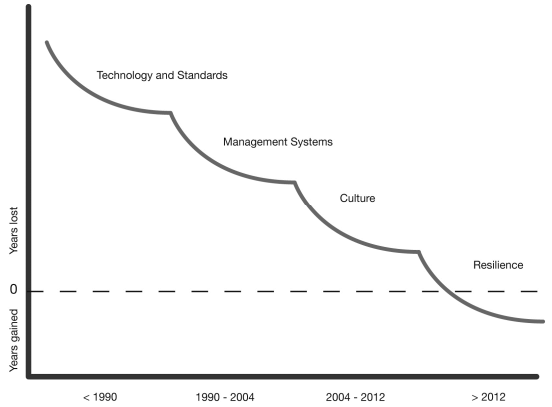
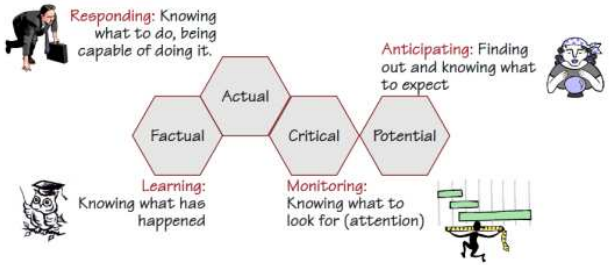
Concepts of Resilience

The next step?

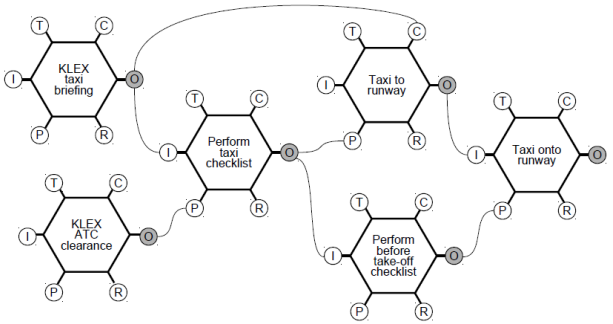
Contents

- Complexity, uncertainty and resilience
- FRAM
- Let's work
- Wrap up





Resilience engineering measures how safe a system is by what it is able to do, hence measures of the positive rather than the negative.

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Why, how and what

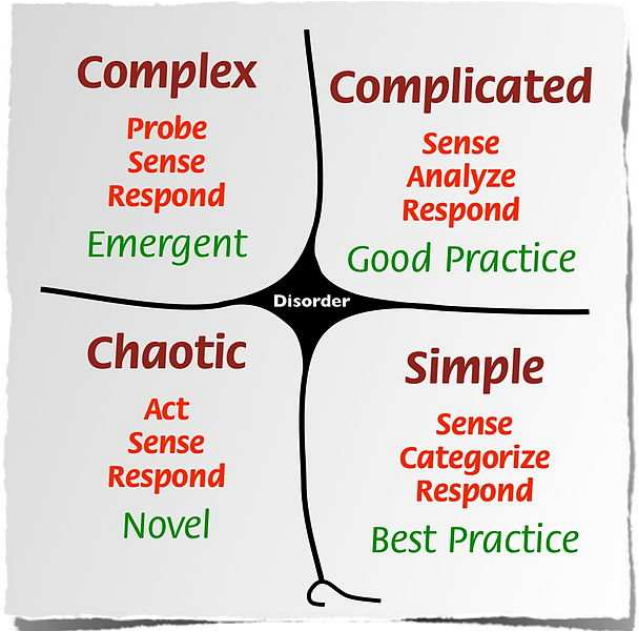
- Safety is based mainly on a technical tradition and reasons in terms of cause – effect relationships where causes are rooted in unreliable system elements: man or technique. *This approach is not enough to undertand and prevent future accidents.*

- Variation is inevitable and needed! Safety is more and more about managing performance. It has to take changes and variability in primary processes into account. *A resilient system is able to adjust its functioning prior to- or after a disturbance or change in such a way that it keeps working.*

- Preconditions for safe performance are allways underspecified. Functional variation is both needed as inevitable. *It is a source for succes as well as for failure.*

