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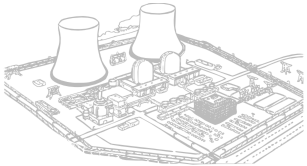

Barriers to learning from experience

Eric Marsden

<eric.marsden@risk-engineering.org>

> *Human beings, who are almost unique in having the ability to learn from the experience of others, are also remarkable for their apparent disinclination to do so.*
>
> *— Douglas Adams, author of The Hitchhiker's Guide to the Galaxy*

Before reading this material, we suggest you consult the associated slideset on *Learning from incidents and accidents*. Topics covered:

- introduction to operational experience feedback / learning from accidents
- overview of academic work on organizational learning

Available from `risk-engineering.org`

Acknowledgement

These slides are largely based on a guidelines document published by ESReDA in 2015 resulting from the work of the *Dynamic Learning as the Followup from Accident Investigation* project group. The author of these slides contributed to the guidelines document.

Freely available from `esreda.org` > Project groups > Dynamic learning

Learning from experience: an important tool for safety management

- Operational experience feedback is an **important tool for safety management**
  - both the formal company process and the informal discussions between colleagues are important
- An **opportunity for dialogue** and collaborative learning across work groups and organizations
- There may be few other channels for communication on safety issues between the relevant actors:
  - industrial companies, contractors
  - labour representatives
  - regulators and inspectors, legislators
  - interested members of the public

A process affected by invisible barriers

- Learning from unwanted events, incidents and accidents is not as trivial as sometimes thought
  - in particular, learning at an organizational level
- Several steps are required to achieve learning:
  1. reporting
  2. analysis
  3. planning corrective actions
  4. implementing corrective actions (including information sharing)
  5. monitoring their effectiveness
- Obstacles may appear within each step
  - learning is not effective unless every step is completed
  - obstacles may be technical, organizational or cultural

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Symptoms of failure to learn

- There are known symptoms of failure to learn, which you may be able to recognize within your organization
- Failure to learn is often caused by underlying pathogenic conditions afflicting the culture of the organization
- These slides propose:
  - some questions to help you identify possible symptoms of failure to learn
  - description of a number of known pathogenic organizational factors which may lead to learning deficiencies

Note: medical metaphors used in these slides should not be interpreted literally, but as an aid to understanding

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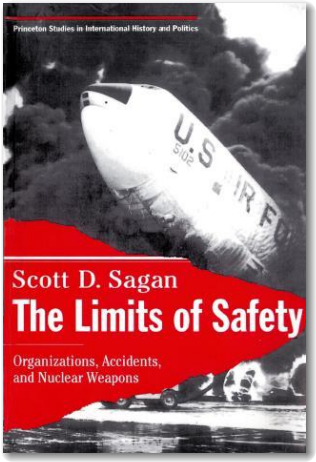
Learning is difficult

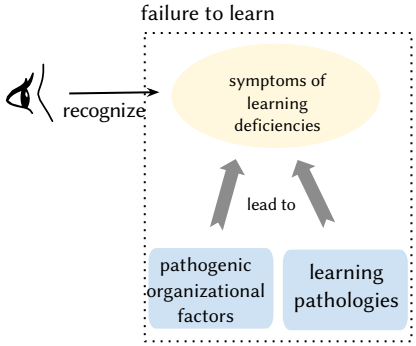
Scott Sagan in his analysis of the safety of the US nuclear weapons programme:

> *The social costs of accidents make learning very important; the politics of blame, however, make learning very difficult.*



Symptoms of failure to learn

- Aspects or types of behaviour of an organization which may suggest the existence of a “learning disease”
- Can be observed by people
  - working within the system (*review of event-analysis process*)
  - external to the system (*accident investigators*)
- Help a person recognize *“we may be running into symptom λ”*
- Point them to possible underlying organizational conditions (pathogens) which may help them understand and improve the situation



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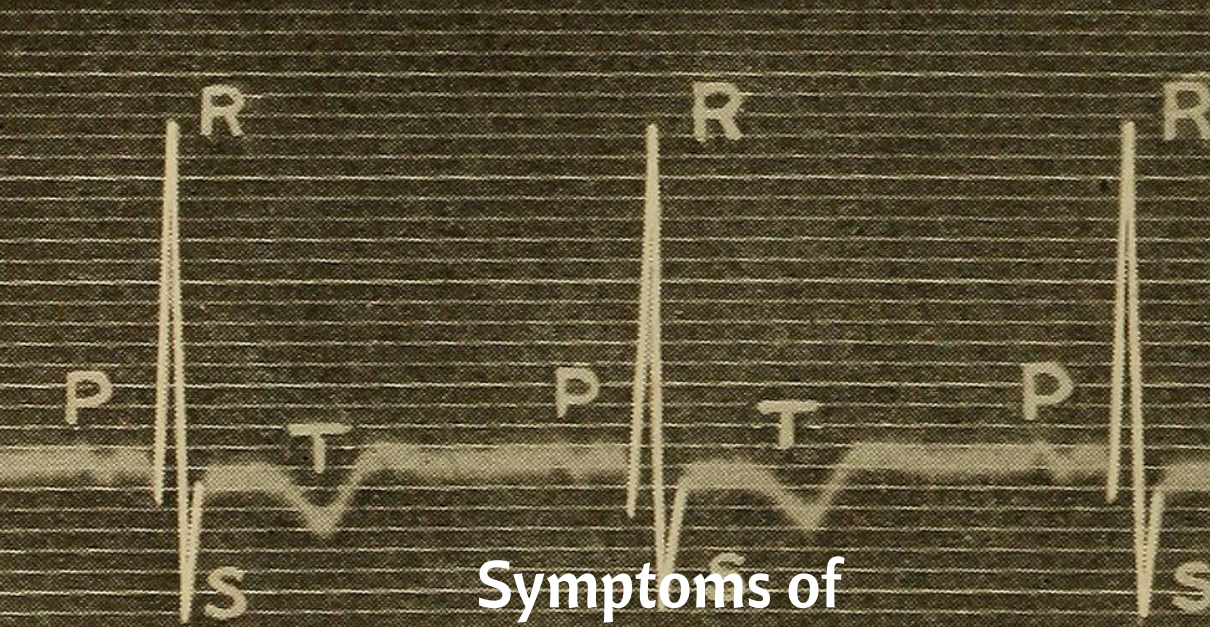
Symptoms

- Under-reporting
- Analyses stop at immediate causes
- Self-centeredness
- Ineffective followup on recommendations
- No evaluation of effectiveness of actions
- Lack of feedback to operators' mental models of system safety
- Loss of knowledge/expertise (amnesia)
- Bad news are not welcome
- Ritualization of experience feedback procedures

Pathogens

- Denial
- Complacency
- Resistance to change
- Inappropriate organizational beliefs
- Overconfidence in the investigation team's capabilities
- Anxiety or fear
- Corporate dilemma between learning and fear of liability
- Lack of psychological safety
- Self-censorship
- Cultural lack of experience of criticism
- Drift into failure
- Inadequate communication
- Conflicting messages
- Pursuit of the wrong kind of excellence



Symptoms of failure to learn

Under-reporting

- Many incidents and near misses are not reported
  - *"not worth the effort; they never invest in safety anyway"*
  - *"none of their business; let's discuss the issue within our workgroup"*
  - coverups to avoid investigation
- Possible consequences:
  - opportunities to learn are missed
  - can lead to mistaken confidence in the safety of one's system
  - can introduce epidemiological bias if incident reports are used for statistical analysis of safety trends

Image source: Banksy

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Our client takes the risks of dropped objects very seriously, so we scan through our incident reports to check for terms such as 'dropped objects' and 'deck' to ensure we do not have issues there.

