

# A Contingency model of Decision-Making Involving Risk of Accidental Loss

Ragnar Rosness, SINTEF  
[ragnar.rosness@sinef.no](mailto:ragnar.rosness@sinef.no)

Resolving Multiple Criteria in Decision-Making  
Involving Risk of Acciental Loss  
26th NeTWork Workshop, Schloss Steinhöfel, Germay,  
27-28 September 2007

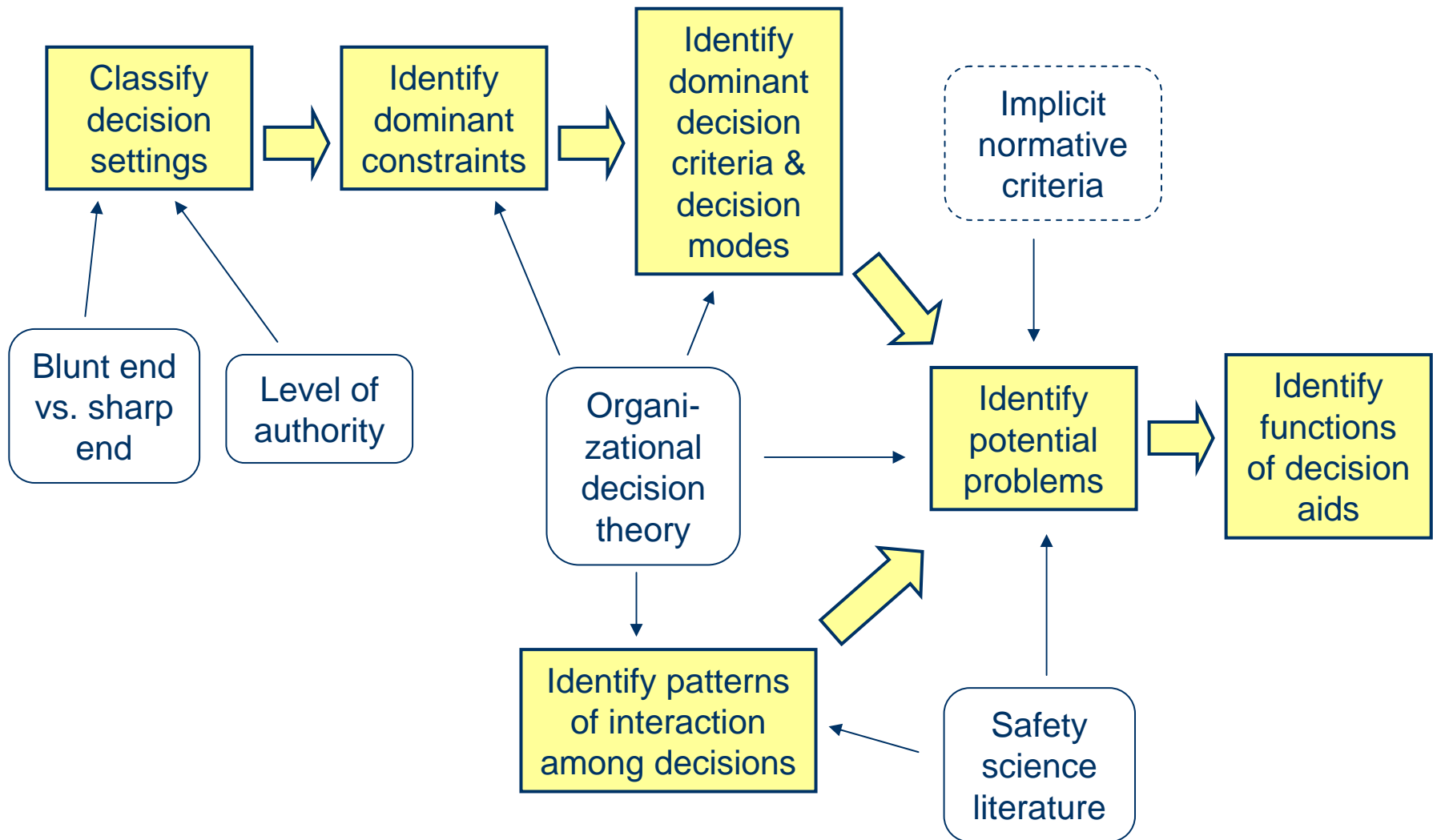
# Assumptions about decisions and decision-making

