

Safety culture and perceptions and practice with nanomaterials in academia and industry



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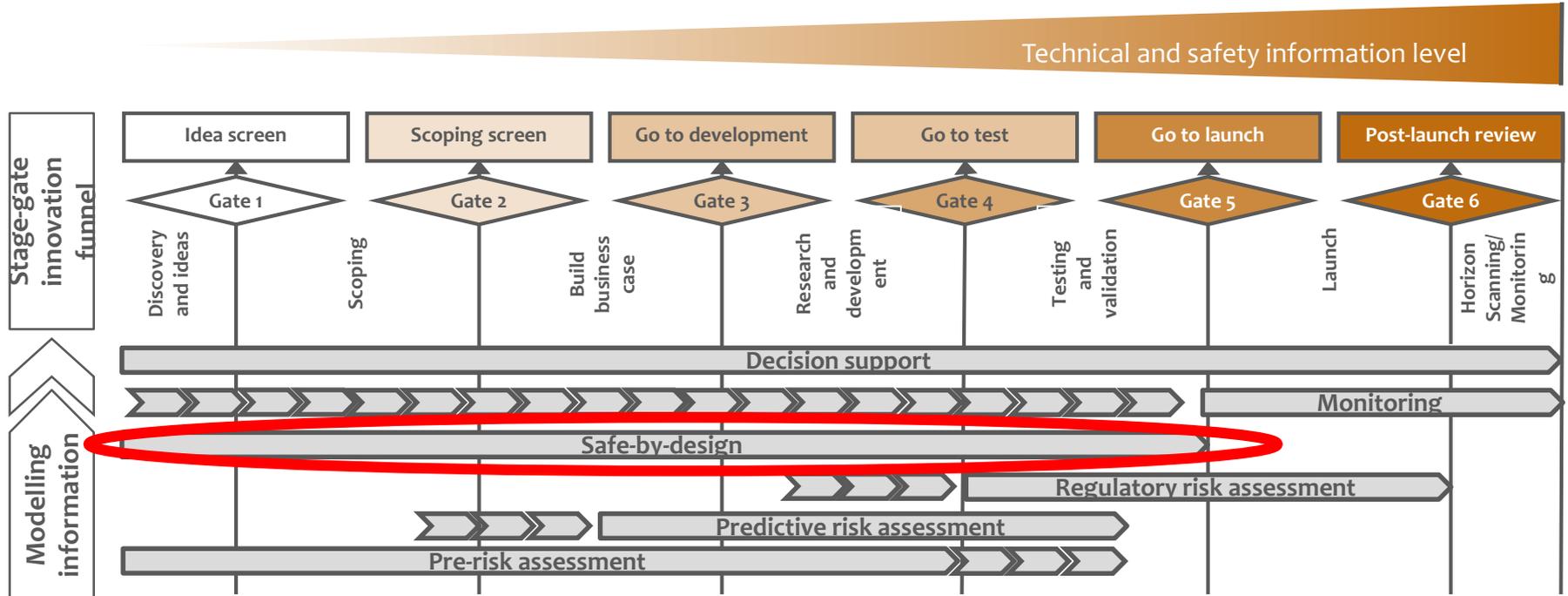
Affiliation

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- **Authors:** Marie Louise Kirkegaard, Pete Kines & Keld Alstrup Jensen; National Research Centre for the Working Environment, Denmark

Background

- Work and research with nanomaterials (NM) has primarily focused on innovation, toxicity, governance, safety management tools, and public perceptions
- Knowledge of the **application** is greater than of its **implications**
- **Precautionary principle**: Appropriate precautionary measures should be taken even when the cause and effect relationships are not fully established scientifically