Under-reporting: possible causes

- a **blame culture** 
- fear that reports will be used in **litigation** or interpreted in a negative way in performance assessments
- uncertainty as to **scope** (which incidents should be reported?)
- insufficient **feedback to reporters** on lessons learned
  - leading to demotivation and "moral disengagement"
- **perverse incentives** which reward people for absence of incidents
- deficiencies in the reporting tool: too complex, inappropriate event typologies…
- a belief that accidents are "normal" in certain lines of work
- management does not **promote the importance** of incident reporting

More info: Petitta, Probst & Barbaranelli (2017). *Safety Culture, Moral Disengagement, and Accident Underreporting.* Journal of Business Ethics, 141(3)

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Under-reporting: possible causes

Top reasons for under-reporting and perceived consequence for reporting accidents.

Item	Endorsement rate
Reasons for under-reporting	
I took care of the problem myself	73.8%
I did not want to go through the follow-up interviews and questions	69.0%
I did not think anything would be done to fix the problem	51.2%
I did not think it was that important	47.5%
I thought it would make work unpleasant	41.5%
I did not want to be the one to break the company's accident-free record	37.5%
I thought it would affect my crew's safety scorecard	37.2%
Consequences of reporting	
Your group lost scorecard points	37.3%
You were blamed for the incident	23.9%
You were blamed for ending the company's accident-free record	21.7%
People gossiped about you in an unkind or negative way	19.7%
You were unfairly disciplined	18.6%
You were mistreated in some other way	11.6%
You were given an unfair performance evaluation	11.4%
You were given less favorable duties	10%

Note: Numbers could add to greater than 100% since multiple responses could be checked.

Source: Probst and Estrada (2010), *Accident under-reporting among employees: Testing the moderating influence of psychological safety climate and supervisor enforcement of safety practices*, Accident Analysis & Prevention

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Note: under-reporting of technical events

- Under-reporting of technical/technological events can be abated by implementing **automated reporting systems**
- Example: the *Signal Passed at Danger* event in railways can be measured using automated systems
  - as a complement to written reports made by train drivers
- Automated reports are typically more numerous, but provide less contextual information than those made by a person
- Also raise the risk of "false positives" that may require extra investigation work

Note: blame culture

- A blame culture over-emphasizes the fault and responsibility of the individual directly involved in the incident (who "made the mistake")
  - rather than identifying causal factors related to the system, organization or management process that enabled or encouraged the mistake
- Organizations should instead aim to establish a "**just culture**":
  - an atmosphere of trust in which people are encouraged, even rewarded, for providing essential safety-related information (including concerning mistakes made)
  - in which they are also clear about where the line must be drawn between acceptable and unacceptable behaviour, and *who* gets to draw that line

Blame culture and accountability

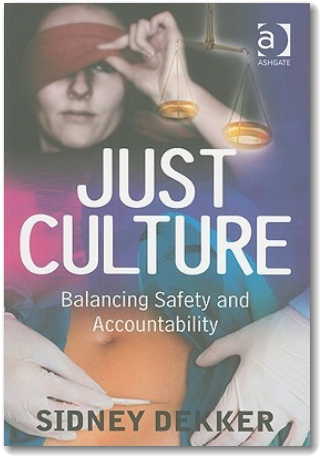
- **Accountability**: an obligation or willingness to accept responsibility or to account for one's actions
- Safety investigations benefit from a **rich and diverse set of accounts** of what happened
- Backward-looking and retributive accountability looks for someone to blame (and punish)
- Forward-looking accountability seeks to understand and improve
- To progress in safety, information is more important than punishment…

More information on just culture

Attitude of members of a just culture when analyzing an event:

- Did the assessments and actions of the professionals at the time make sense, given their knowledge, their goals, their attentional demands, their organizational context?

→ `sidneydekker.com/books/`



ISBN: 978-0754672678

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Note: just culture

View video by Sidney Dekker (4 min.): `youtu.be/t81sDiYjKUk`

Note: just culture

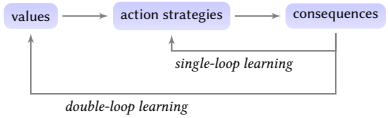
View video by Eurocontrol (5 min.): youtu.be/4Y5lRR9YK2U

Analyses stop at immediate causes (1/2)

- Event analysis identifies **immediate causes** (technical/behavioural) rather than **underlying contributing factors** (organizational)
  - *"operator error" rather than "excessive production pressure"*
- Recommendations target lower-power individuals instead of managers
- Recommendations are limited to single-loop learning instead of double-loop learning
- Instead of multi-level learning, recommendations are limited to the company directly responsible for the hazardous activity
  - insufficient consideration of role of regulators, legislative framework, impact of insurers

Aside: single- and double-loop learning

- Chris Argyris and Donald Schön on organizational learning: two levels of learning
  - **single-loop** learning: people detect an error and fix the immediate cause
  - **double-loop** learning means correcting not only the error, but also the **mental model** and **values** that determine action strategies
- Single-loop learning typically results from a **defensive attitude** with respect to work, and generates superficial knowledge
- Double-loop learning implies more reflection on work and its objectives, on facts and beliefs concerning causality, on one's own responsibility, and can generate more authentic knowledge



Aside: multi-level learning

- Sometimes problems and lessons learned cannot be dealt with within the boundaries of a single organization, but are related to organizational interfaces
  - learning is unlikely to take place unless the stakeholders involved engage in some form of dialogue
- It is difficult for an internal company investigation to recommend corrective actions concerning regulations or the regulator's activity
- Safety boards (as implemented in the Netherlands, for example) provide neutrality in investigations and can make recommendations targeting different system levels and their interactions

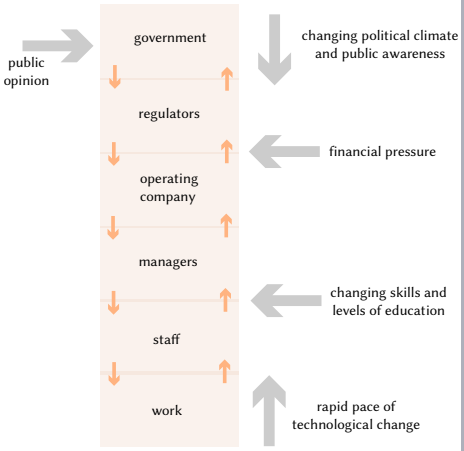


Image of sociotechnical system adapted from [Rasmussen 1997]

Analyses stop at immediate causes: possible causes

- Insufficient training of the people involved in event analysis
  - identification of causal factors
  - understanding systemic causes of failure in complex systems
  - training to help identify organizational contributions to accidents
- Insufficient time available for in-depth analysis
  - production is prioritized over safety
- Managerial bias towards technical fixes rather than organizational changes
  - managers may wish to downplay their responsibility in incidents, so downplay organizational contributions to the event

Note on “root causes”

- Many documents use the term “root cause”, and encourage analysts to dig deep beyond the immediate causes to find these “root causes”
  - using analysis methods such as the “5 whys”
- This “root cause seduction” [Carroll 1995] assumes a linear and reductionist approach to causality which is not always applicable to complex socio-technical systems and “system accidents”
- A more subtle way of working is to seek to understand the **underlying causal structure** of the incident
  - identify **contributing factors**, which may be numerous, and do not always lead to strict deterministic causality
  - ask “how” the events played out (*“what factors contributed?”*) rather than “why” the undesired event occurred (*“who is responsible?”*)

