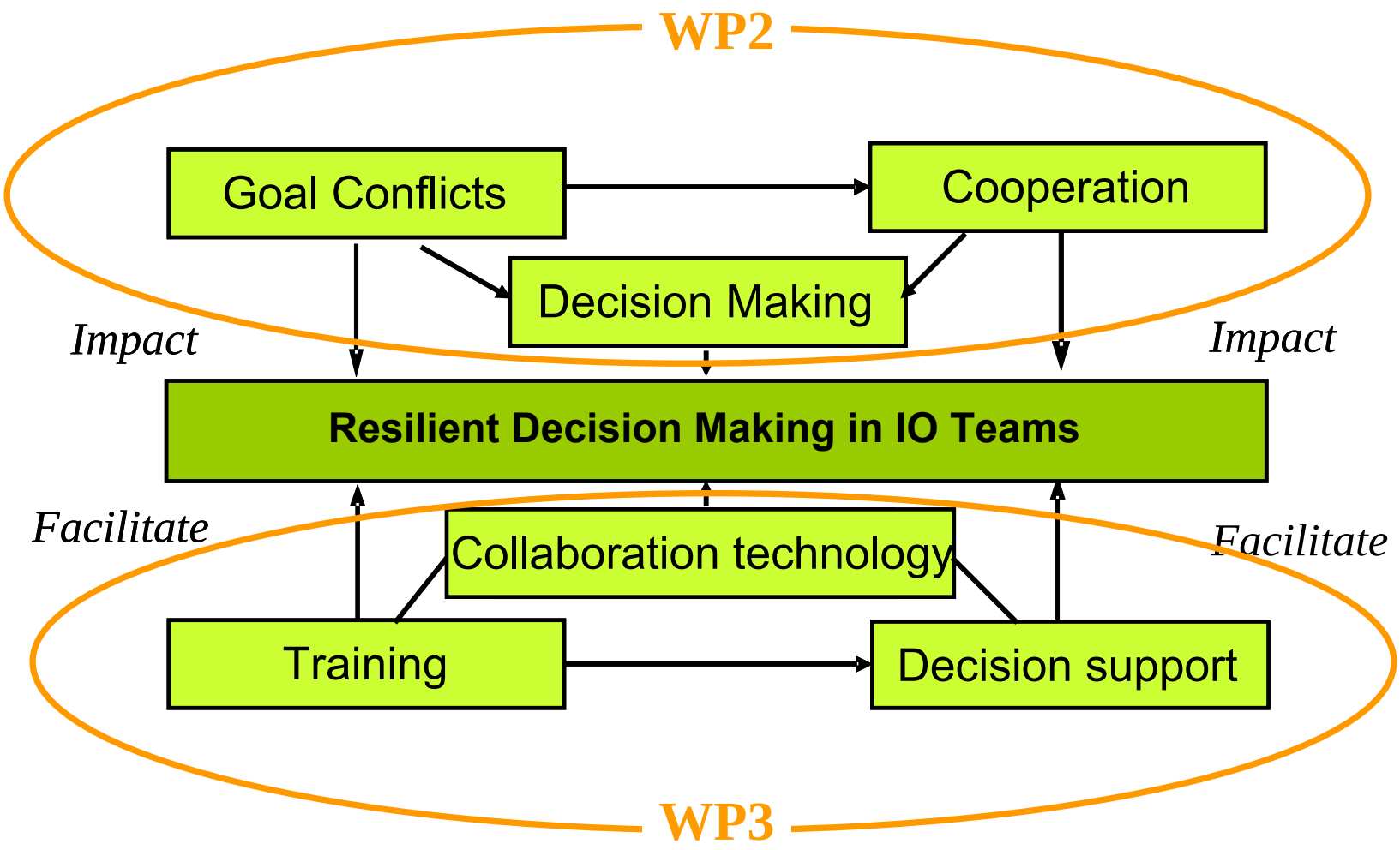
- To develop new knowledge on how changes related to technological development affect resilience; and in particluar how different development processes call for different approaches to HSE management. (Overall plan for the Building Safety project)

Specific objective:

- To develop knowledge on how collaboration technology influence resilience, both positively and negatively, and how HSE management or organisational efforts like personnel training and usage of tools for decision support may support operators' decision making and facilitate and improve resilience.
  (WP3's Problem Description)

The Six Literature Reviews

(note: revised from 1st ver.)



