Environmentally safe nanotechnologies – from innovation to commercialisation

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Who we are?

- Multidisciplinary research, consultancy, training, occupational and environmental health, hygiene, risk
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  - Practical solutions
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- Since 1st September 2012
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What you will learn

- Occupational, consumer and environmental risk management is a "must"
- Need to think beyond today's innovation
- **To control risk, we need to…**
  + Understand how risk propagates from A-Z
  + identify key factors along supply chains
  + integrate EHS in our R&D efforts

…which will improve the commercialisation

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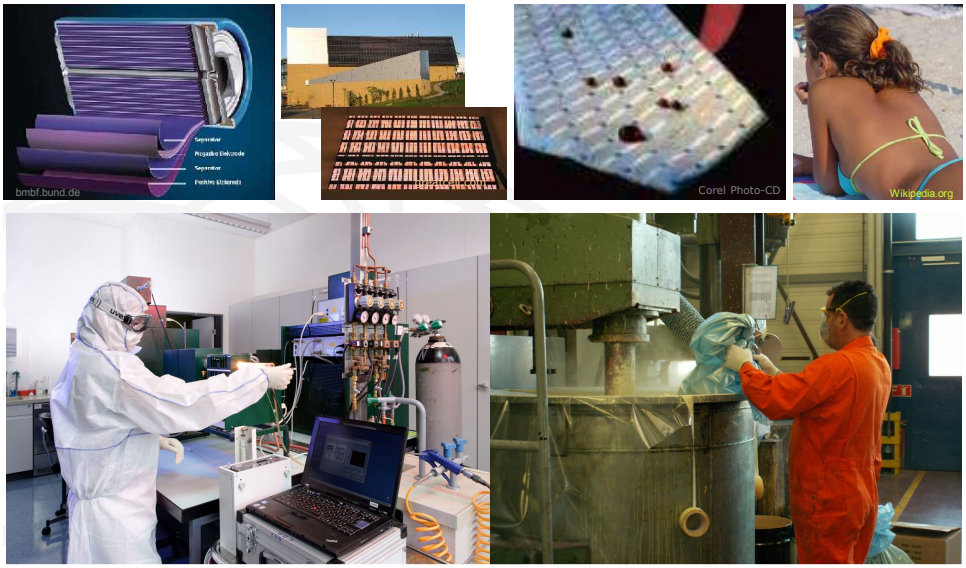
Nanomaterials are widely used in real (working) life situations



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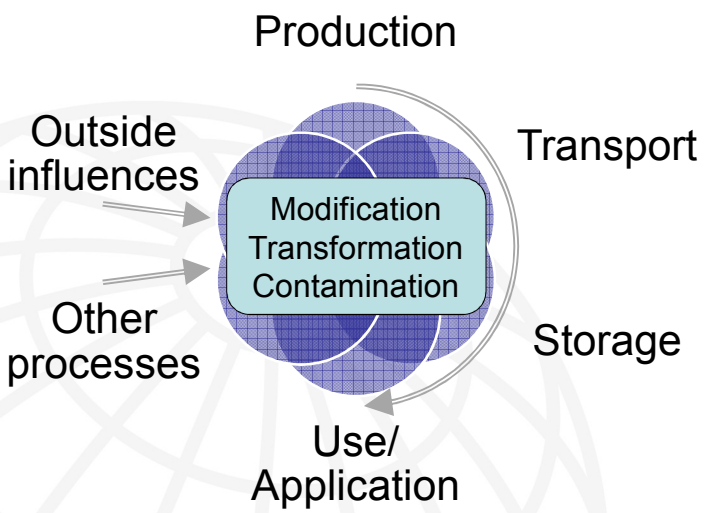
What happens in the real world?



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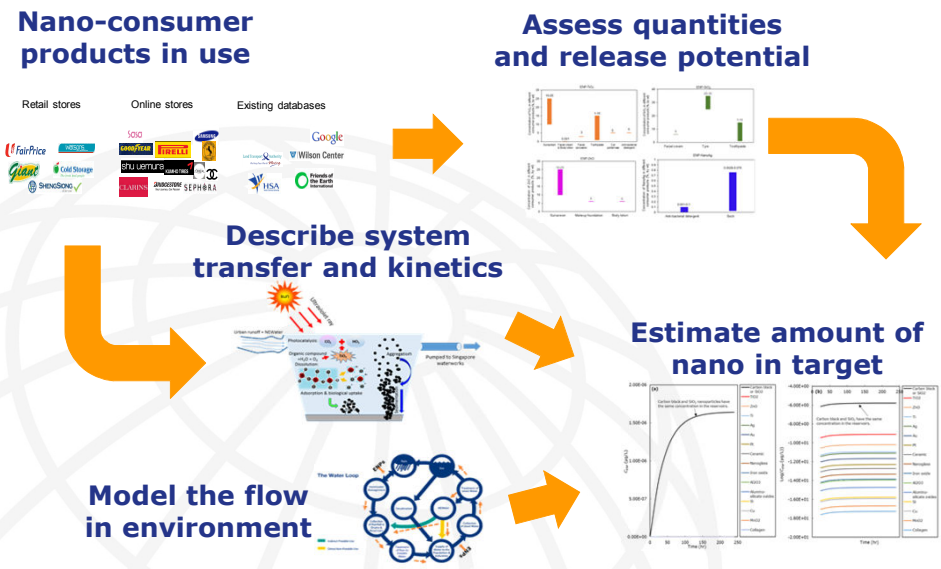
Nanomaterial in the environment