More information: Carroll, J. (1995). *Incident reviews in high-hazard industries: Sensemaking and learning under ambiguity and accountability*, Industrial and Environmental Crisis Quarterly

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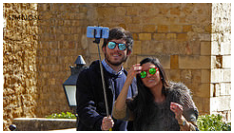
Note on “WYLFIWYF”

- Safety researcher E. Hollnagel guards against the results of biased accident investigations with the acronym WYLFIWYF
  - “What You Look For Is What You Find”
- Accident investigation is a social and political process, not a fully objective engineering exercise
  - investigators’ background, training and preconceptions on factors which lead to accidents will inevitably influence their findings
  - causes are *constructed* rather than *found*
- This bias inevitably influences the corrective actions implemented, because WYFIWYF…
  - “What You Find Is What You Fix”

Self-centeredness (lack of external learning)

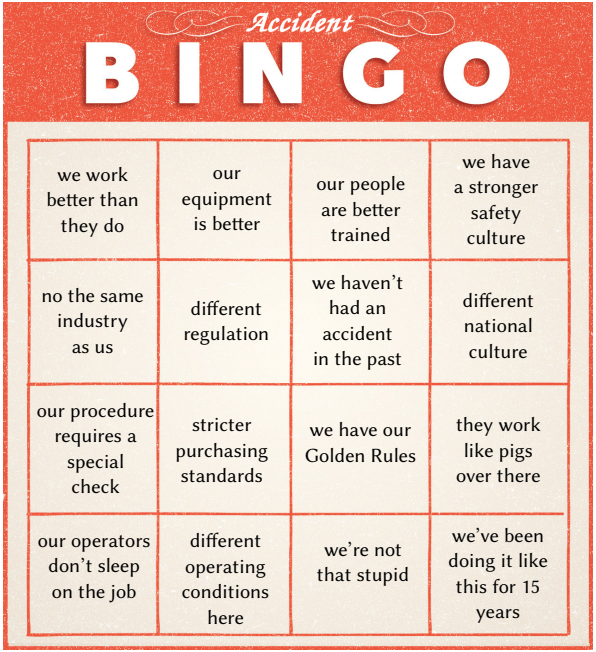


- Many institutional & cultural obstacles to sharing information on events and generic lessons
  - between sites from a same firm
  - between firms in the same industry sector
  - between industry sectors
- In several major accidents, failure to learn from incidents and accidents elsewhere was a contributing factor to the severe events
- Example: Fukushima-Daiichi disaster (2011):
  - Tepco & Japanese nuclear regulator did not implement a safety mechanism that could have prevented escalation of the accident
  - this H_2 recombination mechanism is widely implemented in US and European plants

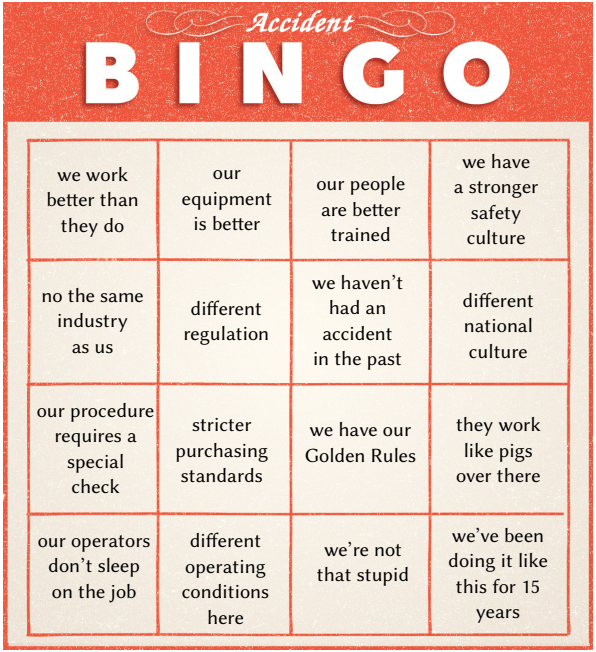
Self-centeredness (lack of external learning)

- Can be caused by:
  - the feeling that "*that couldn't happen to us; we operate differently*" (better!)
  - fears related to reputation or prestige (for oneself, one's colleagues, one's company)
  - the idea that you "*don't wash your dirty laundry in public*"
  - the inherently contextual nature of much learning: it may require significant mental effort to recognize elements of an incident that occurred elsewhere that could be applicable to your operations


“
It wouldn’t happen to us...



- An attitude of **denial** is common after accidents



- An attitude of **denial** is common after accidents
- Denial is contrary to the *preoccupation with failure* encouraged by HRO researchers

More information: Distancing through differencing: an obstacle to organizational learning following accidents, R. Cook and D. Woods, 2006

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Ineffective follow-up on recommendations

- Certain recommendations or corrective actions are not implemented, or are implemented very slowly
- Can be caused by:
  - insufficient budget or time to implement corrective actions
    - management complacency on safety issues; production is prioritized over safety
  - lack of ownership of recommendations (no buy-in)
  - resistance to change
  - inadequate monitoring within the safety management system
  - inadequate interfacing with the management of change process

It generally takes years for investigations of major accidents to result in changes at the system level (typically involving the legal, regulatory, and legislative processes).

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No evaluation of effectiveness of actions

- Consolidation of learning potential of incidents: effectiveness of corrective actions should be evaluated
  - did implementation of recommendations really fix the underlying problem?
- Lack of evaluation can be caused by:
  - political pressure: negative evaluation of effectiveness may be seen as implicit criticism of person who approved the action
  - compliance attitude/checklist mentality: people go through the motions without thinking about real meaning of their work
  - system change can make it difficult to measure effectiveness (isolate effect of recommendation from that of other changes)
  - overconfidence in the competence of the safety professionals ("*no need to reassess our previous excellent decisions*")
  - lack of a systematic monitoring and review system that evaluates effectiveness of lessons learned

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No feedback to operators' safety models

- Safety of complex systems is assured by people who control the proper functioning, detect anomalies and attempt to correct them
- People have built over time a **mental model** of the system's operation, types of failures which might arise, their warning signs and the possible corrective actions
- If they are not open to new information which challenges their mental models, the learning loop will not be completed

- Can be caused by:
  - operational staff **too busy** to reflect on the fundamentals which produce safety ("*production prioritized over safety*")
  - organizational culture allows people to be **overconfident** (lack of questioning attitude)
  - mistrust of the analysis team (maybe they come from headquarters, "*don't understand our way of working*")
  - reluctance to accept change in one's beliefs

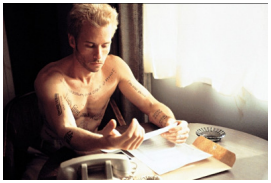
Note: “questioning attitude”

This is an attribute of organizational culture which is recommended in the nuclear sector

- Individuals demonstrate a questioning attitude by
  - challenging assumptions
  - investigating anomalies
  - considering potential adverse consequences of planned actions
- This attitude is shaped by an understanding that accidents often result from a series of decisions and actions that reflect flaws in the shared assumptions, values, and beliefs of the organization
- All employees should be watchful for conditions or activities that can have an undesirable effect on safety

Source: adapted from the INPO definition

Loss of knowledge/expertise



- People forget things. Organizations forget things.
- This amnesia can be caused by:
  - effects of **outsourcing** (knowledge is transferred to people outside the organization)
  - aging workforce and insufficient **knowledge transfer from experienced workers**
  - insufficient use of **knowledge management** tools
  - inadequate or insufficient **training**
  - insufficient **adaptation** (including unlearning), which is necessary to cope with a changing environment/context

Any deviation not properly processed through the reporting system will eventually be forgotten!

