Integrating human factors within MAE control measures: Error and ALARP in offshore petroleum activities

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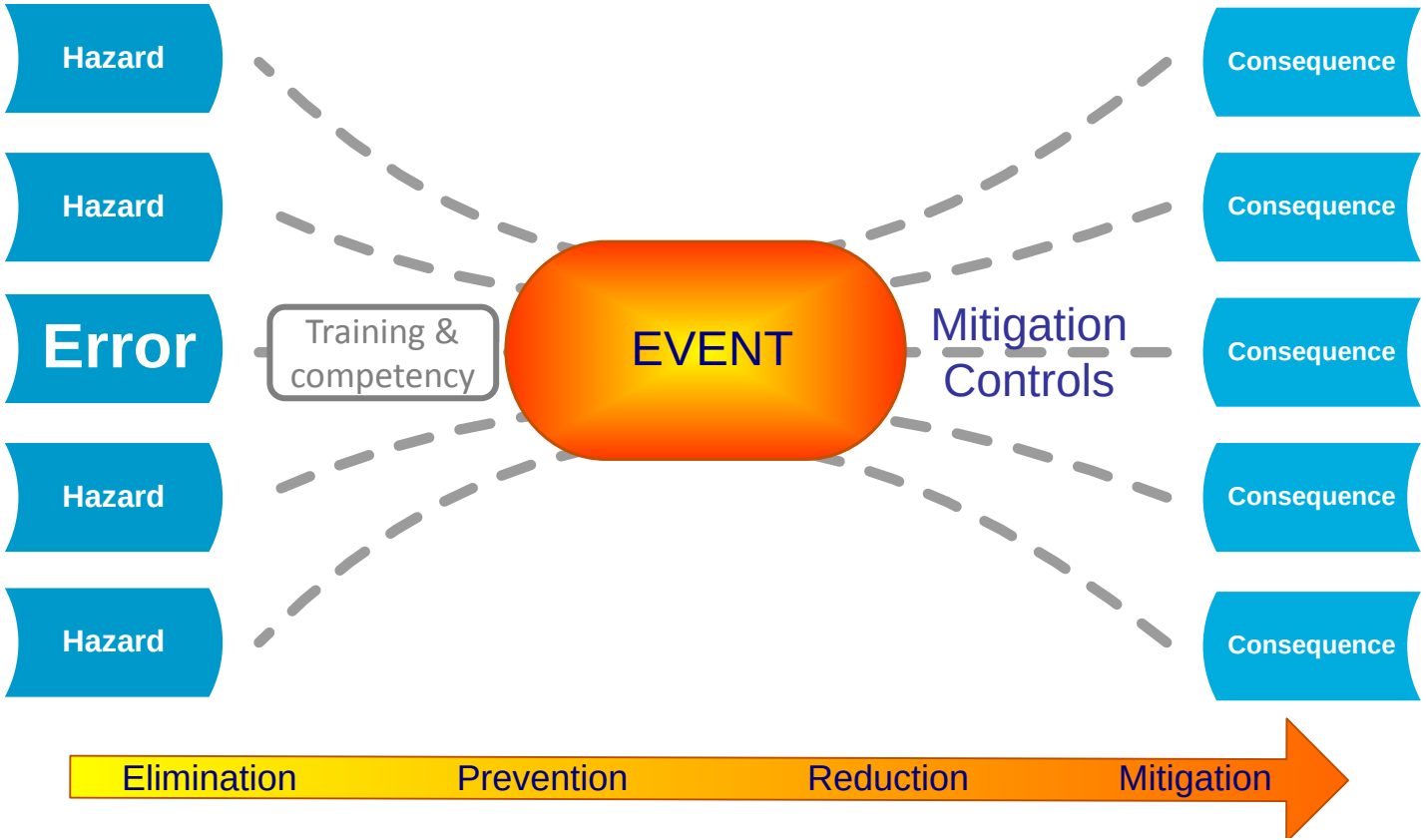
Human Factors and MAEs

