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Learning lessons from accidents with a human  
and organisational factors perspective:  
deficiencies and failures of operating experience  
feedback systems

# Outline

- The issue: from failing to learn to the repeat of accidents
- What is analysing and learning from events with a human and organisational factors perspective?
- Historical failures of operating experience feedback systems
- Classifying the operational feedback systems failure types
- Conclusion: Interest of a « Culture of accidents »

## From failing to learn to the repeat of accidents

- « **Echoes** » of Challenger in the Columbia space shuttle accidents
  - Sally Ride “observed that there were “echoes” of Challenger in Columbia.”
  - CAIB (2003):“The foam debris hit was **not the single cause** of the Columbia accident, just as the failure of the joint seal that permitted O-ring erosion was not the single cause of Challenger. **Both Columbia and Challenger were lost also because of the failure of NASA’s organizational system.**”
  - “First, despite all the post-Challenger changes at NASA and the agency’s notable achievements since, **the causes of the institutional failure responsible for Challenger have not been fixed**. Second, the Board strongly believes that **if these persistent, systemic flaws are not resolved, the scene is set for another accident**. Therefore, the recommendations for change are not only for fixing the Shuttle’s technical system, but also for fixing each part of the organizational system that produced Columbia’s failure.” (CAIB, 2003)

## From failing to learn to the repeat of accidents

- Grangemouth, Texas City, Prudhoe Bay: repeating similar accidents at BP
  - “noted **“striking” similarities** between the **lessons of Grangemouth and the events of the Texas City explosion**, [...] The Panel concluded that “in its response to Grangemouth, BP missed an opportunity to make and sustain company-wide changes that would have resulted in safer workplaces for its employees and contractors”
  - “there are **striking similarities** in the reported causes of the 2006 events involving BP’s **Prudhoe Bay pipelines** and the 2005 explosion at the BP **Texas City Refinery**. Most if not all of the seven root causes that BP consultants identified for the Prudhoe Bay incidents have strong echoes in Texas City”. She concluded that “The CSB report and the Booz Allen report point to similar cultural factors within BP, in both its upstream production and downstream refining operations. **The similarity in the two reports underscores how safety culture truly is set at the top at a corporation.**”

# From recurring organisational cause of accidents to « pathogenic » organisational factors

- Poor recognition of critical components, of critical activities or deficiency in anticipation and detection of errors,
- (Excessive) production pressures,
- Deficiency of communication or lack of quality of dialogue,
- Excessive formalism or proceduralisation,
- Organisational complexity, obscurity and compartmentalisation,
- Learning deficiencies (OEF, closing feedback loops, lack of listening of whistleblowers),
- Lack of accountability,
- Inability to develop and maintain individual competencies, and to develop and use collective competencies,
- Lack of staffing,
- Lack of organisational culture of safety,
- Deficiency of daily safety management,
- Complacency or deficiency of control authorities,
- Failure to re-examine design basis and operations assumptions.