IO Teams

The concept *IO team* is used as a reference to a group of people, who makes decisions mediated via a cooperation room, in the context of integrated operations (IO).

Key characteristics of IO teams:

- Different professional backgrounds (professional language, etc.)
- Different areas of responsibility and, thus, potentially partly different concerns
- Experiences from / working in different companies/cultures
- Different levels of familiarity with each other (ranging from team mates who co-operate closely on a daily basis to team mates, who have never meet each other before, etc.).
- Different levels of experience in using collaboration technology

Key Outcomes of the Literature Surveys

Decision making

- Contextual factors impact decision making → different factors in different types of settings.
- Decision aids.

Goal Conflicts – Safety related

- A broadening of the concept *goal-conflict* to encompass the perspective of the organizational level → goal-conflict typology.
- Means to facilitate prioritization of safety goals.

Cooperation

- IO cooperation brings multiple competences together, however, distance and culture may influence cooperation.
- Tools / Guidelines for IO cooperation and facilitation to achieve resilient work processes.

Decision support

- Includes all aspects related to supporting people in making decisions.
- Different IO interaction situations need different tools.

IO Teamwork Training

- Specification of generic teamwork competencies needed by IO team members.
- Outlining a high-level CRM-based training design, and arguing for cross-company teamwork guidelines.

New tech's impact on RE

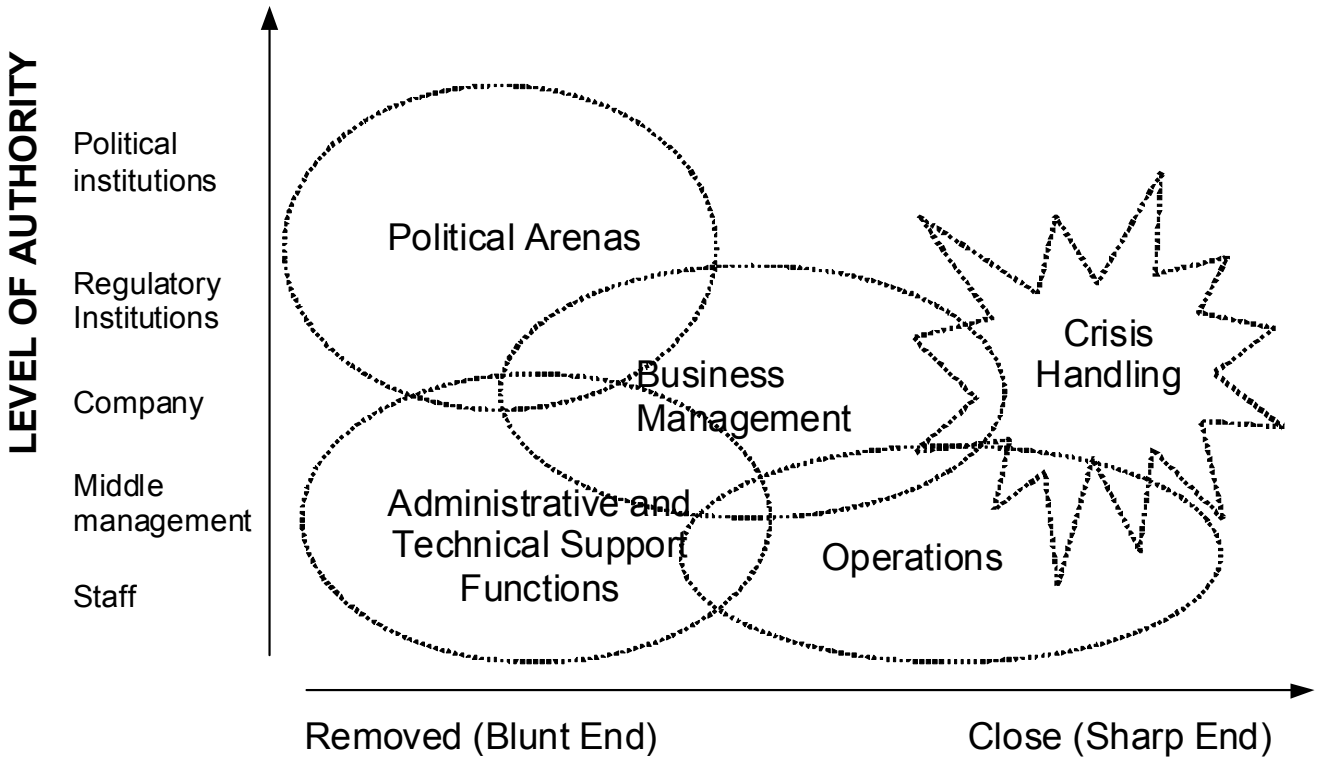
- An extended Joint Cognitive Systems approach to understand collaboration technology impact on resilience.
- Identify how collaboration technology may improve, weaken or be a premise for resilience.