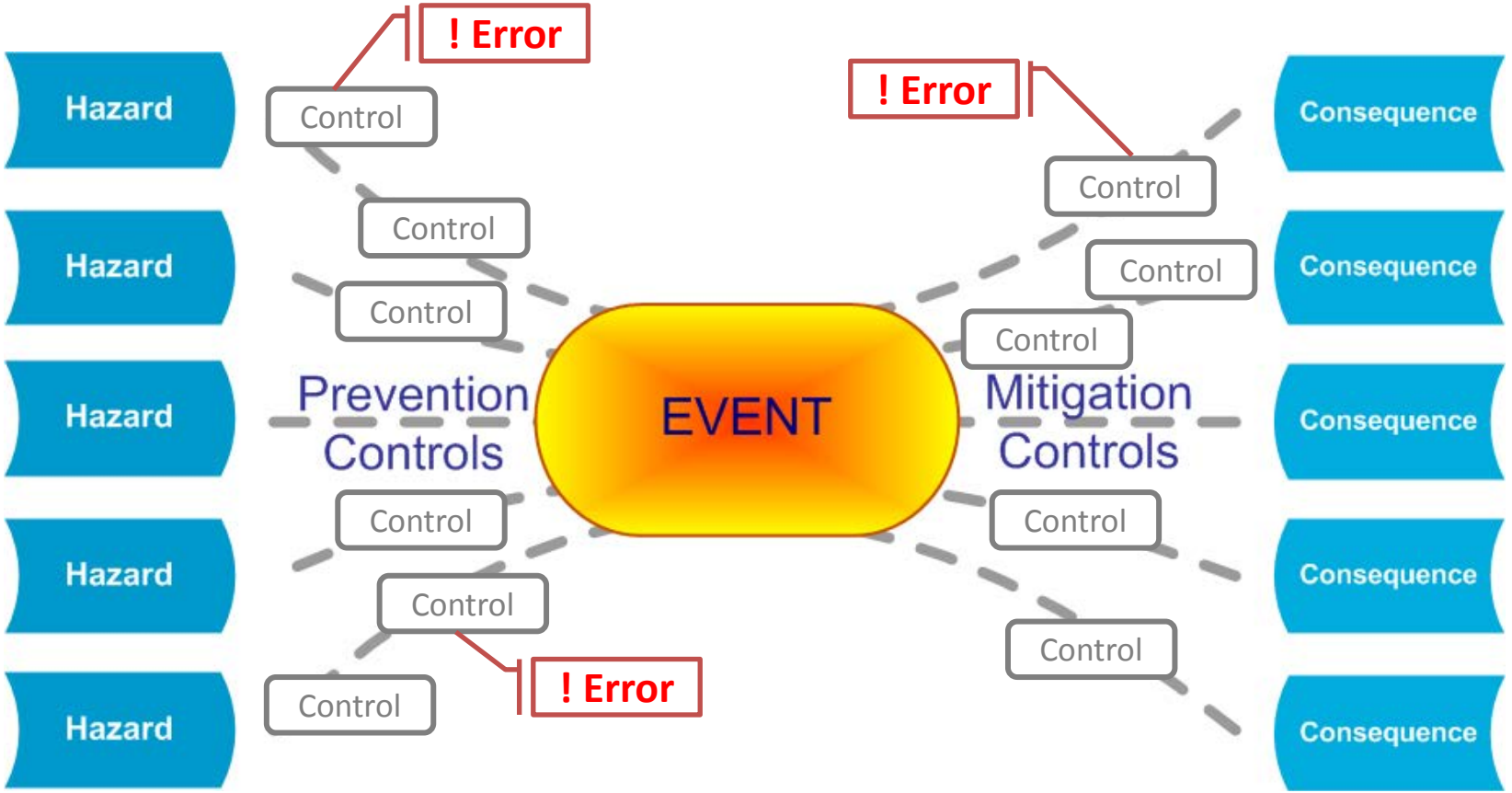
- Humans interact with control measures
- Error can be a barrier-defeating factor
- Error risk can be addressed through adapted traditional risk management approaches