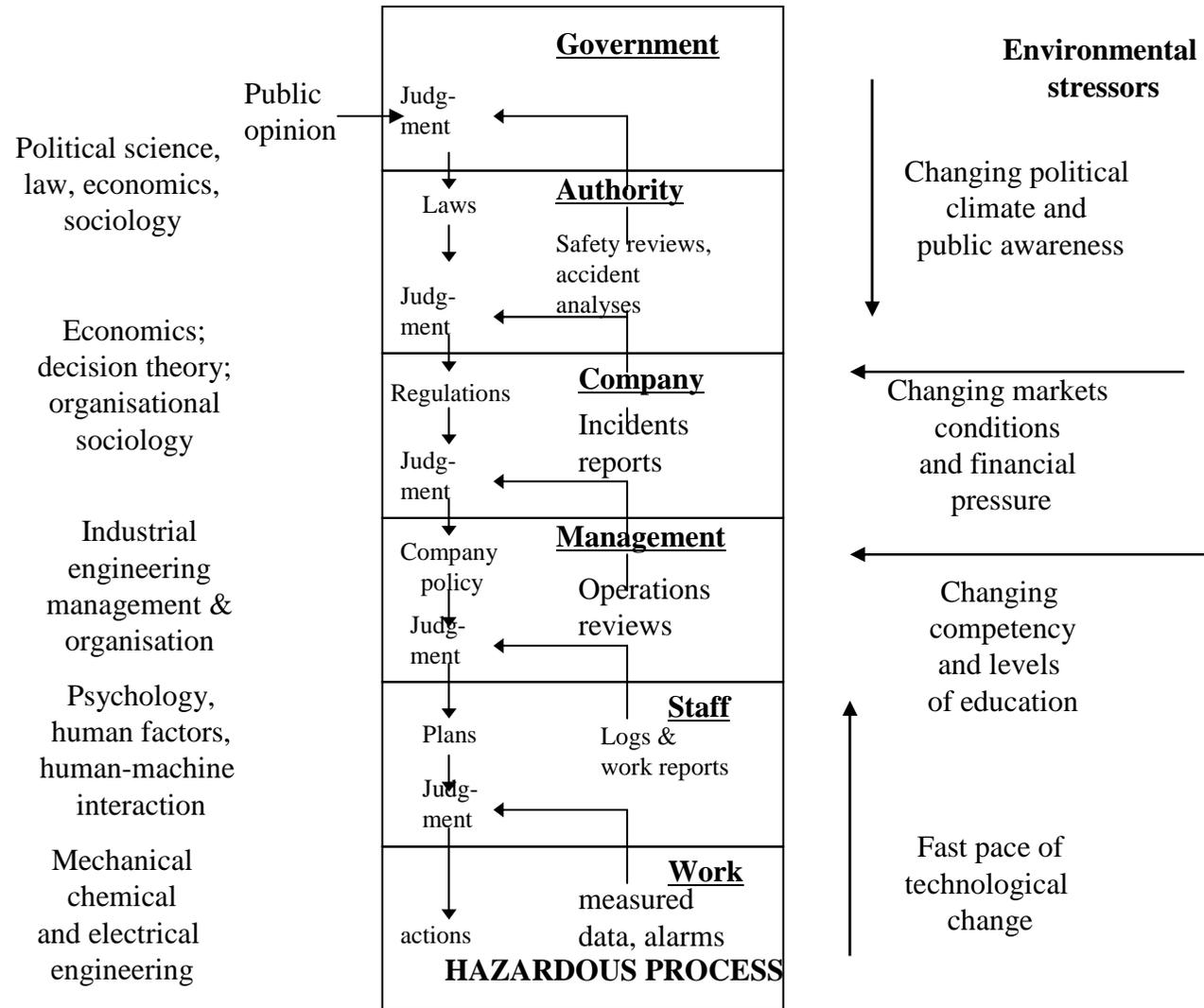
## What is analysing and learning from events with a human and organisational factors perspective?

- *“The Board recognized early on that the accident was probably **not an anomalous, random event, but rather likely rooted to some degree in NASA’s history** and the human space flight program’s culture. Accordingly, the Board **broadened its mandate** at the outset to include an investigation of a wide range of historical and organizational issues, including political and budgetary considerations, compromises, and changing priorities over the life of the Space Shuttle Program. The Board’s conviction regarding the importance of these factors strengthened as the investigation progressed, with the result that this report, in its findings, conclusions, and recommendations, places **as much weight on these causal factors as on the more easily understood and corrected physical cause of the accident.**” (CAIB, 2003)*

# What is analysing and learning from events with a human and organisational factors perspective?

- **Defining an event (near-miss, incident, accident) from a human and organisational point of view:**
  - **“In-depth analyses of accidents, incidents and crises clearly showed that any event is generated by *direct and/or immediate causes* (technical failure and/or “human error”).**
  - **Nevertheless their occurrence and/or their development are considered to be induced, *facilitated or accelerated by underlying organisational conditions* (complex factors).**
  - **A vast majority of events can be seen as the *ending point of a process of safety degradation*. An event is very rarely an “unexpected combination of circumstances” or an “act of God”.**
  - **Indeed, an accident happens at the end of an *incubation period* (B. Turner 1978), during which some events and *signals (weak or strong)* occur, but they are not perceived and/or not treated appropriately according to their potential threat to safety.**
  - **Every industrial system is coping with factors that impact safety, both positively and adversely. The life of an industrial system, from a safety standpoint, can be seen as continuous tension between resilient organisational factors (ROF) and pathogenic organisational factors (POF). An accident occurs when POFs overtake ROFs. ” (Y. Dien, 2006, ESReDA, 2009)**