Stage-gate model



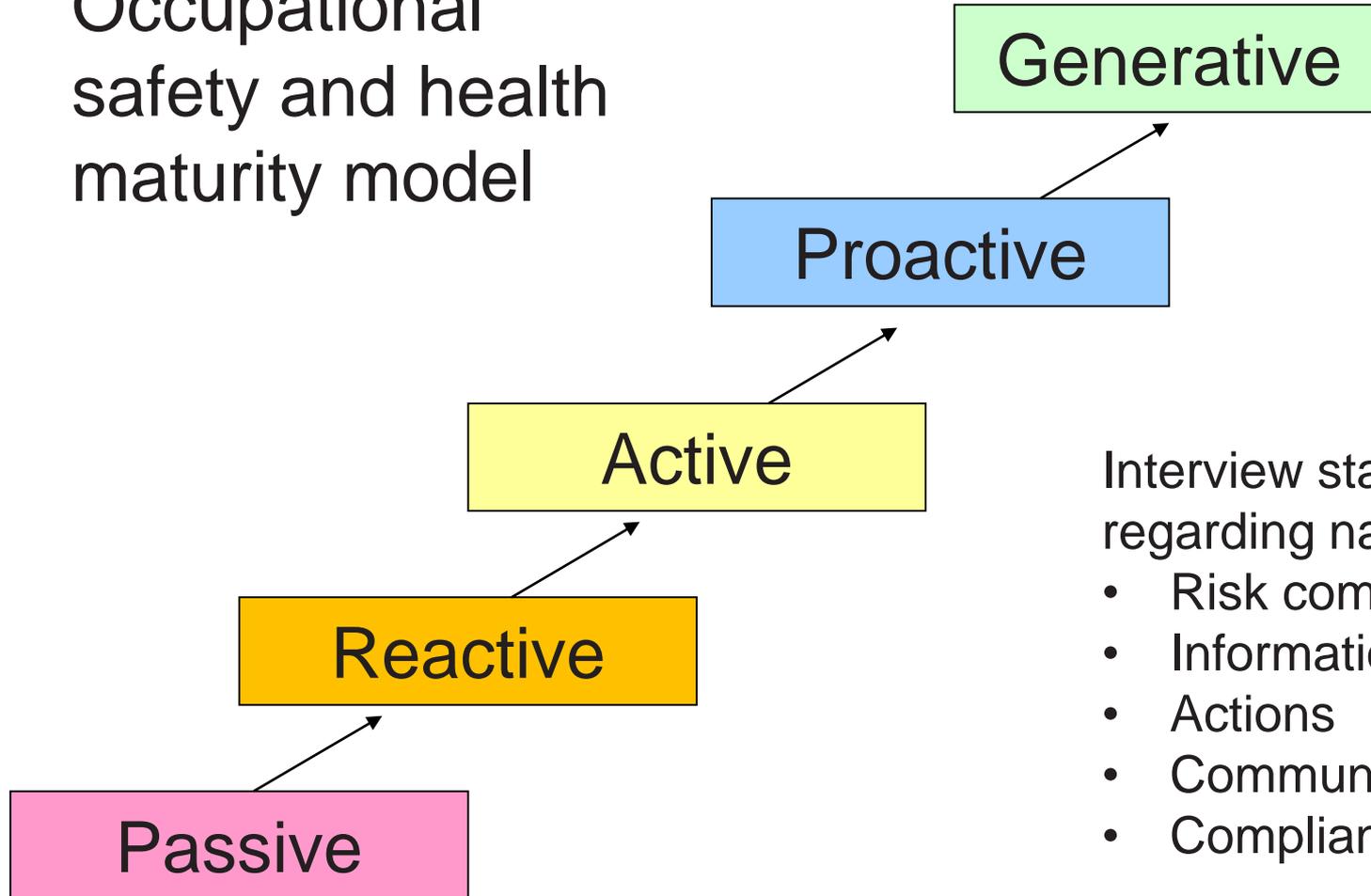
Presentation objective

- Preliminary results of a study of OSH professionals' in **academia** and **industry** and their perceptions and actions in attaining and applying knowledge about nanomaterials in relation to a safety culture model

Method

- Semi-structured interviews with OSH professionals (2016-2017)
- **Five** academic institutions
- **Five** industrial companies
- **Five** topics regarding nanomaterials (coded in Nvivo pc program)
- **Five-step** safety culture ladder model

Occupational safety and health maturity model

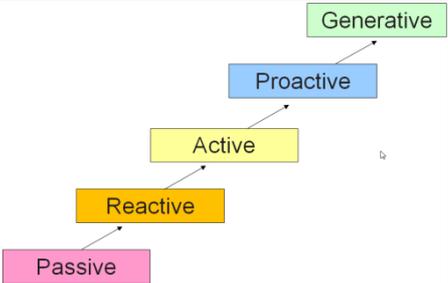


Interview statements
regarding nano:

- Risk comprehension
- Information gathering
- Actions
- Communication
- Compliance