Reducing error risk

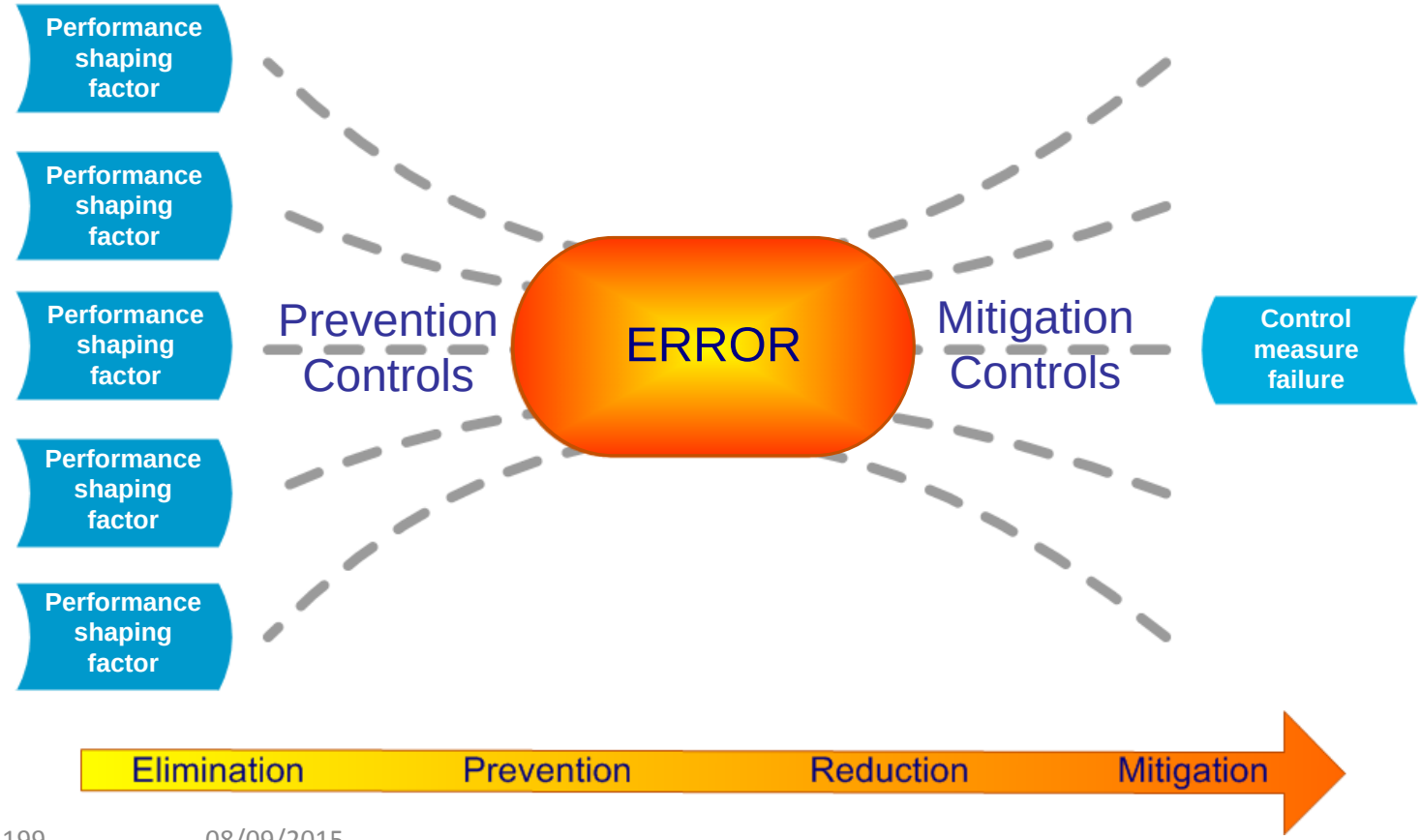
Typical approach



A more accurate approach



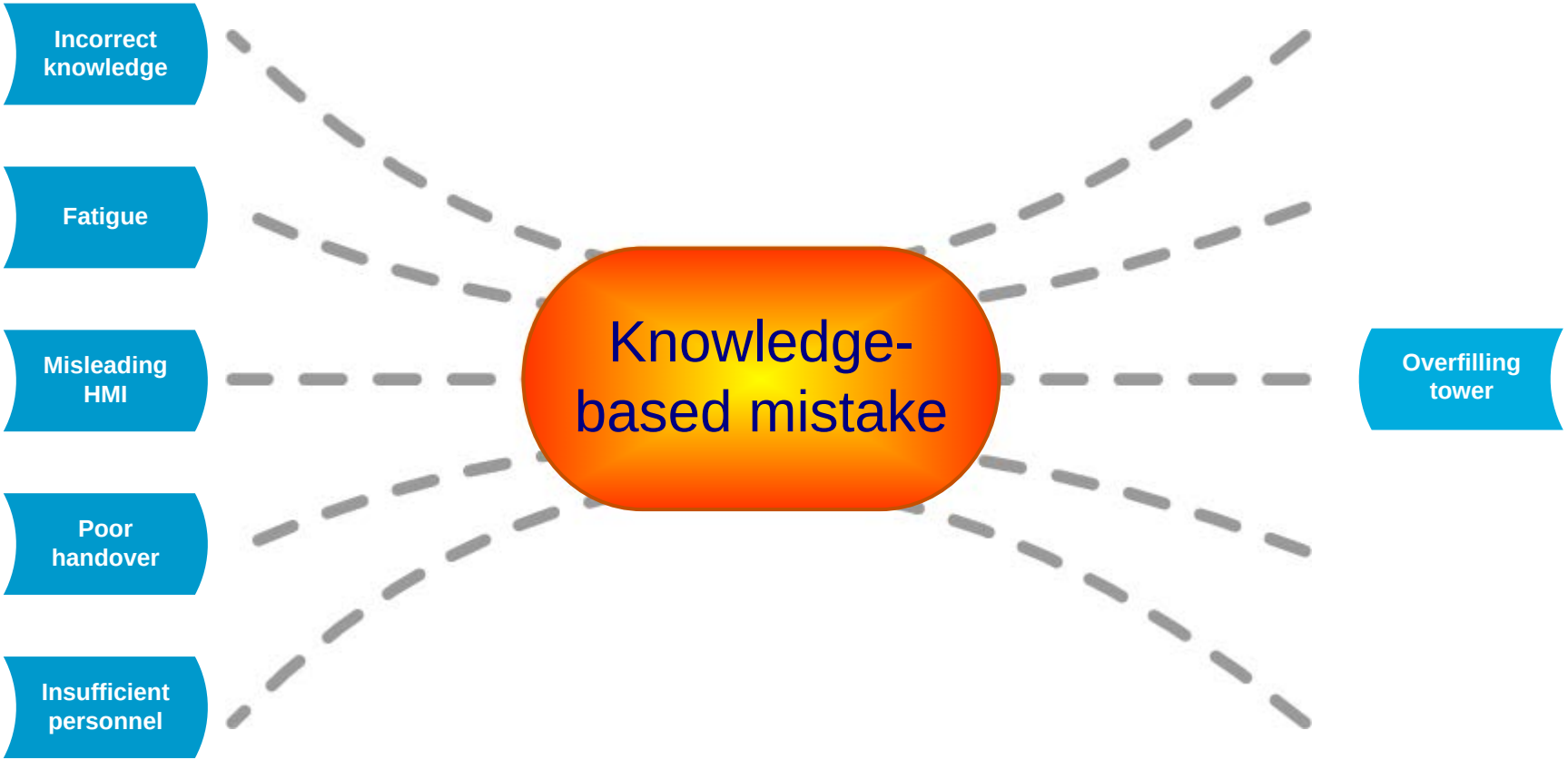
A deeper exploration



Example – Texas City Refinery

- March 23, 2005
  - Isomerization unit start-up
  - Operators overfilled the raffinate splitter tower
  - Pressure relief devices activated
  - Flammable liquid spurted from a blowdown stack
  - No flare installed
  - Ignition, explosion and fire
  - 15 deaths, 180 injuries

Error analysis



Possible controls

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Benefits of error analysis

- Classify potential high-risk errors
- Identify critical PSFs
- Develop targeted control measures
- Focus on prevention and mitigation
- Facilitate risk reduction to ALARP