Bad news are not welcome

- Organization is not open to bad news
  - bearers of negative reports are criticized
  - people who criticize the organization are described as “not a team player”
- Whistleblowers are ignored
  - example: alerts concerning missing indicator light raised by captains prior to capsize of Herald of Free Enterprise ferry (Zeebrugge, 1987)
  - example: warnings raised by safety manager of a railway operating company concerning a poorly designed signal prior to the Paddington Junction railway accident (London, 1999)
- A “risk glass ceiling” prevents internal safety managers and audit teams from reporting on risks originating from higher levels within their organization
  - can lead to “board risk blindness”, as seen at BP Texas City (USA, 2005)

Image source: Banksy

Bad news are not welcome

- In complex systems, the boundary between safe and unsafe operation is imprecise and fluctuates over time
  - organizations are exposed to competing forces that lead to practical drift
  - people's attitudes and beliefs change over time
- Sources of danger, safety models and organizational safety barriers should be **regularly debated** and **challenged**
  - the presence of conflicting views on safety should be seen as a source of insights, rather than a problem to be stamped out
- Need to maintain *requisite imagination*: the "fine art of imagining what might go wrong" [Westrum]

Source: S. Antonsen (2009). *Safety culture and the issue of power*, Safety Science, 47:2


“Don’t bring me problems,
bring me solutions!”

This “no whining rule” is used by some managers.

However, finding solutions is rarely a solo sport! It may require multiple viewpoints, varied expertise, and access to power to change. This managerial attitude is bad for safety.

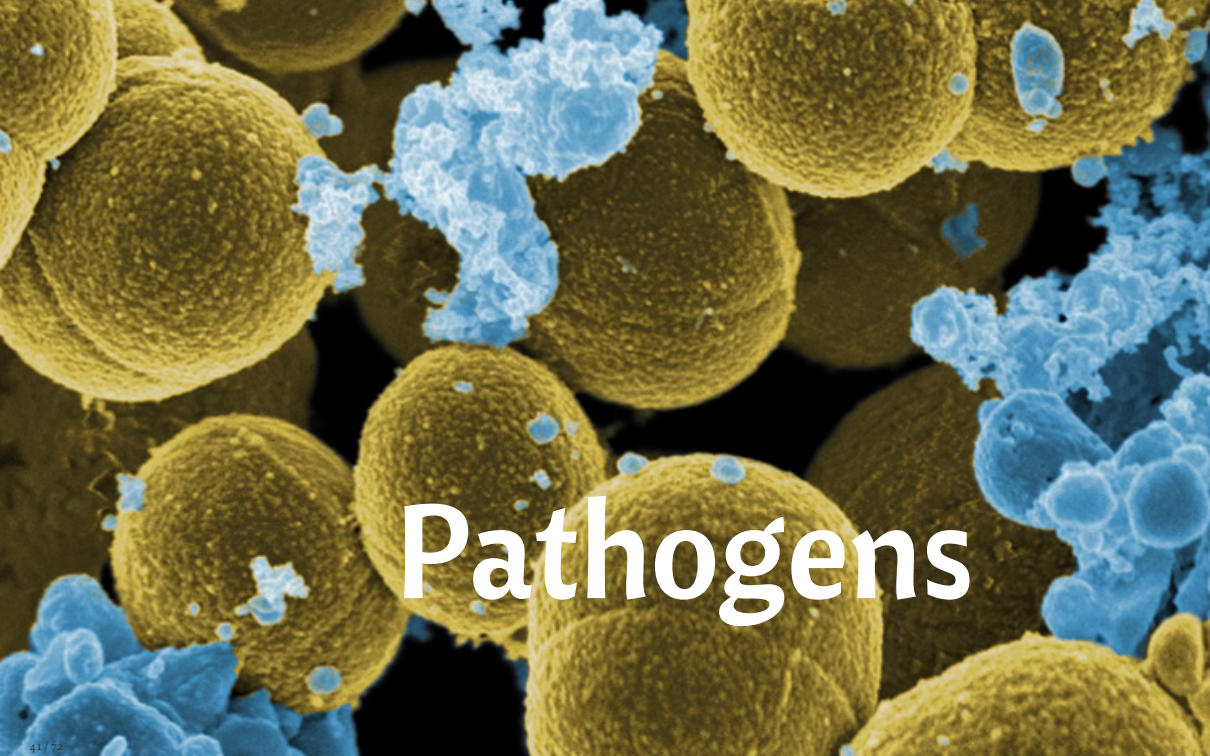
Bad news are not welcome

- Some organizations promote “get things right the first time” as a value
- Requiring immediate operational excellence discourages experimentation and learning
  - it discourages workers from voicing concerns about points that might be improved
- Lean manufacturing (kaizen principles): any production line worker can pull the **andon cord** to ask a manager to come and analyze something that seems wrong

Ritualization of experience feedback procedures

- Ritualization or **compliance attitude**: a feeling within the organization that safety is ensured when everyone ticks the correct boxes in their checklists and follows all procedures to the letter
  - without thought as to the *meaning* of the procedures
- Related to **safety theatre**, the empty rituals and ceremonies played out after an accident, in order to show that "things are being done"
- Related to the "**procedure alibi**", the tendency to implement additional procedures after an event as a way for safety managers to demonstrate that they have reacted to the accident
- This kind of organizational climate is not conducive to learning

Image source: `flic.kr/p/hykfe7`, CC BY licence

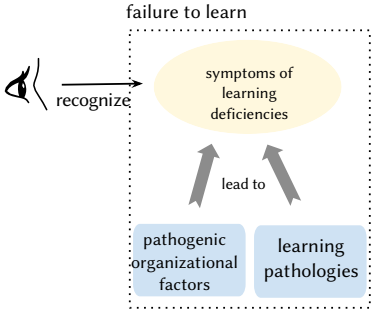

Pathogens

Pathogens

Pathogen (for these slides): an underlying organizational condition which hinders learning and may lead to one or more symptoms of failure to learn

- generally more difficult to detect or diagnose at an operational level than the symptoms described previously
- may be responsible, to various degrees and possibly in combination with other problems, for a number of symptoms

These pathogens should not be thought of as *causes* of potential accidents, but rather as **conditions which allow accidents to develop**.