Complexity

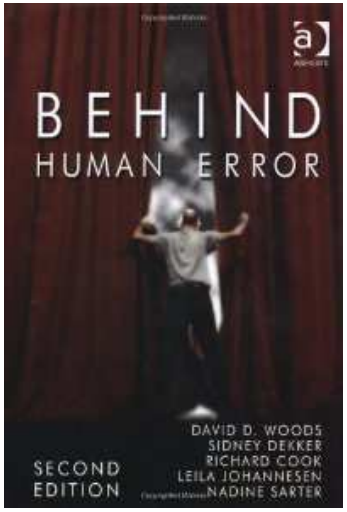
- complicated ≠ complex
- The end of Newtonian models
- There is no helicopter! -> Local rules
- Hind sight bias, no timeline
- Emergent properties
- Breaking up in parts does not work
- Systems are not ‘bi-modal’

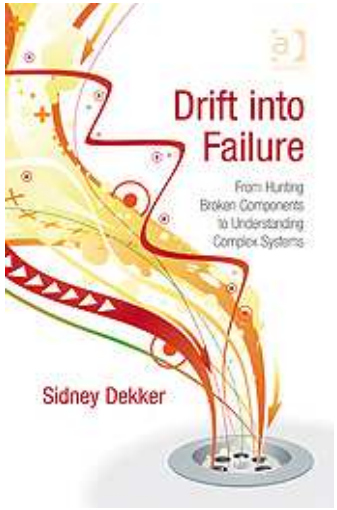


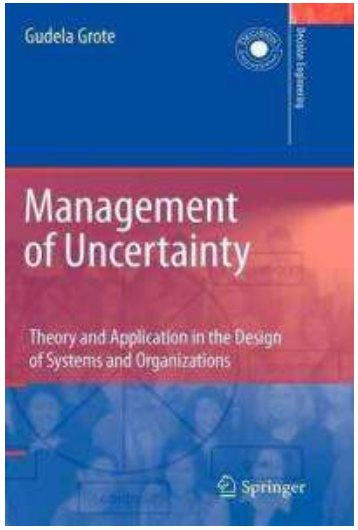
Uncertainty

Gudela Grote:

- Zero risk in complex systems is not possible
- Apply flexible rules
- Apply local controls
- Relationshop between rules and routines





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Minimizing uncertainties
- complex, central planning systems
- reducing operative degrees of freedom through procedures and automation
- disturbances as to be avoided symptoms of inefficient system design