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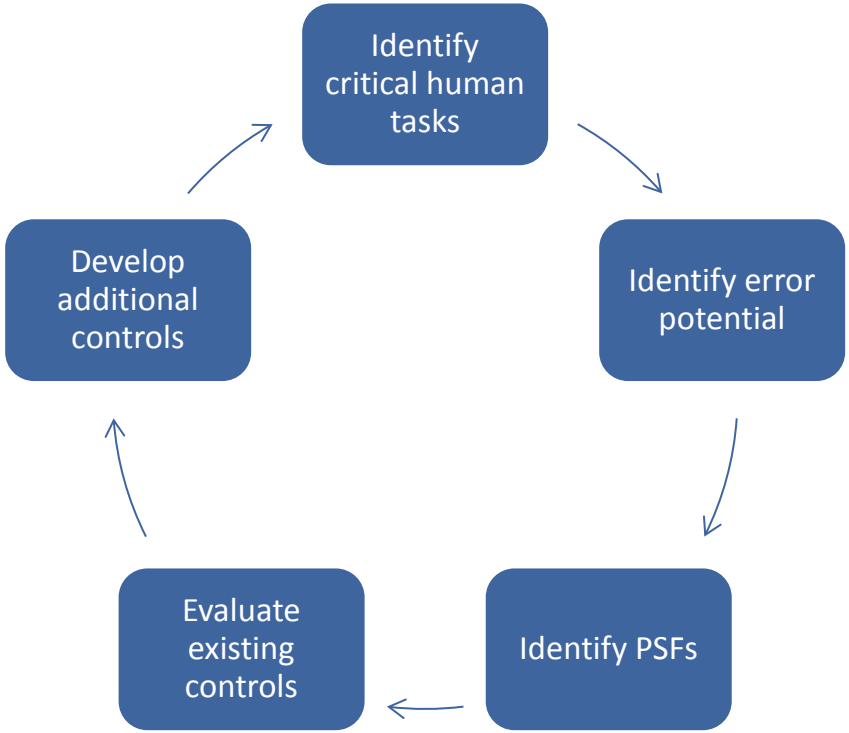
Which errors?

- “Critical human tasks”
- Activities people are expected to perform:
  - as barriers against an incident
  - to prevent incident escalation
  - to support or maintain barriers during an incident

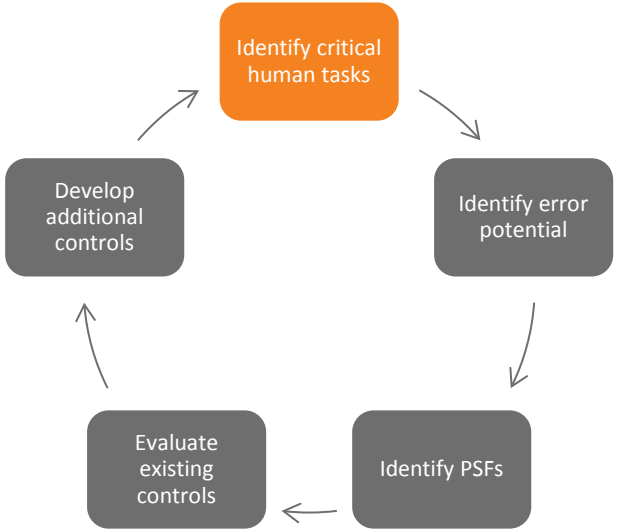
- OGP (2011). *Human factors engineering in projects.*

A suggested process



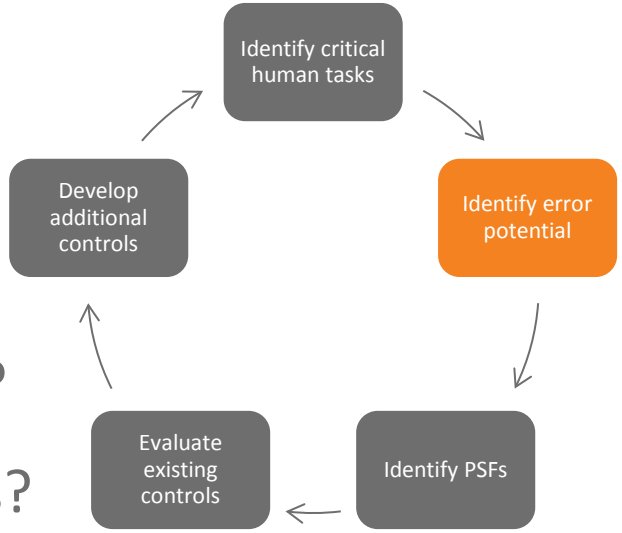
Identify critical human tasks

- Tasks where:
  - a procedure is a single point failure
  - people interact with control measures
  - error can lead to barrier failure
  - barrier failure can lead to MAE