Results

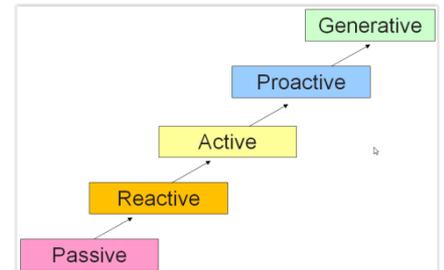
- Approximately 300 relevant interview statements were coded

OSH themes	Risk comprehension	Information	Actions	Communication	Compliance
Safety culture level					
					
		Numbers removed until published in journal			

- No 'exemplary' statements
- Majority of statements are 'active'

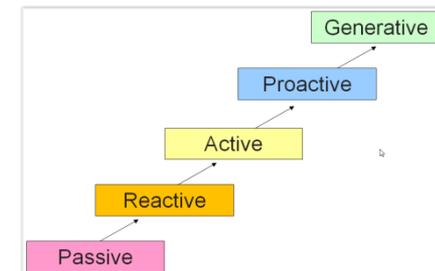
1. Risk comprehension

- Nano-safety through planning and procedures (proactive)
- Various information and system checks (active)
- Lack of understanding of when and where NM were dangerous (reactive)
- Risks as a part of the job (passive)



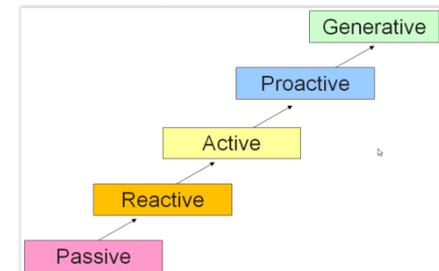
2. Information

- Up-to-date legislation, certification (proactive)
- Cooperation with suppliers and consultants, safety data sheets, SOPs (active)
- Currently available OSH information for NMs was described as too complicated to understand, insufficient, impractical and inaccessible (“**nano information jungle**” on the internet) (reactive)



3. Actions – handling NM

- Eliminating NM contact, designated NM handlers; involvement in design and layout of lab and equipment selection (proactive)
- Hierarchy of prevention and ‘precautionary principle’ (active)
- Trust in labelling from suppliers, focus on equipment (reactive)
- No risk assessment of measures – only small amounts (passive)



Hierarchy of OSH measures



1 Avoid / eliminate the hazard



2 Technical safety measure



3 Organizational safety measures



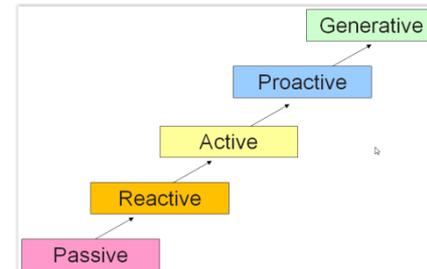
4 Use of personal protective equipment



5 Behavioural safety measures

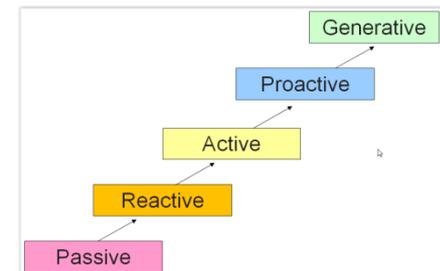
4. Communication

- Primary introduction focused on procedures (academia) vs. practice (industry)
- Adapting info, reinforcing training, certification training (proactive)
- Specific nano intro, formal training (active)
- General info, self help, buddy system training (reactive)



5. Compliance

- 'Part of the job' (reactive) vs. Zero tolerance for risks (proactive)
- Level of compliance was reflective of managerial attitude (walk the talk), the type of assignments, availability and applicability of PPEs.



Structural differences

Academia vs. industry - provide challenges in affecting and sustaining cultural change in safety, e.g.:

- Size and organisational structure (smaller and less complex in academia)
- Turnover, cultural and linguistic diversity (greater in academia)
- Academia rarely audited by OSH authorities and professionals

- Nano-specific OSH program – more common in industry
- Powder vs. liquid based NM applications

Needs

- Information that is easily accessible, applicable and low level of complexity (easily understandable)
- Nano-specific OSH programs that cover all aspects of the life-cycle - from research and design to disposal
- Allow for flexible deployment of multilevel and integrated OSH initiatives to support sustainable nanotechnology and operational excellence

Implications

- Politicians, engineers to collaborate with communication experts and social scientists in effectively **framing** information on NM
- Both **credibility** and **culture** need to be taken into consideration

Thank you for your attention



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