Denial

- Denial is the feeling that “it couldn’t happen to us”
  - related to **cognitive dissonance**, where people cannot accept the level of risk to which they are exposed
  - an accident demonstrates that our worldview is incorrect
  - some fundamental assumptions we made concerning safety of system were wrong
  - paradigm shifts are very expensive for individuals (since they require them to change mental models and beliefs) and take a long time to lead to change

Denial

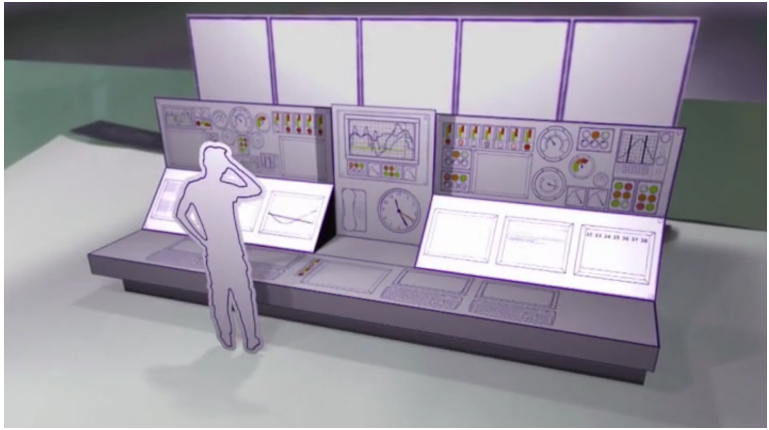
- Denial may be related to **agnotology**: culturally induced ignorance or doubt
  - on certain risk topics there are several valid interpretations of "truth" in the scientific knowledge available
  - professional communities whose livelihood depends on existence of an industrial activity tend to converge on interpretations that justify its continued existence…

> *It is difficult to get a man to understand something, when his salary depends upon his not understanding it.*
>
> *– Upton Sinclair (1935)*

Complacency

- Complacency occurs when there is a widely held belief that all hazards are controlled, resulting in reduced attention to risk
- The organization (or key members within the organization) views itself as being uniquely better (safer) than others
  - feels no need to conform to industry standards or good practices
  - sees no need to aim for further improvement in safety
- The opposite of *vigilance*, or *chronic unease*, put forward by researchers in the *High Reliability Organizations* school as important cultural features for safe operations

Chronic unease: explainer video



Explanatory video on chronic unease from the Energy Institute (thanks to Shell)
→ `rapidview.co.uk/lfi/` (free to view online)

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Complacency: possible causes

- **Overconfidence** in the safety system and its performance
  - possibly due to a lack of accidents in the last few years
  - a feeling that past success guarantees future success
- Reliance on a narrow set of statistics as the sole safety performance indicator
  - example: safety indicators based on occupational safety, ignoring all process safety aspects
  - incentives and rewards based on this narrow — and possibly misleading — safety indicator
- Organization's **inattention to critical safety data**
- **Superficial investigation** of incidents
  - with focus on the actions of individuals rather than on systemic contributing factors

Negative effects of success

> *Success narrows perceptions, changes attitudes, reinforces a single way of doing business, breeds overconfidence in the adequacy of current practices, and reduces the acceptance of opposing points of view.*

Karl Weick & Katheleen Sutcliffe. *Managing the unexpected: Resilient performance in an age of uncertainty*, Jossey-Bass, 2007

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Negative effects of success

> *When an organization succeeds, its managers usually attribute success to themselves or at least to their organization, rather than to luck. The organization's members grow more confident of their own abilities, of their manager's skills, and of their organization's existing programs and procedures. They trust the procedures to keep them apprised of developing problems, in the belief that these procedures focus on the most important events and ignore the least significant ones.*

W. Starbuck & F. Milliken. *Challenger: fine-tuning the odds until something breaks*, Journal of Management Studies, 1988, 25(4):319-341, DOI: 10.1111/j.1467-6486.1988.tb00040.x

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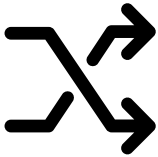
Resistance to change

- Individuals often avoid change
- Note: conservatism is an important principle in safe design and operations
  - innovation is a source of new risks
- Some changes are necessary to adapt to modifications in the environment
- Symptom of organizational resistance to change: trying new ways of doing things is not encouraged

Resistance to change

- Organizations have a **low intrinsic capacity for change**
  - often require endogenous pressure (from the regulator, legislative modifications) to evolve
- Performance of social systems (companies, governments) is limited by the paradigmatic beliefs of its members
  - the **core assumptions** that have been encapsulated in procedures and reified in structures
- May be due to a **competency trap**: a team may have developed high performance in their standard approach to a problem
  - constitutes an obstacle to trying out other, potentially superior approaches

Resistance to change

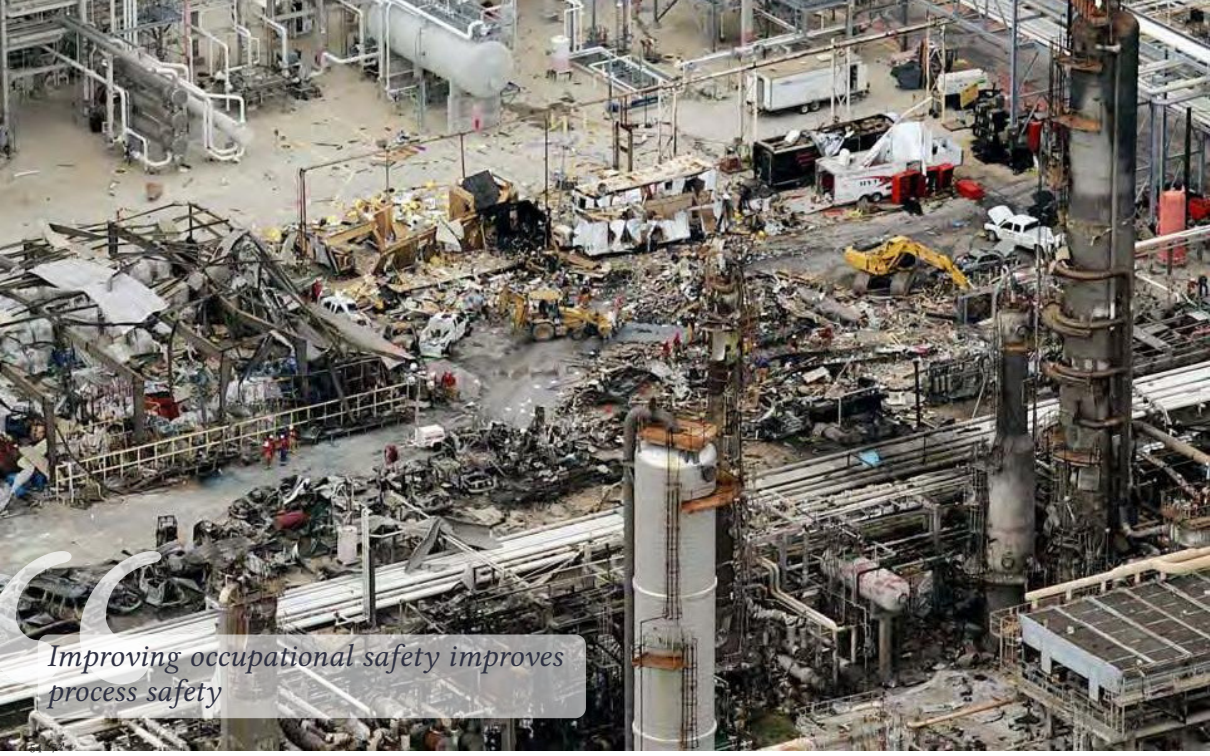


- Managers sometimes complain of “resistance to change” concerning proposed reorganizations
- Workers may have identified negative aspects of the planned change
  - degraded working conditions
  - lower safety
- If their concerns are not addressed, they will likely oppose the modification