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Example: surfaces value chain

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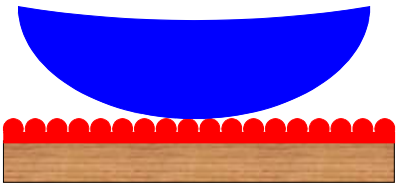
Clean with passive structures

Lotus flower (nature):
Nanostructure +
hydrophobic material

➢ always clean



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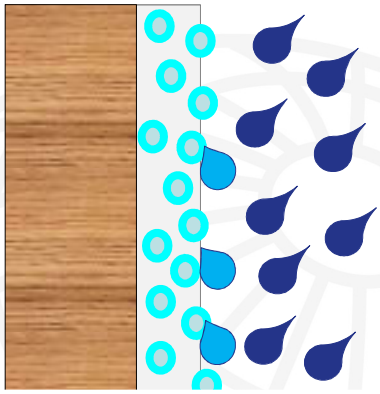
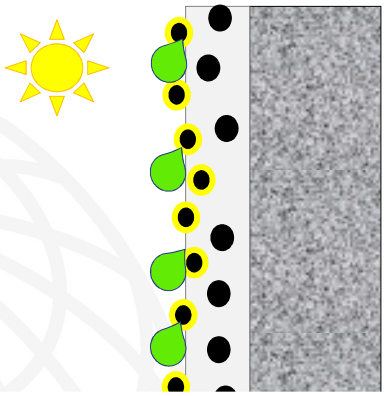
Clean with active nanomaterials

Leaching silver-ions



Silver kills bacteria and algae
No bleaching of support

Production of radicals



Nano-TiO_2 produces radicals
Destroys all organic material

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Future of "successful" product

Scenario: Massive deployment of product

Nano-Silver

Use: Silver getting into waste-water and environment

-> Increases risk of bacterial resistance

End: Silver getting into landfills

-> can leach into ground-water

Inherent problems:
Silver must leach to have effect
Silver is precious – price hike!

Nano-TiO_2

Use: Radicals may destroy surface material

-> TiO_2(n) release possible

End: Destruction often results in dust formation

-> TiO_2(n) release possible

Solvable problems:
Radical-resistant support
Avoid dust during destruction

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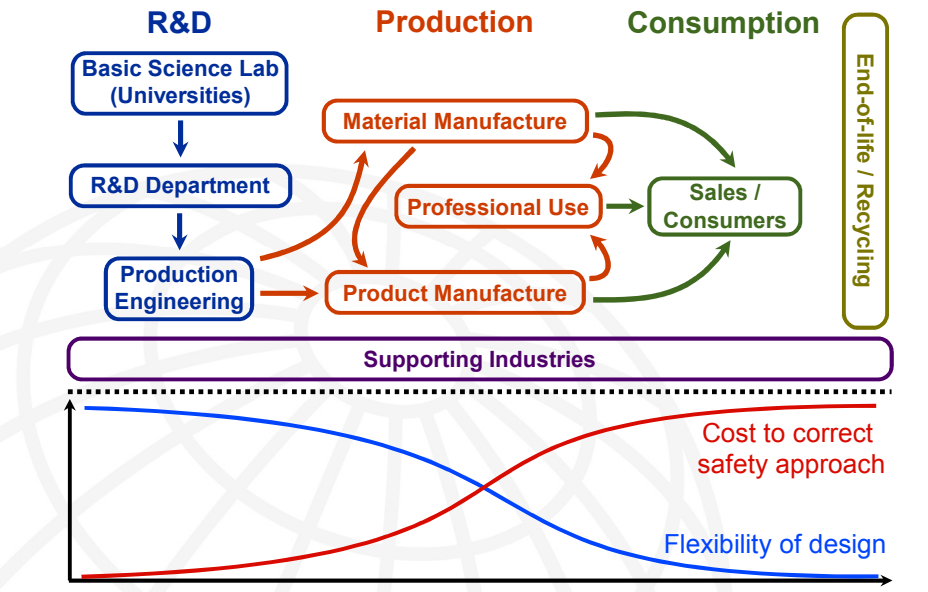
Life-Cycle / Value Chain focus