Dependence / feed-forward control

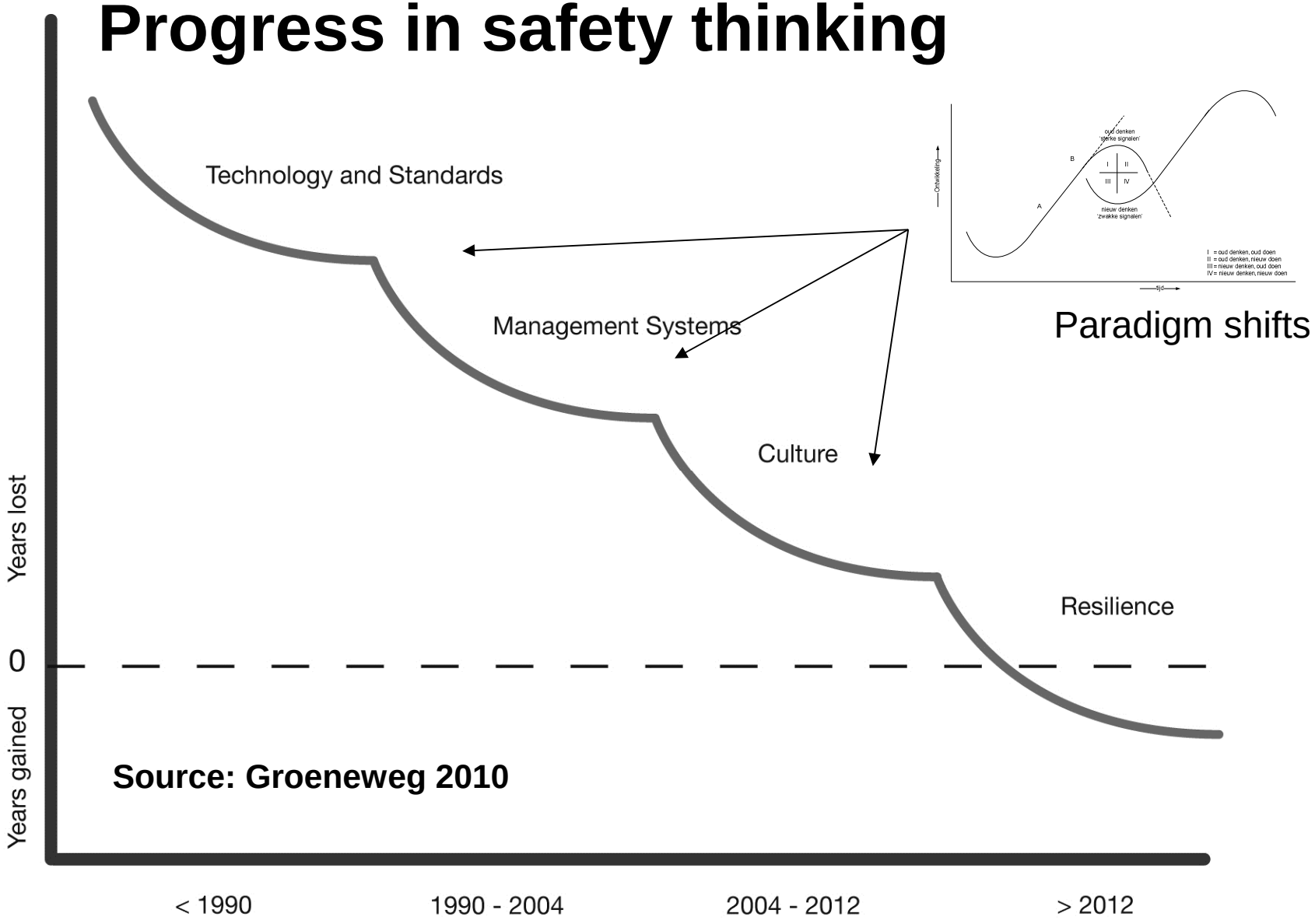
Coping with uncertainties
- planning as resource for situated action
- maximizing operative degrees of freedom through complete tasks and lateral cooperation
- disturbances as opportunity for use and development of competencies and for system change

Autonomy / feedback control

Balance through loose coupling

Motivation through task orientation
Higher order autonomy
Flexible changes between organizational modes
Culture as basis for coordination/integration

Progress in safety thinking



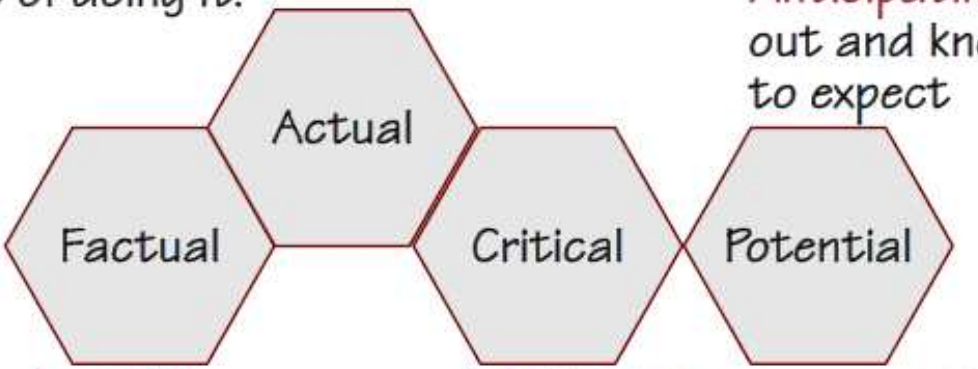
Paradigm shifts

Source: Groeneweg 2010

Resilience

Responding: Knowing what to do, being capable of doing it.