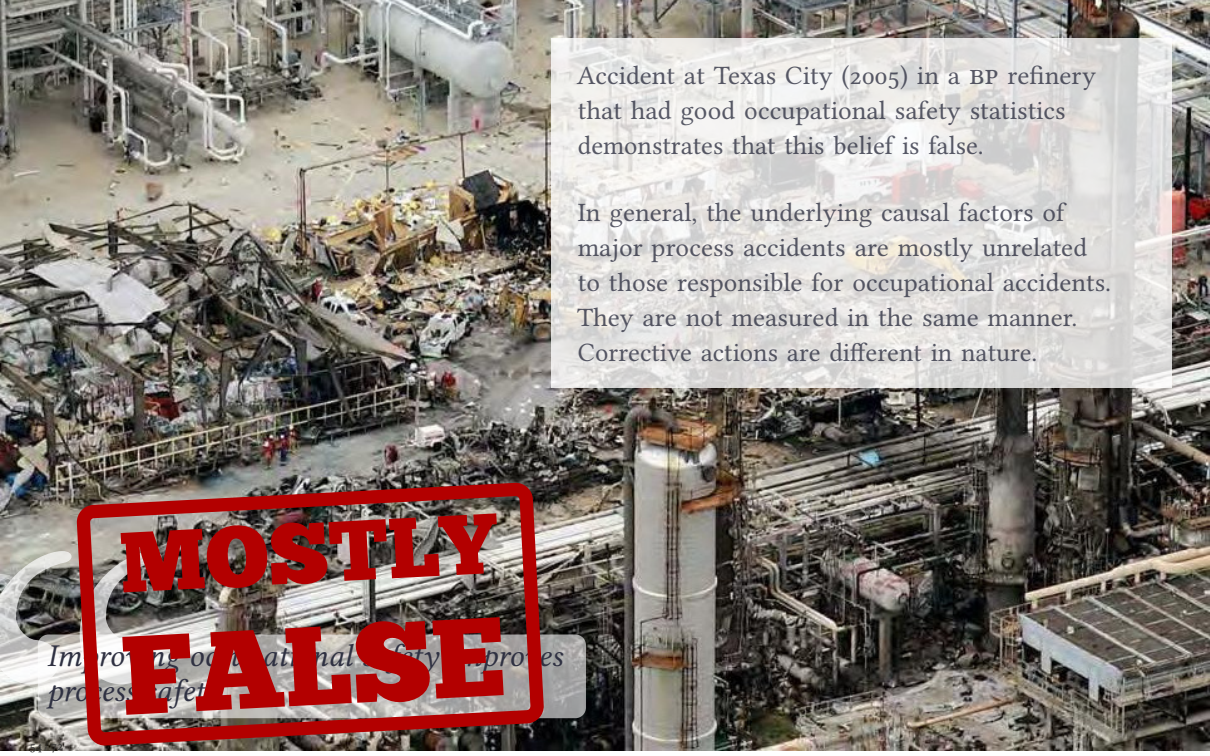
Inappropriate organizational beliefs about safety

Some inappropriate beliefs or "urban myths" concerning safety and safety management:

- The "*we haven't had an accident for a long time, so we are now safe as an organization*" myth
  - belief that past non-events predict future non-events
- **Fatal conceit**: believing that a group of well-intentioned experts have enough information to plan centrally all aspects of the safety of a complex system
  - a conceit that requires not only delusion but hubris… [Hayek]
- The "rotten apple" model of system safety [Dekker]
  - "*our system would be safe if it were not for a small number of unfocused individuals, whom we need to identify and retrain (or remove from the system)*"



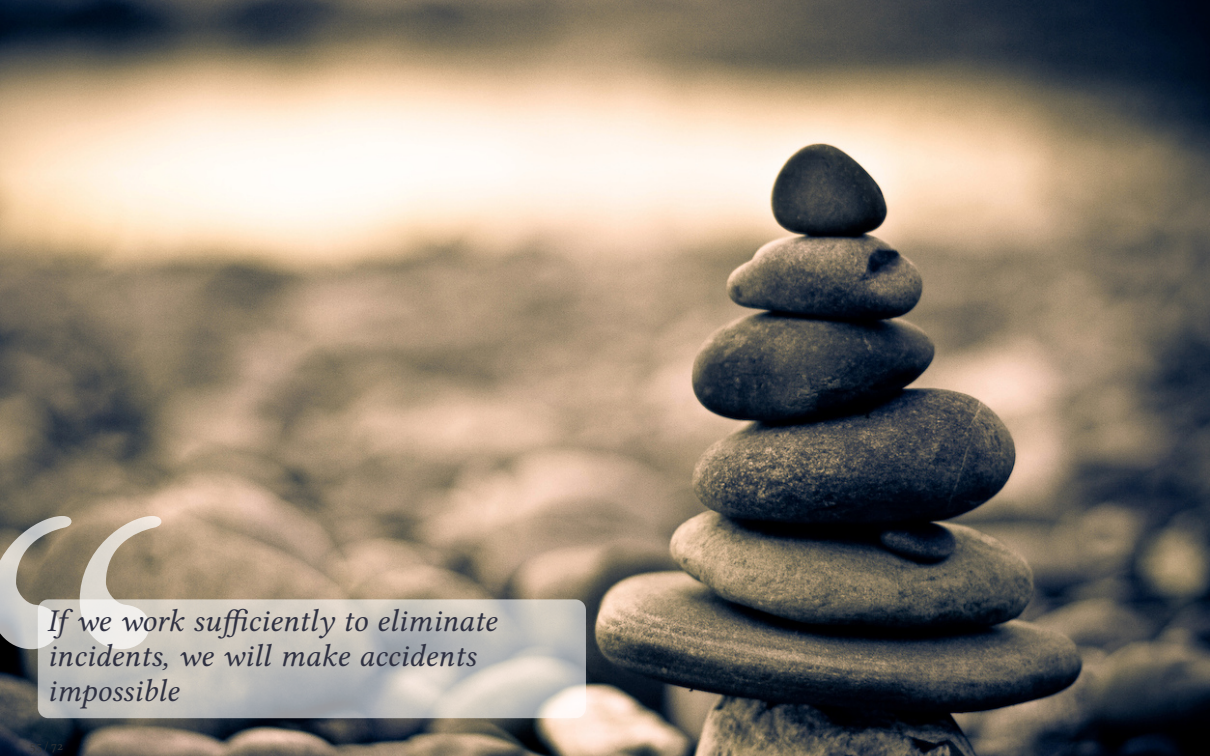
Improving occupational safety improves process safety



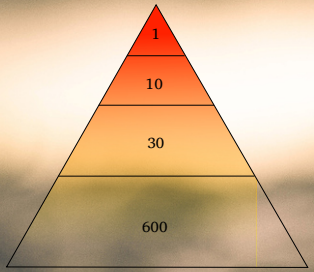
Accident at Texas City (2005) in a BP refinery that had good occupational safety statistics demonstrates that this belief is false.

In general, the underlying causal factors of major process accidents are mostly unrelated to those responsible for occupational accidents. They are not measured in the same manner. Corrective actions are different in nature.

Improving occupational safety improves process safety



If we work sufficiently to eliminate incidents, we will make accidents impossible



This is a structuralist interpretation of Bird's incident/accident pyramid: a mistaken view that "chipping away at the minor incidents forming the base of the pyramid will necessarily prevent large accidents".

An attractive interpretation, since it suggests a simple intervention strategy: "focus people's attention on avoiding minor incidents (slips & falls) and their increased safety awareness will prevent the occurrence of major events".

Possibly true concerning certain categories of occupational accidents, but generally false concerning process safety and major accident hazards.