Identify error potential

- Task analysis can help
  - What errors are possible?
  - Classify errors by a taxonomy
  - What are the potential consequences?
  - What are the high-risk potential errors?



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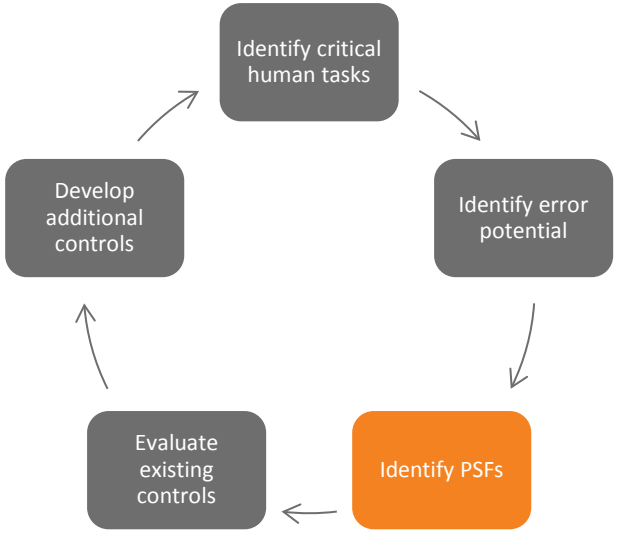
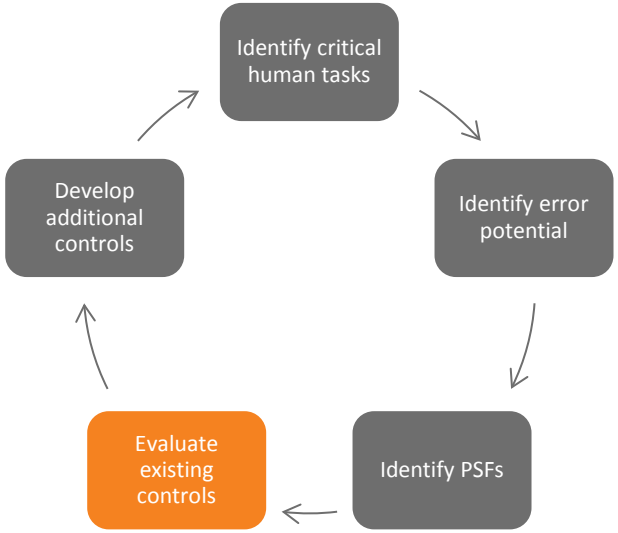
Identify PSFs

- People-level
  - Knowledge, skills, experiences
  - Health
- Job-level
  - Procedures
  - Equipment
  - Supervision
- Organisation-level
  - Culture & climate
  - Corporate strategy



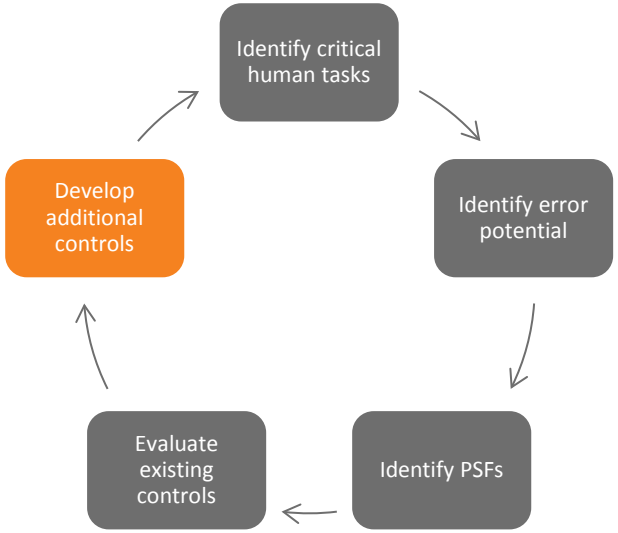
Evaluate existing controls

- Prevention controls?
- Mitigation controls?
- Is error risk ALARP?