Anticipating: Finding out and knowing what to expect

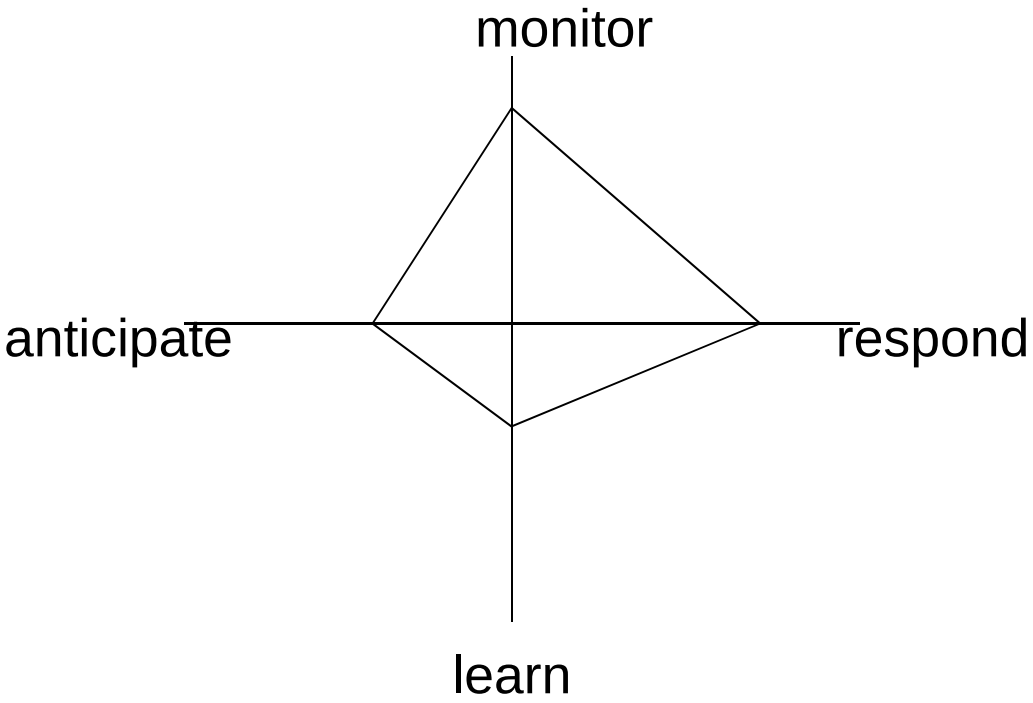


Learning: Knowing what has happened

Monitoring: Knowing what to look for (attention)

Resilience engineering measures how safe a system is by what it is able to do, hence measures of the positive rather than the negative.

The resilience analys grid (RAG)
From concept to instrument, the next step after Tripod Delta?



See also: http://resilience-innovationlab.org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Taming complexity

- ETTO (efficiency - thoroughness trade offs)
- Accountability (Pronovost)
- HRO:
  - Preoccupation with failure
  - Reluctance to simplify interpretations
  - Sensitivity to operations
  - Commitment to resilience
  - Deference to expertise
- Local actions & control
- Mindfulness