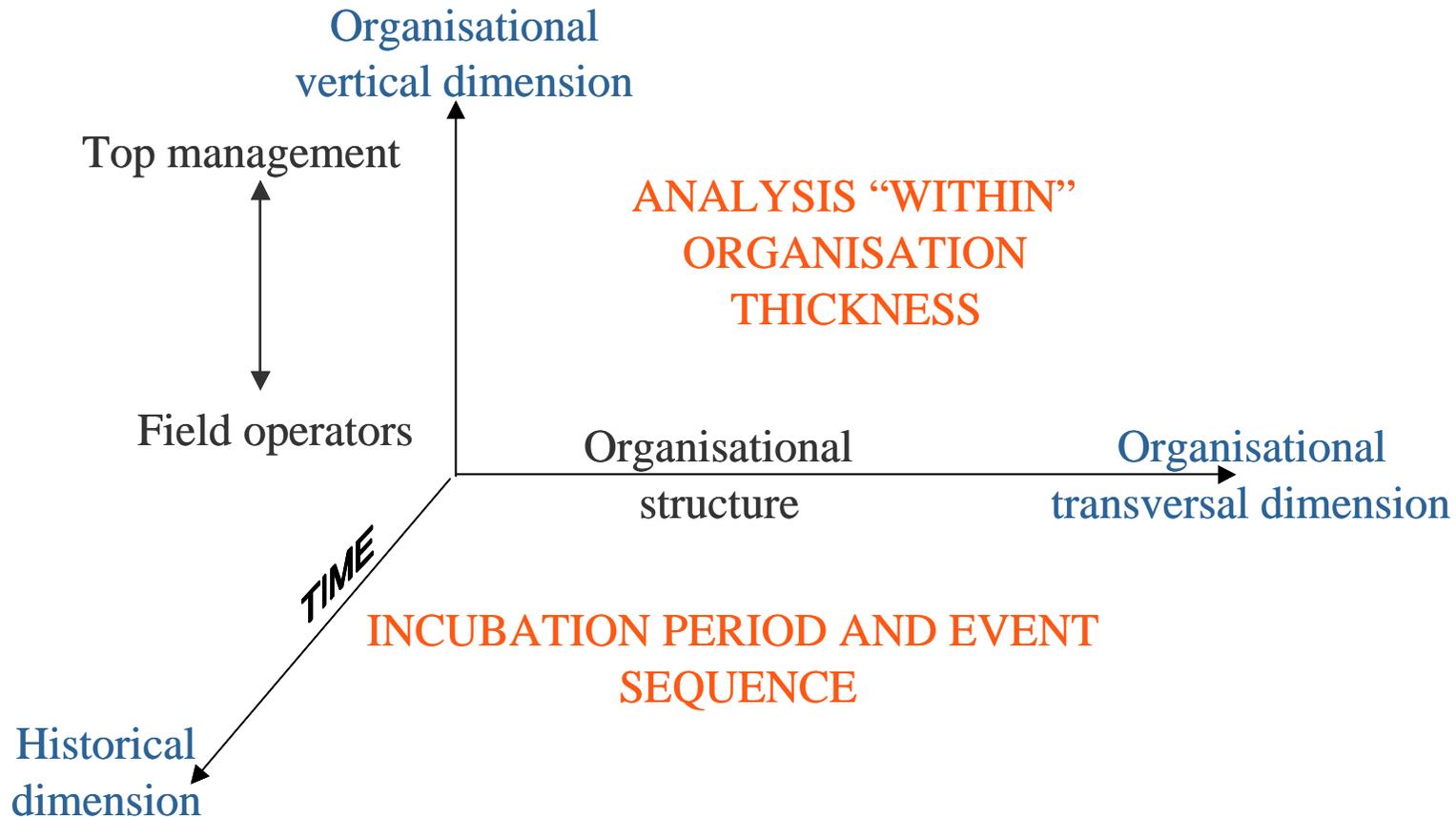
# Socio-technical system (J. Rasmussen, 1997)