Decision Making: A Contingency Model

Ragnar Rosness

Findings:

A Typology of Decision Settings:



Practical Implications

Decision Setting	Potential Problems	Functions of decision aid	Examples of decision aids
Operations	Slips Missed warnings Local rationality, ignorance about side effects Safety margins may erode (Practical drift; Snook, 2000)	Detect slips. Help identify and remove human error traps. Make warnings effective, insistent. Inform actors about possible side effects. Detect erosion of safety margins.	Filtering of alarms to prevent alarm inflation so that warnings remain effective and informative.
Business Management	Recycling of ineffective solutions. Reliance on simplistic indicators. May face strong incentives to run a risk.	Propose alternative solutions. Provide comprehensible feedback on complex phenomena. Provide incentives for minimising risk.	Key Performance Indicators that reward managers for minimizing risks.

Decision Setting	Potential Problems	Functions of decision aid	Examples of decision aids
Administrative and Technical Support Functions	Unrealistic assumptions. Unrealistic models.	Support identification of realistic assumptions. Help to detect, communicate and take into account uncertainties and ignorance related to models.	Establish arenas where system designers can meet persons working at the sharp end and adjust their assumptions.
Political Arenas	Inconsistency over time. Decisions not followed up by action. Safety margins may erode in the absence of strong watchdogs.	Identify decision options that are robust w.r.t. changing constellations of power. Provide organizational structures to protect safety interests (watchdogs).	Establish decision arenas where watchdogs such as NGOs may exert influence.
Crisis Handling	Defence mechanisms may lead to defective coping if danger materialise (Janis and Mann, 1977)	Enable decision-makers to cope with situations where prompt action is required to deal with an imminent and serious danger.	Training in proactive management (i.e. a crisis management tactic focused on updating and handling of the worst case scenario).

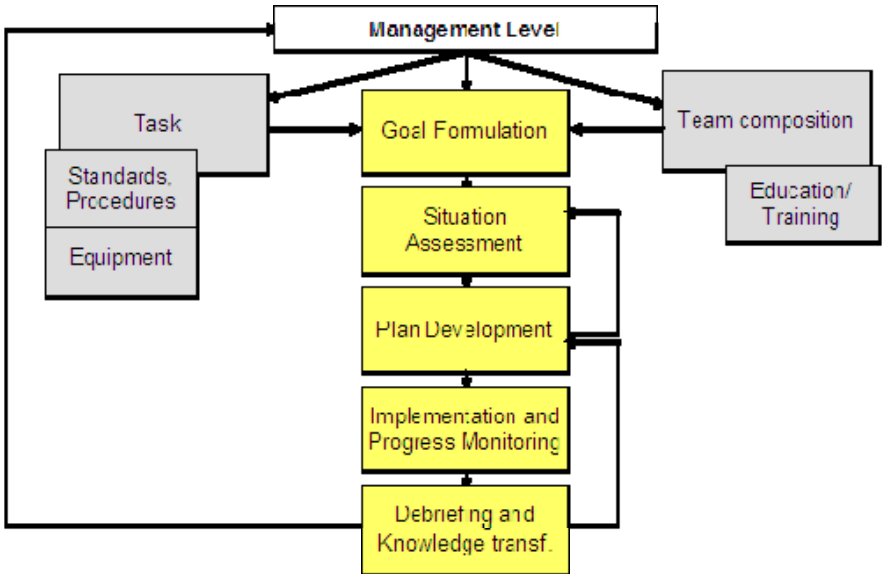
A Goal-Conflict Typology to Support Adequate Prioritization of Safety Goals in Decision-Processes Mediated via Cooperation Rooms. A Psychological Perspective Ann Britt Skjerve

