

Safety management in different high-risk domains – all the same ?

Prof. Dr. Gudela Grote
Departement Management, Technology, and Economics
ETH Zürich

Overview

- Fundamentals of safety management
- Limits to generalizability
- A closer look at some elements of safety management
 - Safety culture
 - Incident reporting
 - Rules
 - Team training
- Final observations

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Safety management systems: Definitions

- Arrangements made by the organization for the management of safety in order to promote a strong safety culture and achieve good safety performance (INSAG, 1999)
- Organized approach to managing safety, including the necessary organizational structures, accountabilities, policies and procedures (ICAO, 2006)
- Often, the basic management cycle of plan-do-check-act is emphasized and an integration with other management systems, especially quality management, is advocated.

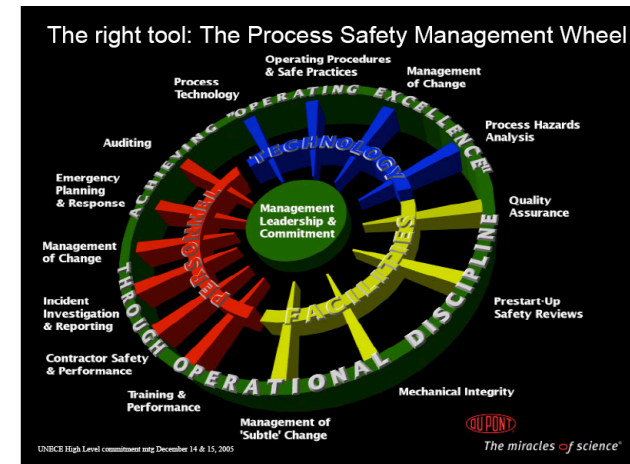
Safety management systems: Common elements

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- Safety Policy
- Management commitment
- Risk identification and mitigation
- Safety resources and responsibilities
- Standards and procedures
- Training
- Safety performance monitoring
- Continuous improvement
- Management of change

Safety management systems: An example – The Dupont model

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Limits to generalizability

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- External regulation vs. self-regulation
- Personal vs. process safety
- Minimizing vs. coping with uncertainty
- Relevant organizational characteristics

External regulation vs. self-regulation

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- Regulatory bodies
 - Number, functions, interaction, etc.
- Regulation regime
 - Prescriptive vs. goal-oriented, prescription of content vs. process, zero-risk vs. acceptable risk, etc.
- Role of the regulator and relationship with regulated organization
 - Expert, independent authority, representative of public interest, etc.

Personal vs. process safety

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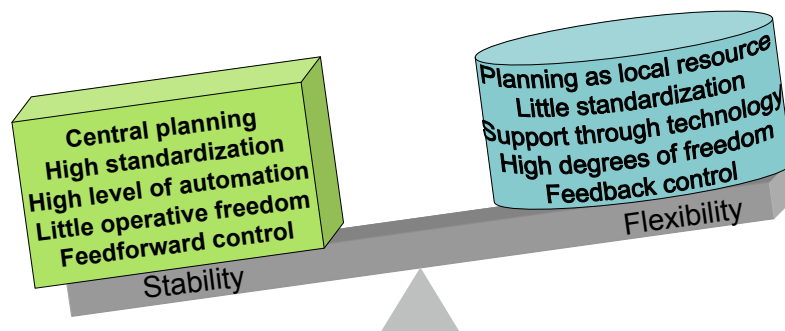
- Personal safety =
Risks for own health and well-being
- Process safety =
Risks inherent in a primary work process
 - Personal and process safety may or may not be related depending on the primary work process.
 - Causal mechanisms differ between incidents related to personal vs. process safety (e.g. due to visibility of risk, motivation, required competence, task complexity).

Minimizing vs. coping with uncertainty

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(Grote, 2009)

- Balance between **minimizing uncertainty**, which creates stability, and **coping with uncertainty**, which creates flexibility



Balance between stability and flexibility

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- Stability requirements
 - Tightly coupled processes
 - Traceability of decisions and processes
 - Low fault tolerance
 - Low qualification level of personnel
- Flexibility requirements
 - Frequent external changes
 - High variance in work processes
 - Avoiding overroutinization and complacency
 - Need for innovation

Relevant organizational characteristics

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- Tasks and work processes
 - Complex vs. simple, routine vs. innovation, types of interdependencies, etc.
- People
 - Types and levels of qualification, demographic and psychological diversity, tenure, etc.
- Organization structure
 - Levels of hierarchy, functional division, distribution of decision authority, etc.
- Technology
 - Level of automation, ergonomics, degree of penetration, etc.
- External relationships
 - Unionization, supply chain dependencies, outsourcing, etc.

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Safety culture: Long-standing issues

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- Safety culture vs. safety climate ?
- Safety culture vs. no safety culture or Good vs. bad safety culture ?
- Explanatory power of safety culture ?
- Characteristics of (good) safety culture for measurement, management, prescription ?