## What is analysing and learning from events with a human and organisational factors perspective?

- (CAIB, 2003): ***“Many accident investigations do not go far enough. They identify the technical cause of the accident, and then connect it to a variant of “operator error” – the line worker who forgot to insert the bolt, the engineer who miscalculated the stress, or the manager who made the wrong decision. But this is seldom the entire issue. **When the determinations of the causal chain are limited to the technical flaw and individual failure, typically the actions taken to prevent a similar event in the future are also limited: fix the technical problem and replace or retrain the individual responsible. Putting these corrections in place leads to another mistake – the belief that the problem is solved. The Board did not want to make these errors.”*****

# What is analysing and learning from events with a human and organisational factors perspective?



3 dimensions of « organisational analysis » of an event (Y. Dien, 2005)

# Historical failures of operating experience feedback systems

- Operating experience feedback systems failures in other industries
  - Columbia space shuttle accident
  - Texas City refinery explosion
- Are there operating experience feedback systems failures in the nuclear industry?
  - Three Mile Island accident
  - Davis Besse incident

# Historical failures of operating experience feedback systems

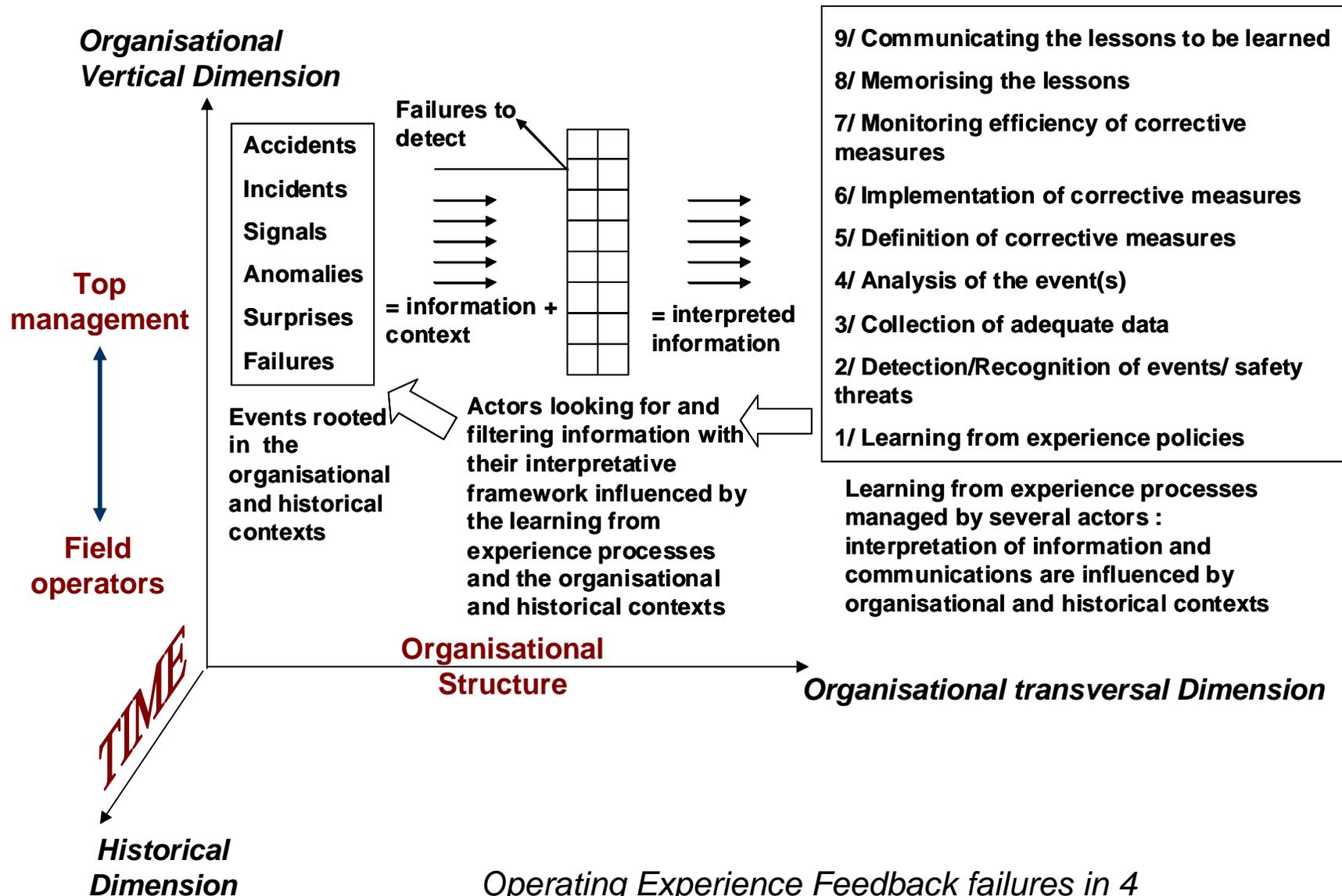
- Texas City OEF failures (CSB, 2007):
  - “Many of the safety problems that led to the March 23, 2005, disaster were **recurring problems that had been previously identified in audits and investigations.**”
  - Several incidents 1994-2004: “These incidents were early warnings of the serious hazards of the ISOM and other blowdown systems’ design and operational problems. **The incidents were not effectively reported or investigated by BP or earlier by Amoco [...]. Only three of the incidents involving the ISOM blowdown drum were investigated.**”
  - **Internal audit** (2004): “graded as “poor” how incident investigation information was analyzed to monitor trends and develop prevention programs”
  - BP and the petroleum industry did not learn from some incidents and did not review some standards,
  - BP did not learn from Grangemouth incidents in 2000