Findings:

Extended definition of the concept goal conflict

...a situation in which the task-performance process implies that a (safety) goal conflicts with one or more other desired goals, as judged from the organizational perspective, and/or as judged by the individual decision-makers in real time.

Team's perception \ Trade-off criteria	No relevant trade-off criteria exist	Relevant trade-off criteria exist
A perceived safety-related goal conflict	Type I	Type II
No perceived safety-related goal conflict	Type III	Type IV



Practical Implications

Phase Name	Purpose and major issue	Means to facilitate adequate prioritization of safety goals
Goal formulation	Purpose: The facilitator should introduce the overall goal to the team mates and ensure goal commitment. It is critical to ensure that the team members understand the goal correctly and commitment to achieving the goal in a safe manner.	Communication behaviour to facilitate goal commitment. Shared work spaces might help visualising the problem and clarify the goal.
Situation assessment	Purpose: Assess the situation at hand, including the safety issues (goals) it involves. It is critical to ensure that the safety issues are adequately identified. *Lack of attention towards safety goals, e.g., failing to observe that safety goals are present and/or judging that the risk towards the safety goals are negligible*, increase the risk that safety goals will not be adequately prioritized. Goal-conflict type III and IV are associated with this phase.	A decision-support system providing a dynamic representation of the safety risks contained in the situation. Procedures and tools that contribute to ensure an adequate work process. Training in communication behaviour.
Plan development	Purpose: Develop a plan for how to deal with the situation at hand. It is critical to ensure that safety goals are adequately prioritized vis-à-vis other types of goals, and to ensure that organizational constraints (requirements in standards, procedures, etc.) are correctly clarified. Goal-conflict type I and II are associated with this phase.	An incentive system that rewards adequate prioritization of safety goals. An additional module associated with the decision-support system sketched above. The module should facilitate assessment of the effects on the safety level of different types of initiatives (e.g. simulation). A tool that supports the team in attending to existing procedures and standards of relevance in the current situation. Training in communication behaviour.
Implementa-tion & Progress Monitoring	Purpose: To implement the plan, and monitor performance progress to determine whether the plan needs to be adjusted. It is critical to ensure that the team will monitor for potential treats towards safety goals.	A tool that facilitates progress monitoring (e.g., as described in relation to the situation assessment phase).
Debriefing & Knowledge transfer	Purpose: To contribute to ensure that future task-performance processes will be adequate vis-à-vis the operator's standards.	Debriefing should reward behaviour which implies that safety is adequately prioritized. Good examples on how situations have been dealt with should be transferred to the organizational level.

Table 6 (page 53)

Cooperation and Team Performance; Challenges and Key Differentials

Findings:

Magnhild Kaarstad

- Cooperation: *a social process, involving the association of persons for common benefit*

Advantages team DM	*Disadvantages* team DM
• Brings multiple knowledge and skill together • Can result in higher quality decisions • Increases commitment	• Requires more time • Can ignore individual expertise • Encourages riskier decision (group think, risky shift)

- Additional challanges for cooperation in *integrated operation*
  - Spatial and temporal *distance*
  - Mulitnational and multicultural *distance*
    - Performance in distant teams is dependent on which team processes and outcomes one is exploring and how distance is measured