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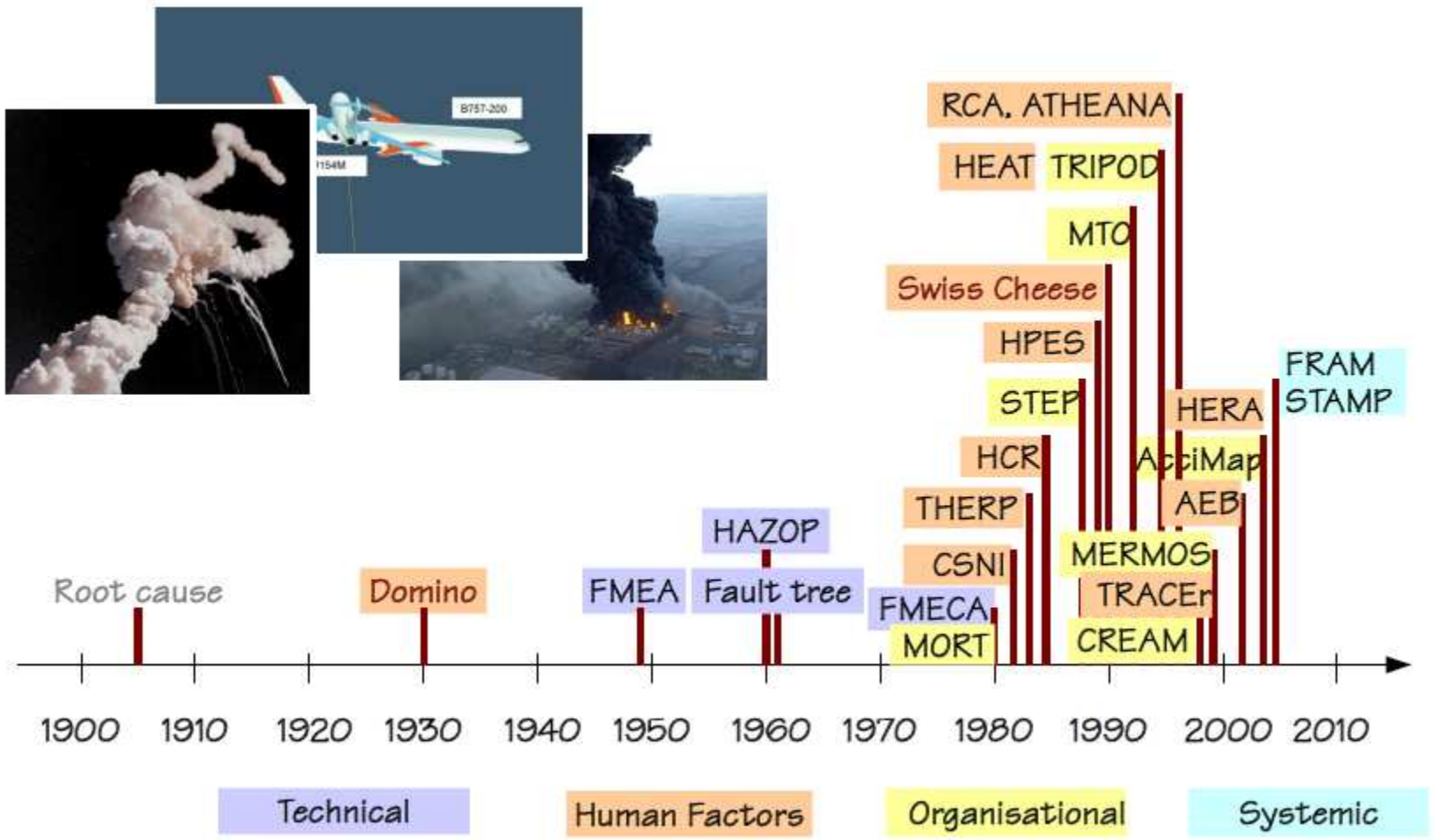
Indicent models have dificiencies:

- Attempt to rationalise
- Atttempt to linearise
- Attempt to determine cause - effect
- Hind sight bias
  - If only he had….
  - If only that had…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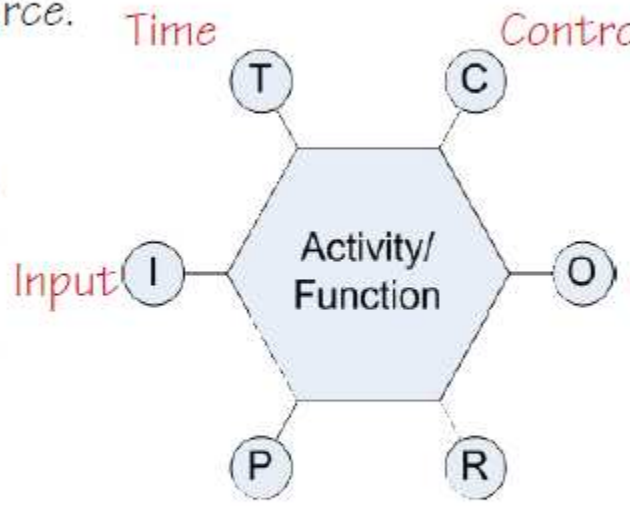
Technical
Human Factors
Organisational
Systemic

FRAM, the next step after Tripod Beta?

Time available: This can be a constraint but can also be considered as a special kind of resource.

That which supervises or adjusts a function. Can be plans, procedures, guidelines or other functions.