- Decision-making is viewed as an activity which we tend to "reconstruct" as a discreet process to make sense of what happened
- It is not obvious how to define and delimit a decision
- There is no way to go beyond sensemaking and observe "decision-making an sich" ("pure decision-making")
- Making better sense of decision-making may help us provide relevant decision aid / support
- Decision-makers do not always intend their decisions to lead to action
- Decision-makers do not always distinguish between decision options and preferences
- ***Decision-making and the resulting decisions are strongly influenced (or shaped?) by the situation, i.e. the constraints of the decision setting***
- ***Providing decision aid may then be viewed as an ergonomic problem (improving human-task-environment interaction)***

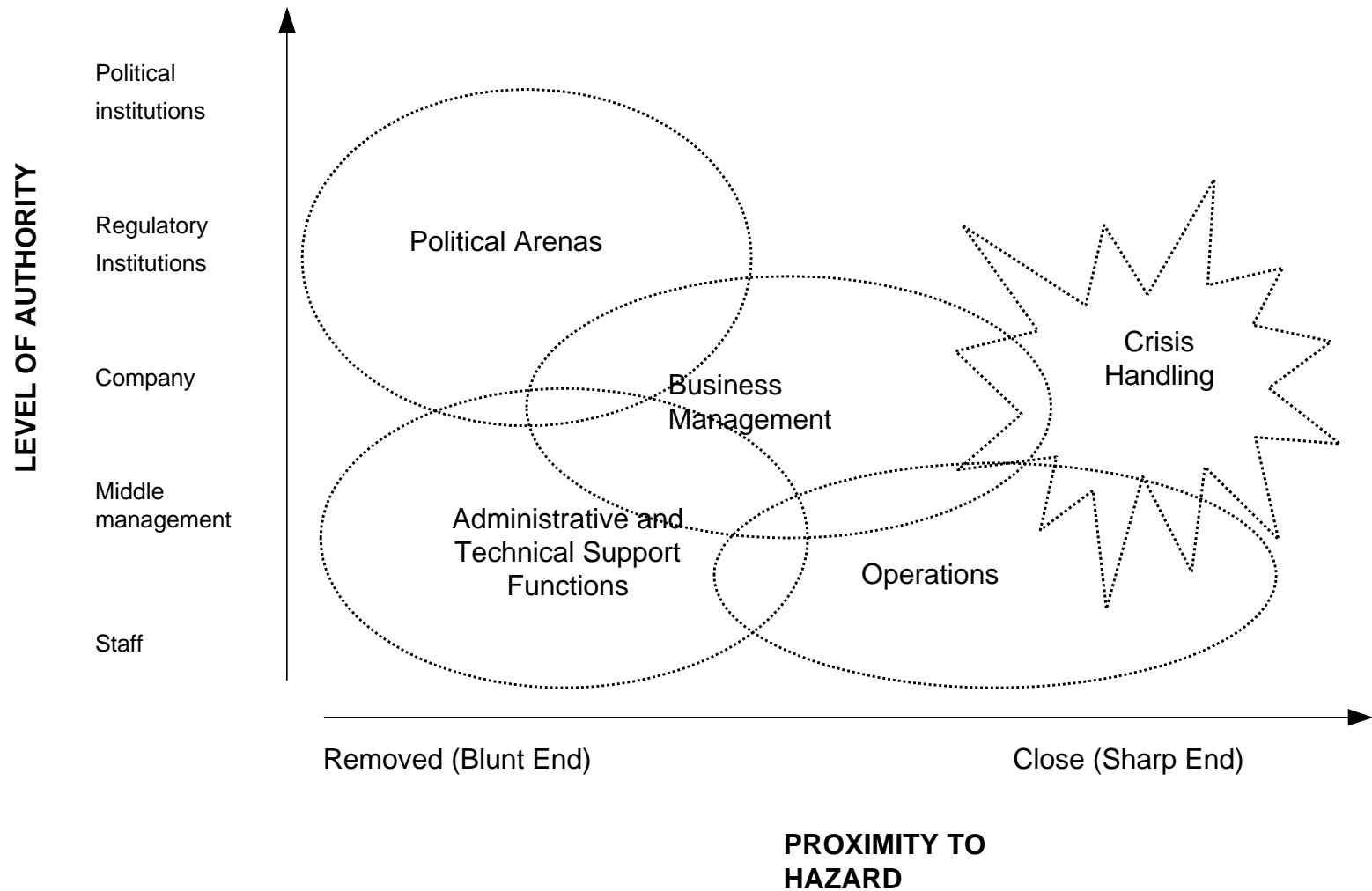
# Objectives of paper

- Provide a descriptive contingency model of decision-making involving risk of accidental loss
- Provide concepts to help us identify ways in which safety may be affected by interactions between decisions
- Derive advice for improving decision-making

# Over all structure of paper



# A typology of decision settings



<b>Decision Setting</b>	<b>Dominant Constraints</b>	<b>Dominant Decision Criteria</b>	<b>Representative Decision Modes</b>
Operations	Workload Limited situation awareness	Smooth and efficient operations Acceptable workload	Skill based and knowledge based action intermittently interrupted by knowledge based problem solving (Rasmussen, 1986) Recognition-Primed Decision-making (Klein, 1993)
Business Management	Information processing capacity Dependence on information filtered by subordinates	Optimise profit (or other KPIs) Avoid trouble Efficient decision-making Ensure commitment or compliance	Satisficing (Simon, 1947; March and Simon, 1958) “Irrational” decision-making devised to gain commitment (Brunsson, 1985)
Administrative and Technical Support Functions	Limited hands-on-knowledge No authority to enforce decisions	Comply with rules and standards Consistency Optimise a single attribute	Extensive reuse of solutions Intermittent, limited optimisation efforts (one attribute)
Political Arenas	Conflicts of interest Changing constellations of power	Robust consensus Secure status of decision-maker	Muddling through (Lindblom, 1959) Symbolic decisions not necessarily followed by action (Brunsson, 1989) Covert decision-making to avoid attention (Brunsson, 1989)