Practical Implications

- ***Key Differentials for efficient IO cooperation***
- Understandings
- Ownership
- Trust
- Common understandings
- Personal development
- Conflict resolution
- Participative decision making
- Leadership
- Commitment
- Emergency operation
- Understand culture
- Counterbalance negative effects of distance

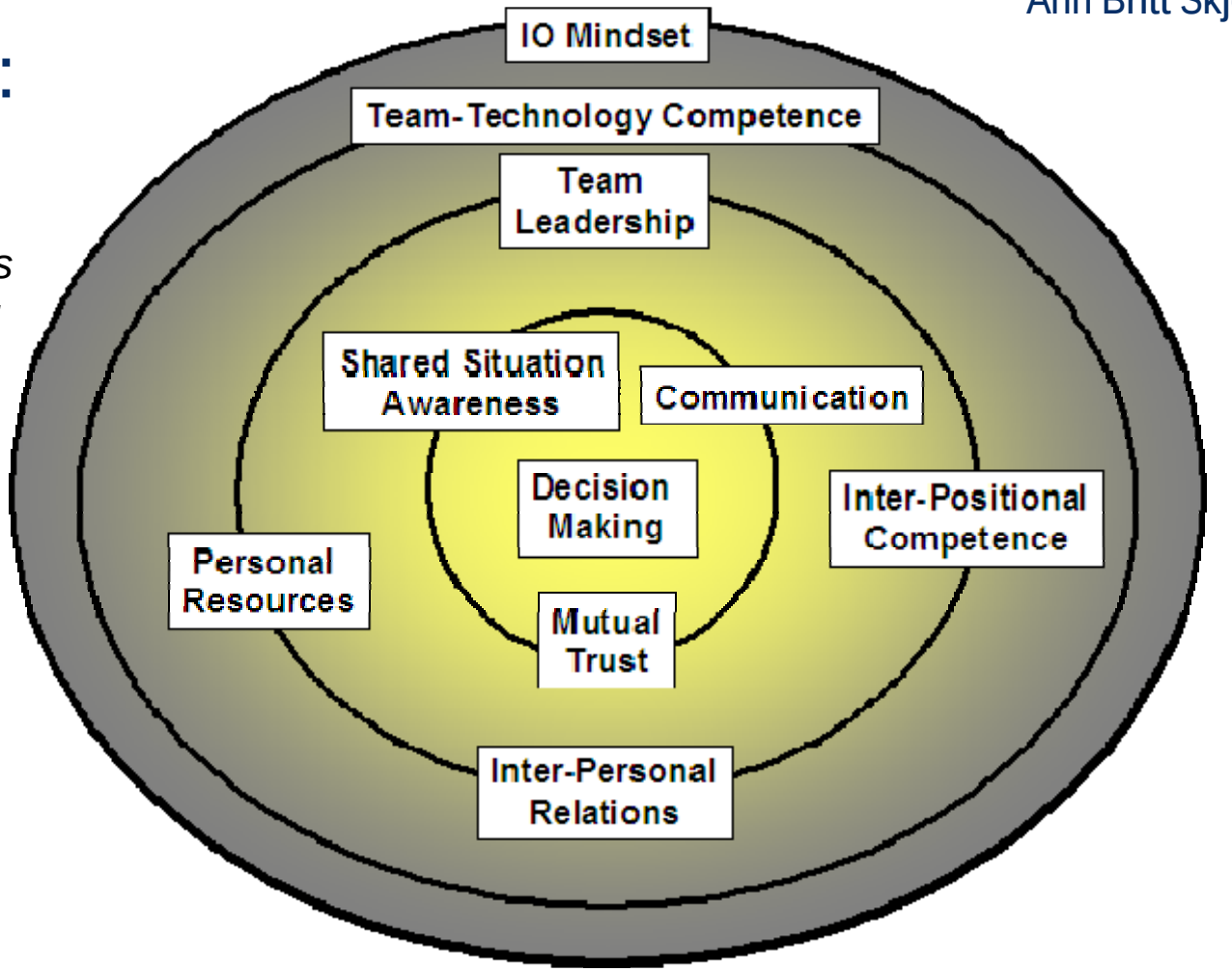
- ***Important research for IO cooperation***
- *Enhance positive aspects* with team processes in teams who have a diversity of thought, perception, background and experience, to cooperate towards common goals and achieve safe and productive cooperation
- *Investigate* how *shared understanding* is built and maintained by members cooperate through a cooperation room
- *Identify team processes* that not work well across distance, and what kind of *tools* could be developed in order to improve them
- *Employ guidelines* for how to cooperate with technical tools to achieve resilient work processes