MOSTLY FALSE

If we work sufficiently to eliminate incidents, we will make accidents impossible

Anxiety or fear

- Accidents often arouse **powerful emotions**, particularly where they have resulted in death or serious injury
  - anxiety related to legal responsibility, to loss of prestige or reputation, to ridicule by one's peers
- Resulting awareness means that everyone's attention can be focused on improving prevention
- Can also lead organizations and individuals to become highly **defensive**
  - leading to a rejection of potentially change-inducing messages
- Needs to be addressed positively if a **culture of openness and confidence** is to be engendered to support a mature approach to learning

Corporate dilemma between learning and fear of liability

- Legal context in many countries: **lawsuits for corporate manslaughter** follow major accidents
  - legal world tends to hold the (incorrect) view that systems are inherently safe and that humans are the main threat to that safety…
- Certain companies are advised by their legal counsel not to implement an incident learning system
  - encouraging a **"don't get caught" attitude** to deviations from procedure
- Legal reasoning (the "smoking gun" argument):
  - incident database may contain information concerning precursor events
  - may be seized by the police after an accident
  - might show that managers "knew" of the possible danger in their system, but had not yet taken corrective action ("incriminating knowledge")

Implementing this legal advice can create an organizational learning disability

Further reading: Hopkins, A. (2006). *A corporate dilemma: To be a learning organisation or to minimise liability.* Technical report, Australian National University

As with most industries, the drilling industry is generally not willing to publicly share information about all errors, omissions, and questionable results because of the potential for liability, legal partner issues, competitive pressures, and unpredictability of court rulings and public interpretation.

Source: *Report of the SPE Gulf of Mexico Deepwater Drilling and Completions Advisory Summit.* Journal of Petroleum Technology, 2011, 63(08), 30–33. doi:10.2118/0811-0030-jpt

Lack of psychological safety

- What is psychological safety?
  - shared belief within a workgroup that people are able to speak up without being ridiculed or sanctioned
  - no topics which team members feel are "**taboo**"
- When psychological safety is present, team members think less about the potential negative consequences of expressing a new or different idea
- Lack of psychological safety can lead to:
  - under-reporting of incidents
  - poor quality of investigation reports: people prefer not to mention possible anomalies which may have contributed to the event
  - poor underlying factor analysis: easier to point the finger at faulty equipment than at a poor decision made by manager

Further reading: A. Edmondson (1999). *Psychological safety and learning behavior in work teams.* Administrative Science Quarterly, 44(2):350–383. DOI: 10.2307/2666999

Improving psychological safety

- Incentives for reporting incidents and making suggestions
- Training managers to **encourage feedback** from their colleagues
- A more **participatory management** style
  - empowering employees to participate in organizational decision-making
- Encouraging workers to **voice their concerns**
  - training in “speak-up behaviour”
- These are typical components of *Crew Resource Management* training
  - widely implemented in civil aviation since ≈ 2000

Self-censorship

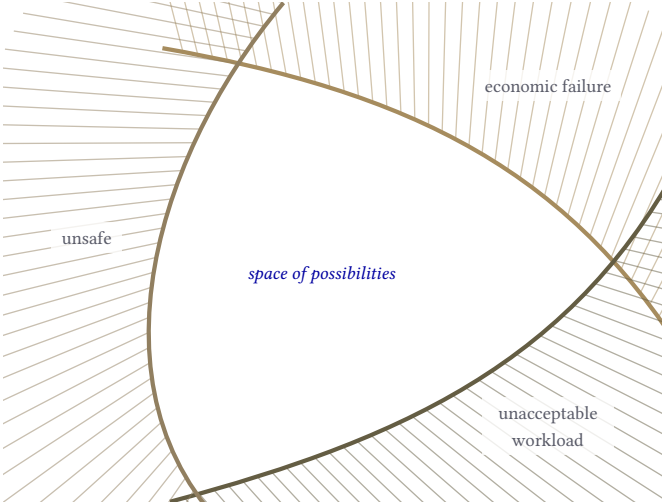
- In some workplace situations, **people do not dare to raise their concerns**
  - withhold ideas and concerns about procedures or processes which could have been communicated verbally to someone within the organization with the authority to act
- Possible causes (related to the lack of psychological safety):
  - concerns for your reputation within the work group, or for your career development
  - fear of damaging a relationship or of embarrassing a peer
  - feeling that one needs solid data, evidence or solutions to raise concerns
  - hierarchical conformity ("*don't embarrass the boss*" and "*don't bypass the boss*")

Drift into failure

- Performance pressures and individual adaptation push systems in the direction of failure
  - competitive environment focuses incentives of decision-makers on short-term financial and survival criteria rather than long-term criteria (including safety)
- Safety margins tend to be reduced over time and organizations take on more risk
- This "drift into failure" tends to be a slow process
  - multiple steps which occur over an extended period
  - each step is usually small so can go unnoticed
  - a "new norm" is repeatedly established ("**normalizing deviance**")
  - no significant problems may be noticed until it's too late

Source: *Risk management in a dynamic society*, J. Rasmussen, Safety Science, 1997:27(2)

Drift into failure



Human behaviour in any large system is shaped by constraints: profitable operations, safe operations, feasible workload. Actors experiment within the space formed by these constraints.

Figure adapted from *Risk management in a dynamic society*, J. Rasmussen, Safety Science, 1997:27(2)

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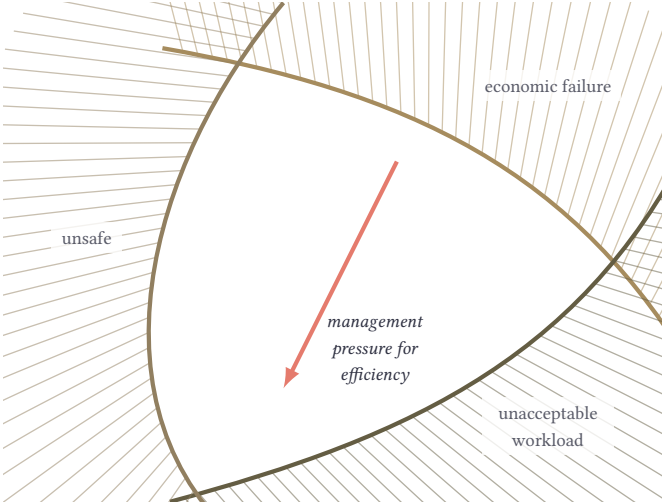
Drift into failure



Human behaviour in any large system is shaped by constraints: profitable activity, safe operations, feasible workload. Actors experiment within the space formed by these constraints.

Management will provide a "cost gradient" which pushes activity towards economic efficiency.

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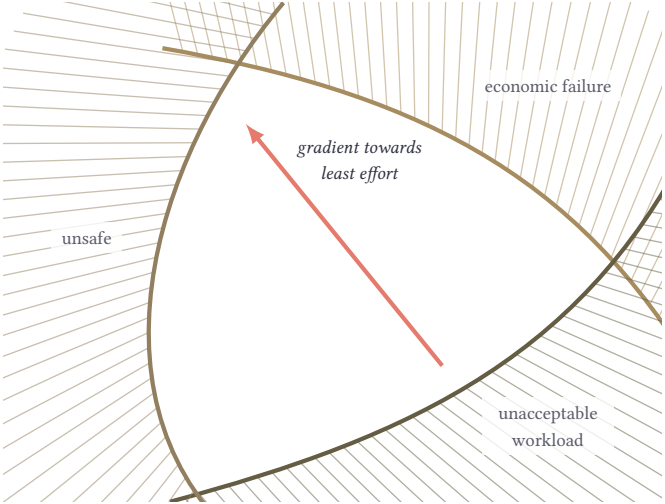
Drift into failure



Human behaviour in any large system is shaped by constraints: economic, safety, feasible workload. Actors experiment within the space formed by these constraints.