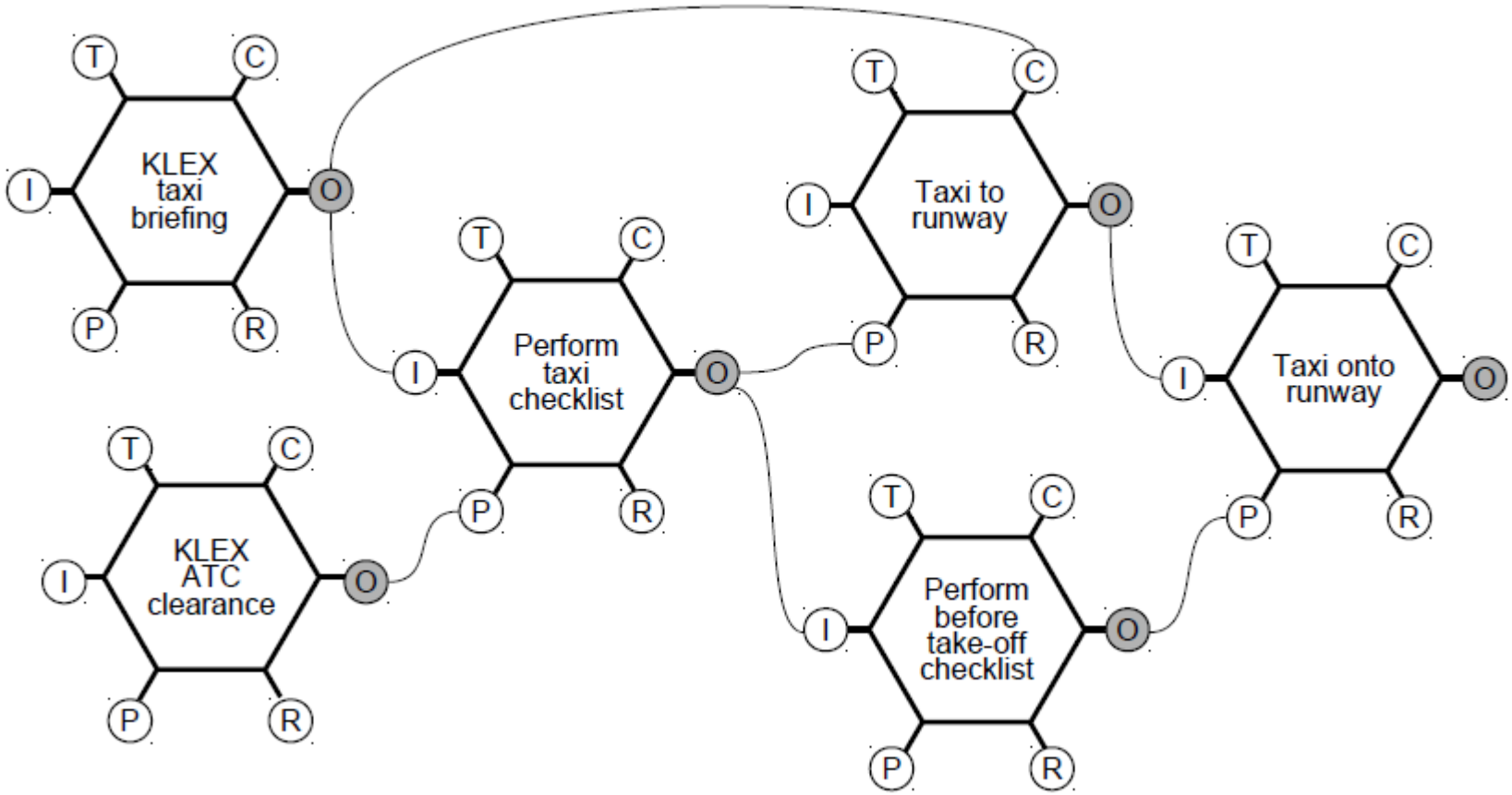


That which is used or transformed to produce the output. Constitutes the link to previous functions.

That which is produced by function. Constitute links to subsequent functions.

System conditions that must be fulfilled before a function can be carried out.