Develop additional controls

- Layered defences targeting error:
  - **Eliminate** the opportunity
  - **Prevent** the error
  - **Reduce** the impact – error identification and recovery
  - **Mitigate** the consequences



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Where to start?

- Evidence of uncontrolled error:
  - Events and dangerous occurrences
  - Existing controls have failed to mitigate error risk
- Performance-shaping factors:
  - Latent conditions
  - Broader implications

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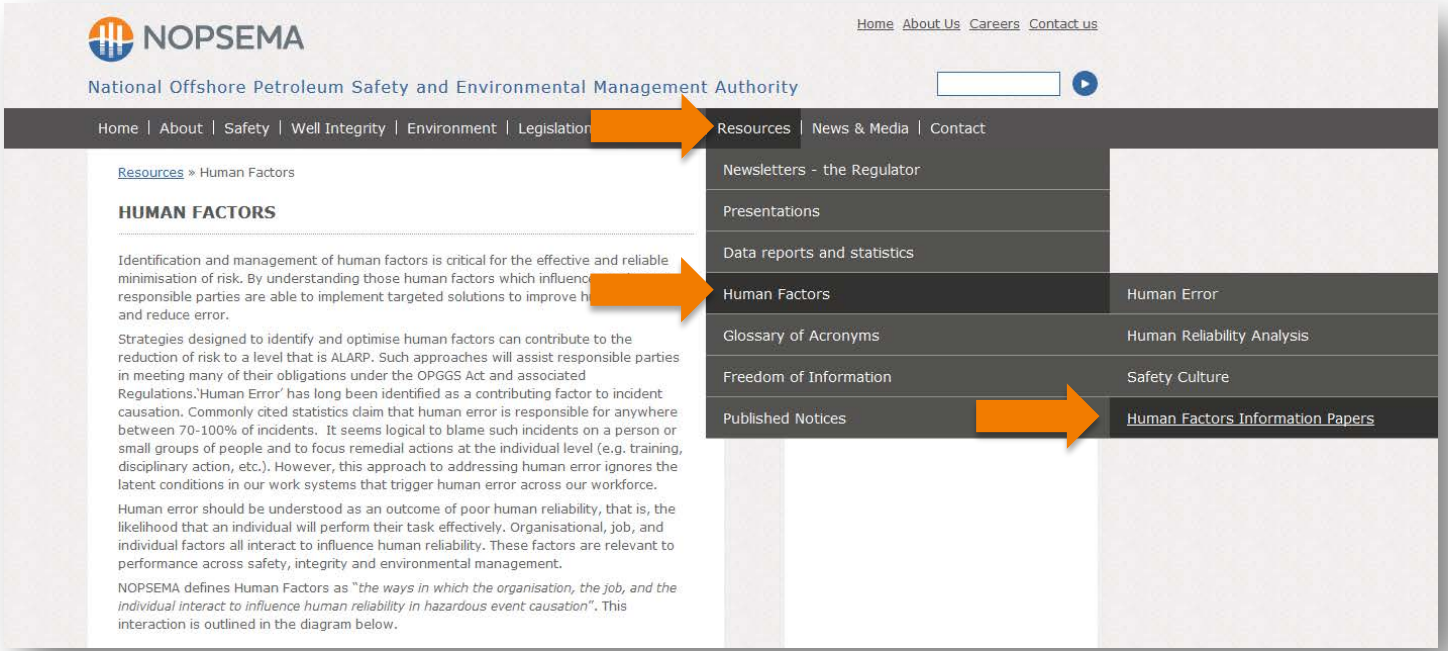
Summary

- Human error can facilitate barrier failure
- Error is most significant within critical human tasks
- Layered defences can reduce error risk
- Effective risk reduction includes:
  - error prevention
  - error mitigation

Online resources



www.nopsema.gov.au

Questions