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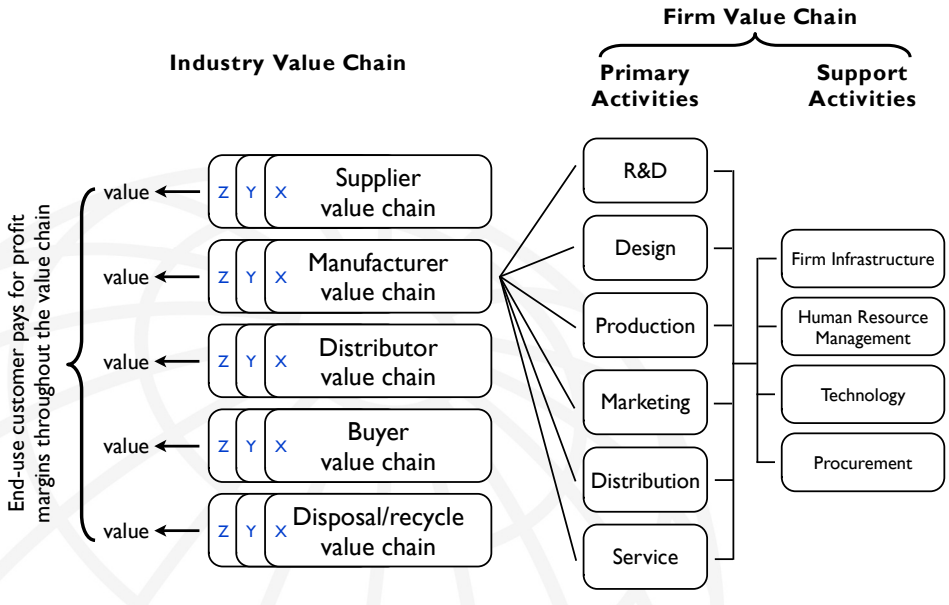
Value Chains at different levels



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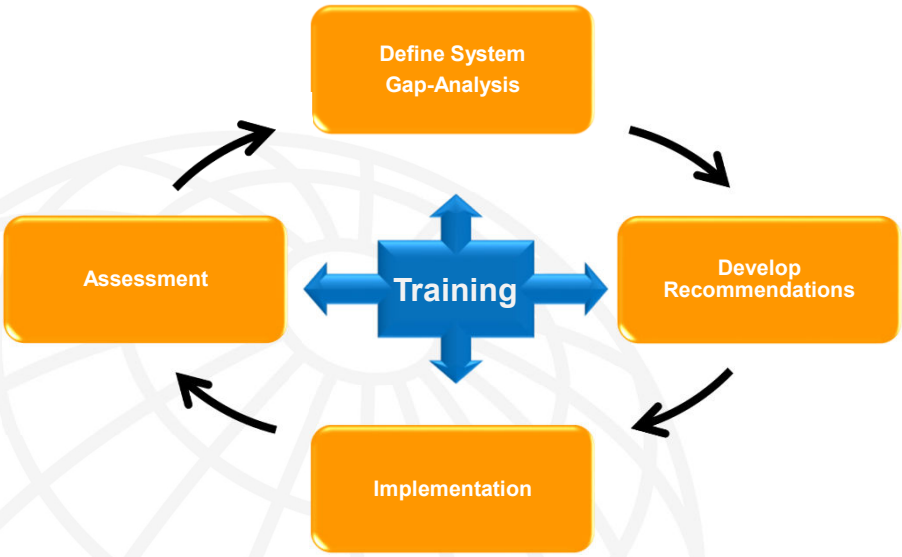
Analysis of companies and full value chain is continuous cycle



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Who controls the risk

R&D

- Make product safe for user and environment
- Avoid unnecessary risks for workers

Production engineers, upscaling

- Keep product safe for user and environment
- Make production safe for workers

Sales and aftermarket

- Make sure clients know how to use safely

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Recommended strategy for R&D

1. Define required product properties
   - Consumer desire it (marketing)
   - Regulators demand it (legal)
2. Find ways to have such a product that is…
   - Safe for the consumer (safety, QA)
   - Friendly to the environment (EHS)
   - Profitable for your company (logistics, QA)
3. Optimise approach along value chain to...
   - Make it safe for environment and workers (EHS-EHS-EHS)
   - Make overall safety economical (finances-f..-f..)

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Challenges along value chain

- Those with benefits may not carry the risk
- Culture of isolated approaches
- Cost given priority over environment/health

Value chain optimisation approach helps identify and understand these challenges.

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From uncontrolled risk to business success

Uncontrolled risk is a risk to business:

- Workers, consumers and environmental risks
- Risks promoted along the value chain

Risk management is part of the business:

+ Own the Know-How to control risks from A-Z
+ Give specifications to supply chain
+ Reduce dead-end R&D efforts

Risk management is best part of the innovation process

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Thank you

- For more information:
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  - http://www.safenano.org