# Historical failures of operating experience feedback systems

- Texas City OEF failures:
  - The management detected the problems *“The new director of BP’s South Houston Integrated Site (consisting of five area BP businesses, including the Texas City site) observed in 2002 that the Texas City refinery **infrastructure and equipment were in complete decline.**”*
  - Internal accident investigation (2004) *“[w]e have created an environment where people ‘justify putting off repairs to the future’ [...]. ‘The incentives used in this workplace may encourage hiding mistakes.’ [...]. ‘We work under pressures that lead us to miss or ignore early indicators of potential problems.’ [...]. **“Bad news is not encouraged.”**”*
  - *“Texas City had serious problems with unresolved Process Safety Management action items. [...] At the end of 2004, the Texas City site **had closed only 33 percent of its PSM incident investigation action items**; the ISOM unit closed 31 percent.”* Furthermore, *“during this same period, loss of containment incidents, a process safety metric tracked but not managed by BP, increased 52 percent from 399 to 607 per year”*.

# Classifying the operating experience feedback systems failure types

- **4 dimensions of OEF failures:** vertical-hierarchical, transversal-inter-organisational, historical, communication and formalisation
- **9 key stages for OEF failures:**
  1. the definition of the OEF system and **policy**
  2. the **detection** of the event or **recognition** of the safety threat,
  3. the **collection** of adequate data,
  4. the **analysis** of the event(s),
  5. the definition of the **corrective measures**,
  6. the **implementation** of the corrective measures,
  7. the assessment, the monitoring in the long term, of the **effectiveness** of corrective measures,
  8. the **memorising** and recording of the event, its lessons, its treatment, and its follow-up,
  9. the **communication** of the lessons to be learned to the stakeholders or parties potentially interested.



*Operating Experience Feedback failures in 4 organisational dimensions (Dechy, Dien, Llory, 2008)*

## Conclusion : interest of a « Culture of Accidents »

- Why a systematic study of past accidents AND construction of a specific knowledge of accidents or « culture of accidents » for prevention purposes?
  1. To provide to analysts **generic lessons** (e.g. organisational failures to learn and other pathogenic organisational factors) which are **frameworks to interpret data** (organisational vulnerabilities, weak signals and incidents) and **to conduct organisational diagnosis** before (and after) a major accident
  2. To provide to managers **levers of actions** : e.g. on operating experience feedback systems : several tens of long term issues, 5 short term priorities:
    - human and organisational factors analysis of the root causes of the events,
    - listening of the field staff, dissenting voices and whistleblowers,
    - monitoring of the external events that provide generic lessons,
    - building an alive memory through a culture of accidents with people who become experiences pillars,
    - the external audit or organisational analysis of the OEF system by independent experts

# Thank you for your attention

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