Crisis Handling	Stress Time to obtain information and act	Avert catastrophic outcomes Avoid extreme stress levels	Recognition-Primed Decision-making (Klein, 1993) Hot cognition (Janis and Mann, 1977)

# Interaction of decisions

- Distributed decision-making and local optimisation
- Meta-decisions
- Absorption of uncertainty
- Normalization of deviance

<b>Decision Setting</b>	<b>Potential Problems</b>	<b>Functions of decision aid</b>	<b>Examples of decision aids</b>
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.
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).



<b>Pattern of interaction</b>	<b>Potential problems</b>	<b>Functions of decision aid</b>	<b>Examples of decision aids</b>
Distributed decision-making with local optimization	Decisions made by different actors may interact in an unexpected manner and cause an accident.	Inform actors about possible interactions and side effects.	Case stories about incidents which demonstrate how unintended interactions may lead to accidents.
Meta-decisions	May impose goal conflicts on lower level decision-makers.	Help decision-makers structure or simplify lower level decision-making. Help decision-makers relieve lower level decision-makers from goal conflicts.	Minimum equipment lists used to support operative decisions on airworthiness, i.e. whether an aircraft may fly.
Absorption of uncertainty	Uncertainty may be underestimated. Value of flexibility may be underestimated. Robust options ignored or rejected.	Identify and communicate uncertainty and the value of flexibility in a realistic manner. Identify robust decision options.	Using scenario descriptions to display uncertainty and search for options that work well across several scenarios.
Normalization of deviance	Deviant events interpreted as normal	Detect cases of normalization of deviance	Independent reviews and audits.

# My own concerns about the paper

- Too terse and abstract, need for "more flesh on the bone", perhaps a narrative?
  - Much of the reasoning is only shown in the tables
- Have I missed important recent work?
- The list of ways in which decisions may interact may not be comprehensive enough
- The selection and interpretation of theory and results from organizational decision theory may be too arbitrary