That which is needed or consumed by function to process input (e.g., matter, energy, hardware, software, manpower).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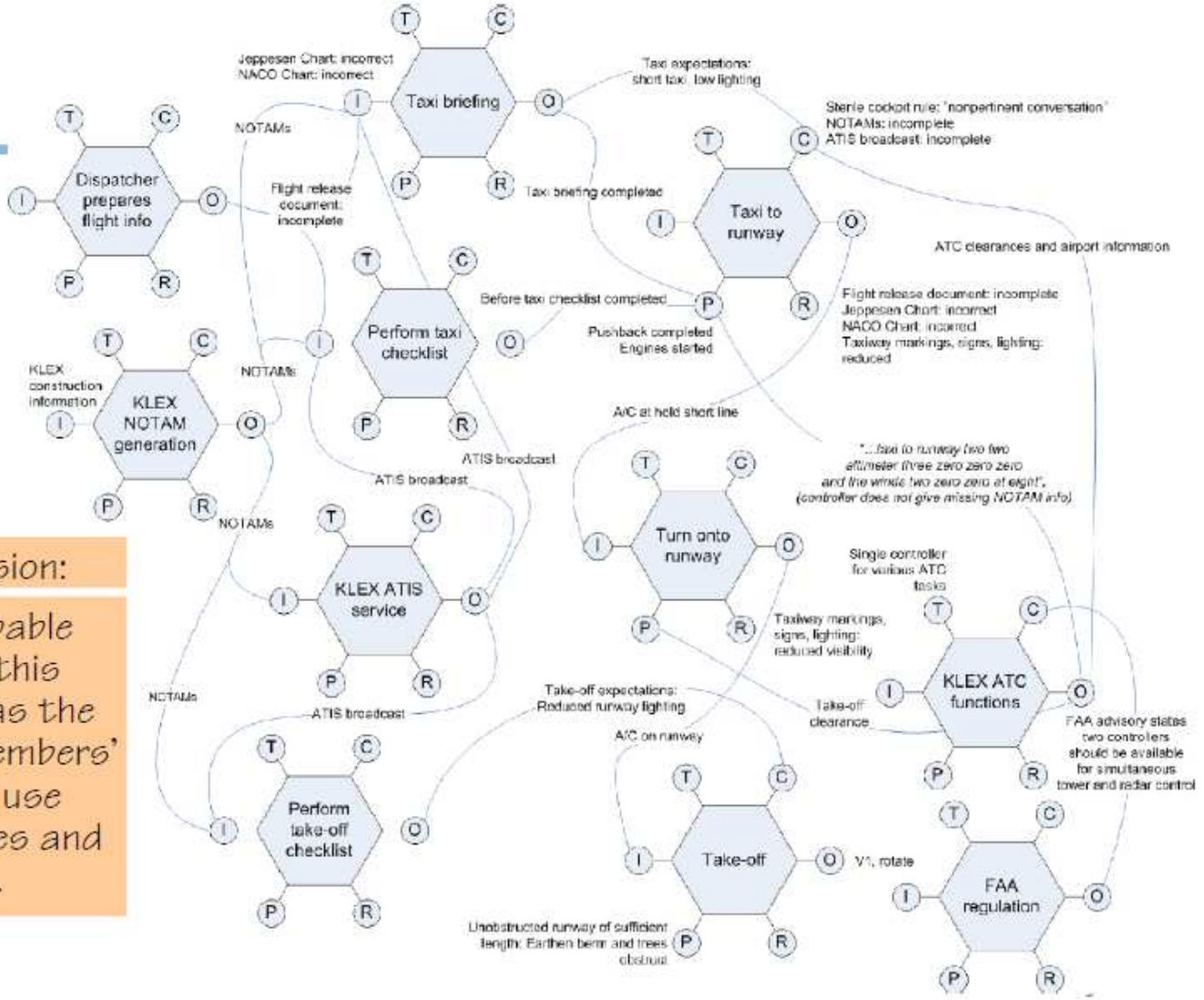
FRAM 3

MINES ParisTech



NTSB conclusion:

... the probable cause of this accident was the flight crewmembers' failure to use available cues and aids ...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Let's work

- 4 flip overs: how do we see:
  - FRAM
  - Complexity
  - HRO
  - Resilience
- Discuss, note, walk around…
- Feedback: one 'owner' per flip, the rest assists
- Group discussion, conclusions

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