IO Teamwork Training

Ann Britt Skjerve

Findings:

Basic Teamwork Competencies for IO Teams:



Practical Implications

Suggestion: Overall cross-company *guidelines/standards* for IO teamwork.

- Sufficiently flexible to allow adaptation to the needs in the situation at hand. Sufficiently rigid to allow employees to enter into new IO teams and contribute efficiently within a short time span (i.e., sufficiently accurate expectations).

CRM-based training:

Module 1: IO Mindset.

Module 2: Teamwork-Technology Competence.

Module 3: IO Teamwork-Competencies.

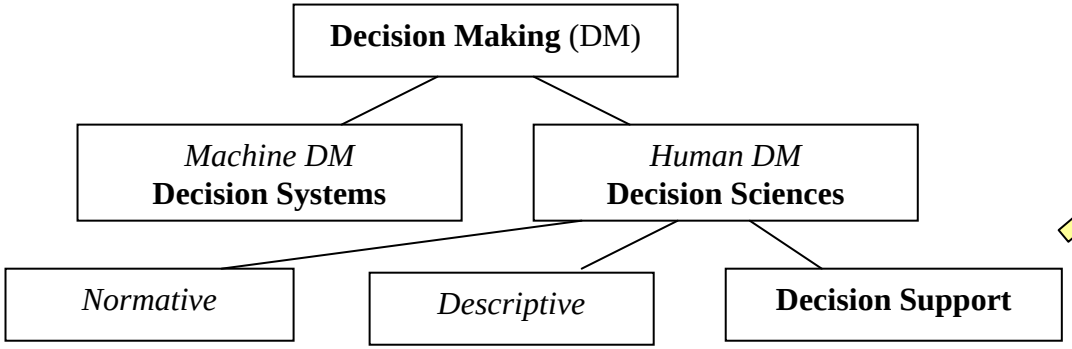
- Scenarios involving mode change from normal operation to emergency operation.
- Scenarios focusing on the attention given to team members with a less-vocal teamwork style, who hold knowledge of particular importance for successful performance, versus team members with a more-vocal teamwork style.

Decision Support to Facilitate Adequate Team Decision Processes

Findings:

Magnhild Kaarstad

- *Decision support*: a broad, generic term, encompassing all aspects related to supporting people in making decisions



Decision Support Systems:

- Individual
- Group
- Organisation

- Situations that might need Decision Support in Integrated Operation
  - Daily operation and planning
  - Project work
  - Risks/ emergencies

Challenges with automation:

- Out-of-the-loop
- Trust
- Misuse

Practical Implications

<table>
<tr><th>Daily operation and planning</th><th>Project work</th><th>Coping with risk and emergencies</th></tr>
<tr><td colspan="3">Efficient collaboration tools for knowledge sharing and discussion</td></tr>
<tr><td rowspan="2">DSS for planning and maintenance - consider following these advices:
Involve the users in the planning, development and implementation stage of the system
Get commitment from the management for developing the system– also financial
Define the system objectives clearly
Define the information requirements clearly
Ensure that there is adequate system support staff available
Make plans for the system’s further evolution, after initial usage and evaluation</td><td>GDSS to facilitate management of project complexity, and for sharing of information and expertise to improve the quality of group decision making.</td><td>Risk analysis as a part of the foundation to control risk</td></tr>
<tr><td>Descriptive support tools, including strategies and guiding principles, e.g.;
Use simple guiding principles
Respect mental models
Use landscape images
Combine and recombine
Recognise your multiple roles, don’t hide from them
Create canyons, not canals.
Tell stories
Send out scouting parties
Post and attend to road signs
Use aligned words to fuel coherence</td><td>DSS for detecting risk; based on e.g.;
Operational envelop
Three boundaries of acceptable performance</td></tr>
<tr><td></td><td></td><td>Normative support tools, including decision support for coping with emergencies based on simulator training of non-technical skills and training to make resilient decisions.</td></tr>
</table>