Management will provide a "cost gradient" which pushes activity towards economic efficiency.

Workers will seek to maximize the efficiency of their work, with a gradient in the direction of reduced workload.

Figure adapted from *Risk management in a dynamic society*, J. Rasmussen, Safety Science, 1997:27(2)

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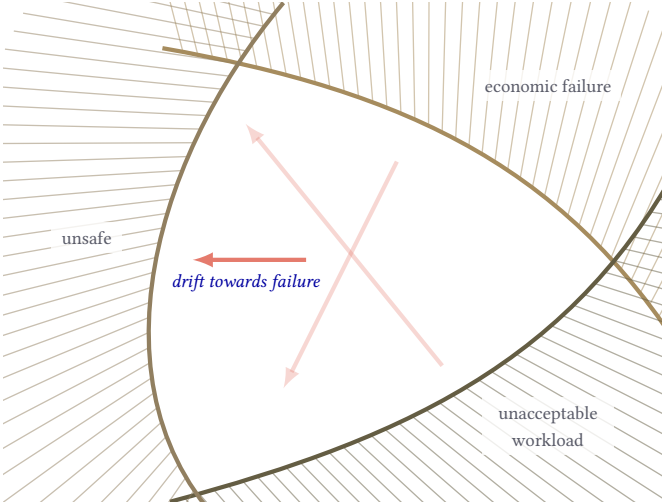
Drift into failure



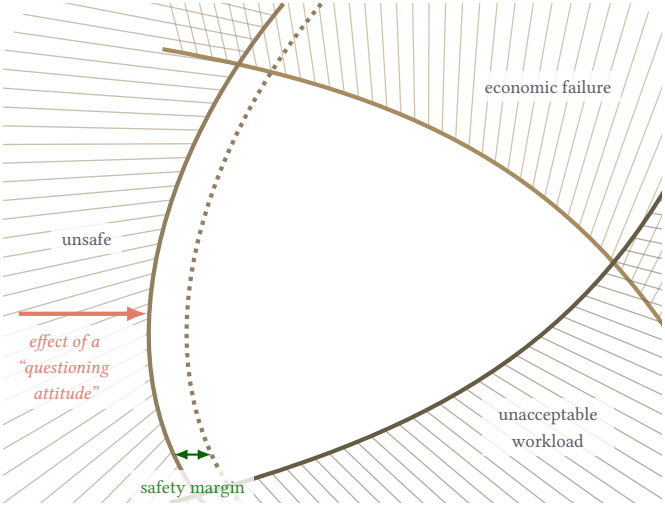
These pressures push work to migrate towards the limits of acceptable (safe) performance. Accidents occur when the system's activity crosses the boundary into unacceptable safety.

A process of "normalization of deviance" means that deviations from the safety procedures established during system design progressively become acceptable, then standard ways of working.

Figure adapted from *Risk management in a dynamic society*, J. Rasmussen, Safety Science, 1997:27(2)

RISK ENGINEERING

Drift into failure



Mature high-hazard systems apply the *defence in depth* design principle and implement multiple independent safety barriers. They also put in place programmes aimed at reinforcing people's *questioning attitude* and their *chronic unease*, making them more sensitive to safety issues.

These shift the perceived boundary of safe performance to the right. The difference between the minimally acceptable level of safe performance and the boundary at which safety barriers are triggered is the *safety margin*.

Figure adapted from *Risk management in a dynamic society*, J. Rasmussen, Safety Science, 1997:27(2)

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Aside: “normalization of deviance”

- Normalization of deviance occurs when it becomes generally acceptable to deviate from safety procedures and processes
  - shortcuts or optimizations in the name of increased performance
- Organization fails to implement or consistently apply its management system across the operation
  - regional or functional disparities exist
- Safety rules and defenses are routinely circumvented in order to get the job done
- Illustration: analysis of the Challenger and Columbia space shuttle accidents showed that people within NASA became so accustomed to a deviant behaviour that they didn’t consider it as deviant, despite the fact that they far exceeded their own rules for elementary safety

Source: Vaughan, D. (1996). *The Challenger launch decision: Risky technology, culture and deviance at NASA*, ISBN: 978-022685175

Drift into failure: possible causes

- Production pressure or cost reductions overriding safety concerns
- Confusion between reliability and safety, including reliance on past success as a substitute for sound engineering practices
- A “limit ourselves to compliance” mentality
  - only safety innovations mandated by the regulator are implemented
- Organizational barriers which prevent effective communication of critical safety information and stifle professional differences of opinion
- Evolution of informal chain of command and decision-making processes that operate outside the organization’s rules
- Insufficient oversight by the regulator, or regulators with insufficient authority to enforce change in certain areas
- A tendency to weigh operational ease/comfort/performance more than the restrictions which are often required for safe operation

Drift into failure: illustration

Video that illustrates drift into failure in complex systems with the sinking of MV Sewel (South Korea, 2014), which killed 295 people.

Watch online: `youtu.be/iZwbm8Y1Ywc`

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Inadequate communication

- Organizational learning requires **communication** between
  - people who are witnesses to the learning event
  - people who analyze it and establish recommendations
  - people who can implement changes and internalize the new information
- Communication is often impaired by the organizational structure of a company
  - organization charts, policies, regulations, budgeting, security systems
- Can be caused by:
  - problems with tools used to store and share information
  - political influences, because “information is power”
  - poor filtering (which information can be useful to whom?)
  - the increasing specialization within certain worker trades/professions
  - the effects of subcontracting

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Conflicting messages

- Sociologist E. Goffmann analyzed organizational behaviour using a dramaturgical metaphor, in which individuals' identity plays out through a "role" that they are acting
- Social interactions are analyzed in terms of how people live their lives like actors performing on a stage
  - "front-stage": the actor formally performs and adheres to conventions that have meaning to the audience
  - "back-stage": performers are present but without an audience
- A disconnect between **management's front-stage slogans** concerning safety and **reality of back-stage decisions** → loss of credibility
  - related: management ability to "walk the talk", reducing the "Say-Do" gap

Pursuit of the wrong kind of excellence

- Safety is a complex issue, and difficult to summarize in indicators
- Some organizations focus on occupational safety indicators (*e.g.* TRIR), and do not use process safety indicators
- Following an incomplete set of safety KPIs can lead to a mistaken belief that level of safety on your facility is high
- Illustration: explosion at BP refinery at Texas City (USA, 2005)
  - occupational safety indicators were good
  - budget restrictions led to underinvestment in equipment maintenance
  - number of losses of confinement was high, but not reported to board level
  - executive incentive scheme allocated 70% of bonus to performance and 15% to safety (an effective if indirect way of resolving conflicts between production and safety...)

More information: Hopkins, A. (2008). *Failure to learn: the BP Texas City Refinery Disaster*, CCH Australia. ISBN: 978-1921322440

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Further reading

- ESReDA report *Barriers to learning from incidents and accidents* (2015) and associated case studies document on multilevel learning, downloadable from `esreda.org` > Project Groups > Dynamic Learning…
- Investigating accidents and incidents, UK HSE, ISBN: 978-0717628278, freely downloadable from `hse.gov.uk/pubns/hsg245.pdf` (a step-by-step guide to investigations)
- UK Chartered Institute of Ergonomics and Human Factors (CIEHF) report *Learning from Adverse Events*
- RoSPA advice on learning from safety failure, at `rospa.com/occupational-safety/advice/safety-failure/`

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