Safety culture: Suggested clarifications

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- *Shared norms and assumptions* guiding behavior (=culture) versus shared perceptions of organizational reality (=climate)
- Core criterion for "good" safety culture: norms and assumptions that support *adequate balance between stability and flexibility*
- Focus on safety culture as a *leading indicator* rather than a lagging indicator (=aiming for predictive power instead of post hoc explanation)
- Avoid attempts to manage or prescribe culture, but address existing *culture as source of resistance against change* towards more safety

Safety culture: Some specifics

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Regulation	External Focus on safety management, not culture	Self Culture to be monitored, especially during change
Risk	Personal Culture needs to prioritize safety over task fulfilment	Process Culture as support for good task fulfilment
Uncertainty management	Minimizing Culture is secondary for organizational functioning	Coping Culture is crucial for coordination and integration
Task	Complex, novel (no specifics)	Simple, routine (no specifics)
Team	Homogeneous Strong culture may be detrimental (group think)	Heterogeneous Culture is crucial for coordination and integration

Incident reporting: Some specifics

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Regulation	External Public reporting can be forced	Self Internal learning is facilitated
Risk	Personal (no specifics)	Process (no specifics)
Uncertainty management	Minimizing Incident reports as basis for stricter control	Coping Incident reports as basis for better support
Task	Complex, novel Incidents may be difficult to detect	Simple, routine Incidents as opportunity for deroutinization
Team	Homogeneous Reporting hampered by complacency	Heterogeneous Reporting hampered by conflicting interests

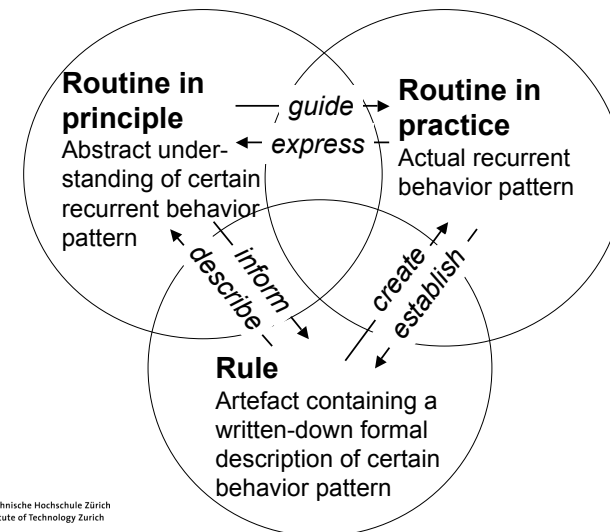
Incident reporting

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- Objective
 - Learning from (minor) events to avoid (major) events
- Variations
 - Report incidents with own involvement vs. observed incidents, confidentiality, voluntary vs. prescribed reporting
- Problems
 - Underreporting, differential reporting, analysis of reports, follow-up with concrete measures, blame and punitive action, sharing information

Rules: A general framework

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Rules: Support for flexible routines

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- Determine desired balance between stability and flexibility
- Use goal and process rules for flexibility and action rules for stability
- Match responsibility and capabilities for uncertainty handling
- Good rule ?

"The correct functioning of the train control system and the automatic traffic control system is to be monitored by the signaller. If necessary, he/she has to intervene manually.

During normal operation, no monitoring is necessary as long as the operational requirements are met.

In the case of disturbances or incidents, the notification of the required services and the required alarm procedures must be guaranteed."

Rules: Some specifics

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Regulation	External Prevalence of legal perspective on rules	Self Prevalence of rules as coordination mechanism
Risk	Personal Predominance of action rules	Process Predominance of goal and process rules
Uncertainty management	Minimizing Predominance of action rules	Coping Predominance of goal and process rules
Task	Complex, novel Predominance of goal and process rules	Simple, routine Rules especially for handling exceptions
Team	Homogeneous Rules as safeguard against complacency	Heterogeneous Rules as common ground

Team training

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- Content of training
 - Technical knowledge and skills, safety knowledge and behavior, "non-technical skills" (e.g. coordination, leadership, decision-making, situation awareness)
- Training methods
 - The more engaging (lecture vs. behavioral modeling/simulation) the more profound the learning
- Training evaluation
 - Subjective assessment, knowledge gain, behavior change, organizational outcomes

Team training: Some specifics

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Regulation	External (no specifics)	Self (no specifics)
Risk	Personal Training as support for self-protection	Process Training as support for managing task interdependencies
Uncertainty management	Minimizing Training focuses on drills	Coping Training focuses on problem solving
Task	Complex, novel Training focuses on problem solving	Simple, routine Training focuses on avoiding overroutinization
Team	Homogeneous Training for questioning own behavior standards	Heterogeneous Training for coping with internal interfaces

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- Implementation of safety management systems seems to run in circles among industry domains.
- Transfer of knowledge across industry domains oscillates between "one size fits all" and "reinvention of the wheel".
- The suggested limits of generalizability are hoped to support a systematic evaluation of meaningful transfers across industry domains.