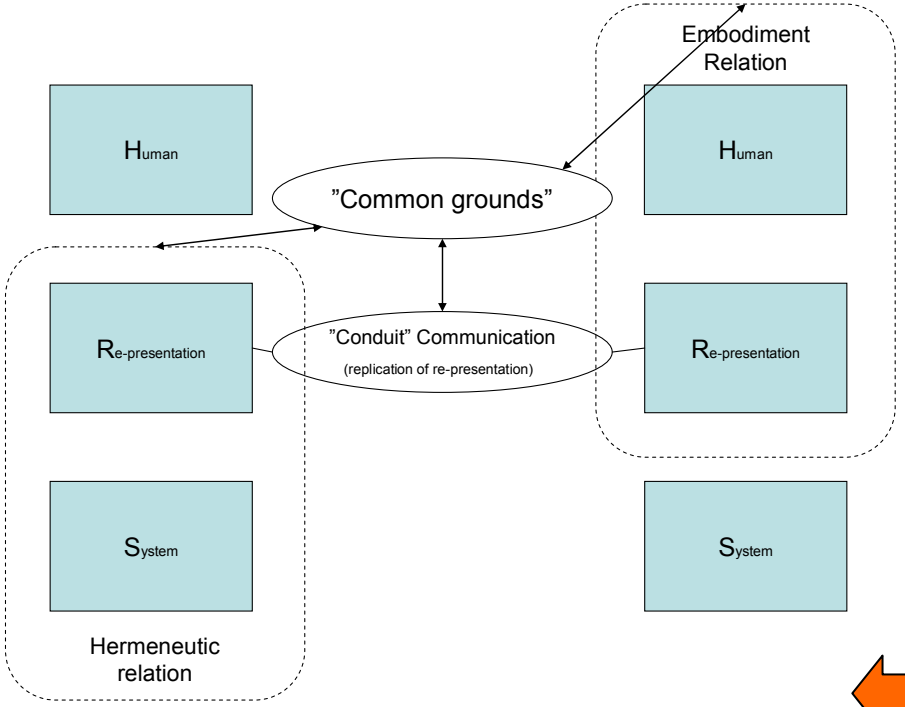
The Effect of Introducing Collaboration Technology on Recilience

Eirik Albrechtsen, Fred Størseth, Tor Olav Grøtan

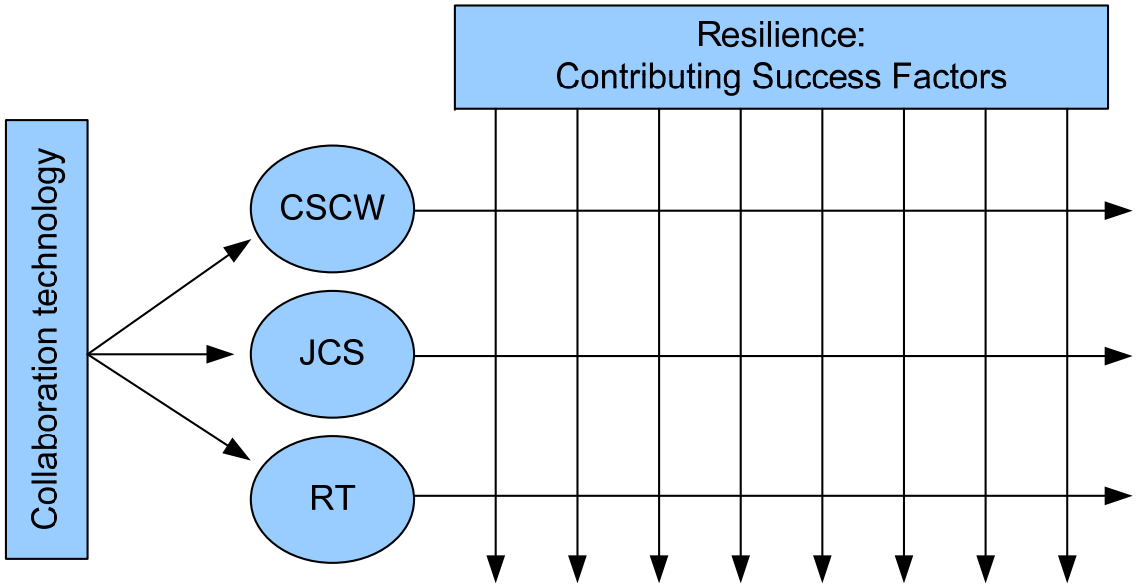
Findings:

- Three complementary positions investigated
  - Computer Supportive Cooperative Work
  - Joint Cognitive Systems
  - Representation technology

Combination of three perspectives
- An extended JCS model



Practical Implications



- Collaborative technology and resilience
  - Premise for resilience
  - Improving resilience
  - Weakening resilience

Empirical Research - WP2 and WP3

- The outcomes of the survey provide a range of suggestions to possible research questions/topics
- What topics should be addressed in the empirical part of the study?
- Key impacting factors:
  - ENI's needs
  - Basis provided by the literature surveys
  - Resources available

A Range of Possible Research Topics Is Readily Identified – Including..

Field studies / Interviews / Surveys / Lab assessments aimed at obtaining an overview of:

How work should be organized and supported to ensure resilient decision processes in IO teams.

1. What type of organizational constraints facilitates sound decision-processes in IO teams?
2. Assess various means to ensured that safety-related goals will be prioritized when goal conflicts arise in IO teams?
3. What means do efficiently support the facilitator in IO teams?
4. Assess the impact of different training methods on the quality of IO teamwork?
5. What is the impact on IO teamwork decision processes of the decision support currently used in IO teamwork?
6. Determine the impact of new collaboration technology on organizational resilience.

Possible Research Topics (1/2)

Possibility 1:

- Purpose: Develop basis for tools to enhance shared awareness in IO team decision processes:
  - Decision support
  - Procedures
  - Training

- Approach: (1) Lab assessment, jointly with IO Center, 4.1. FuCE. (2) Interviews/ field studies aimed at clarifying what tools that are currently in use, experiences and expected future needs.

Planner (screen dump) (under construction). FuCE, 4.1 IO-senter.

Risk Visualisation – Espen Nystad, IFE.

Possible Research Topics (2/2)

Possibility 2:

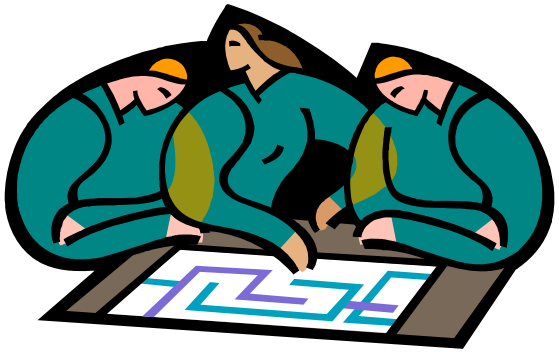
- Purpose: Provide a basis for establishing support for the role as facilitator in IO teams.
  - Decision support
  - Procedures
  - Training

- Approach: (1) Field studies aimed at identifying challenges faced by facilitators and needs for training and support. (2) If possible, data obtained from scenarios in the Lab.

Empirical Study Research Topics Discussion

Other topics?

- 5 minutes, document and discuss suggestions.



Discussion

- ENI's needs
- Basis provided by the literature surveys
- Resources available

  In particular:

  - Access to field data?
  - Access to data obtained in Lab/Cooperation with IO Center.