



System safety – the common factors:  
The influence of culture on the management for safety:  
Examples from different industries

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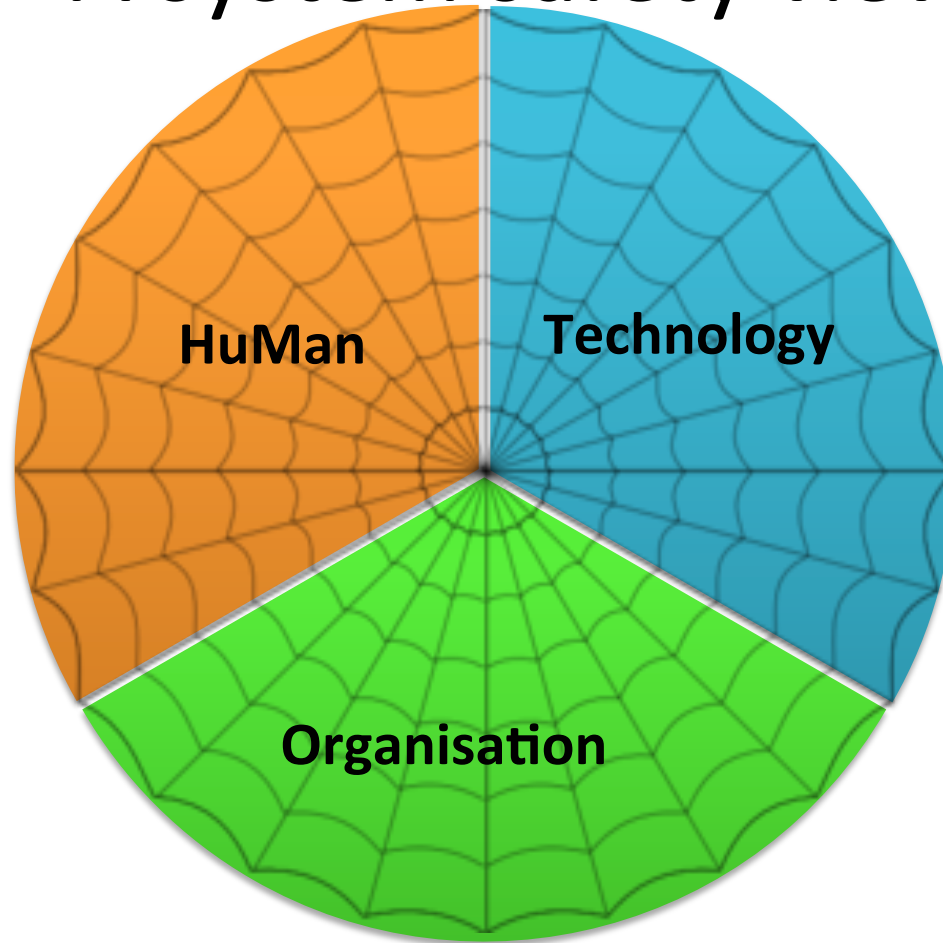
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- HTO concept
- Interactions
- Examples from real accidents
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# HuMans – Technology - Organisation

## A system safety view

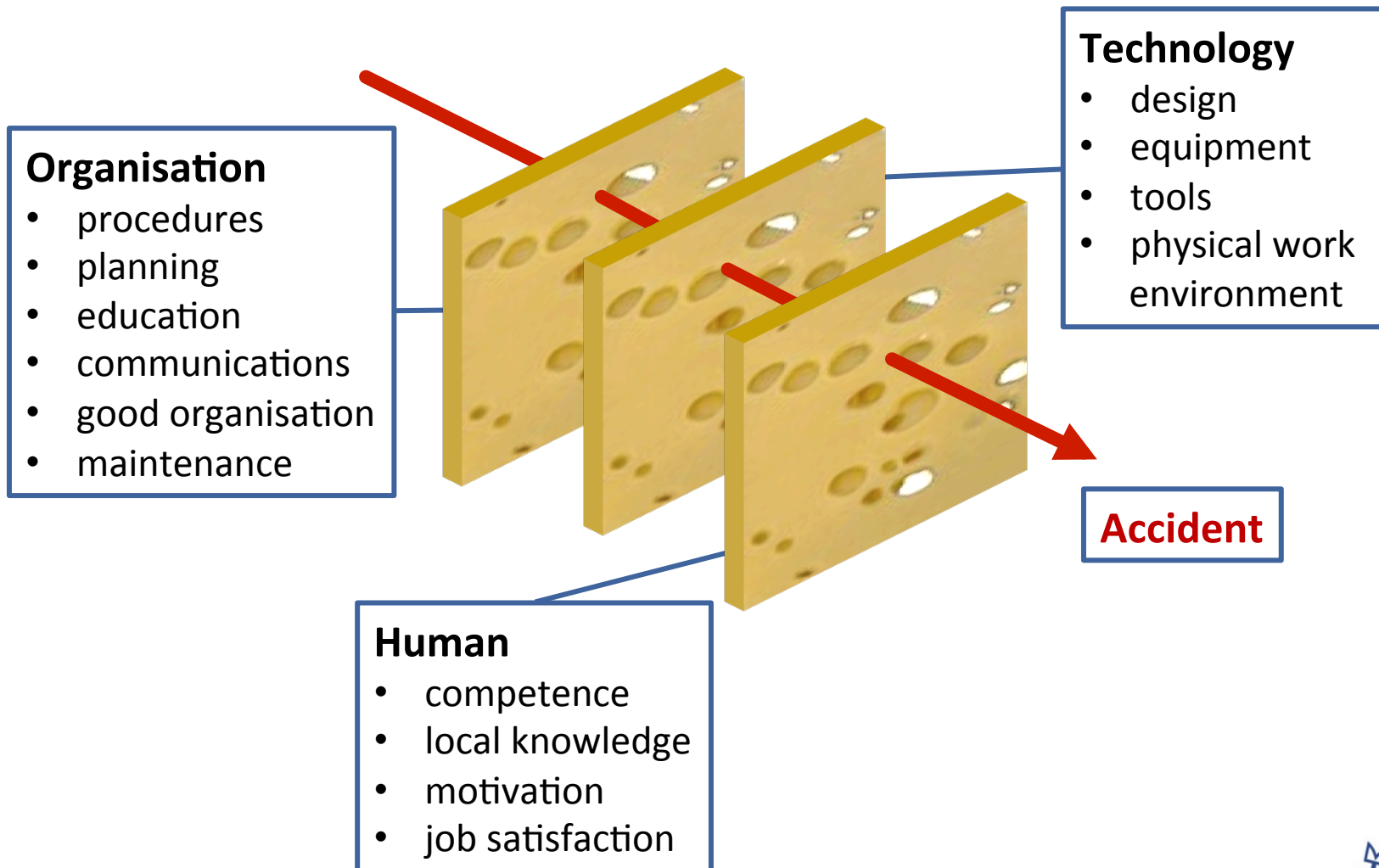


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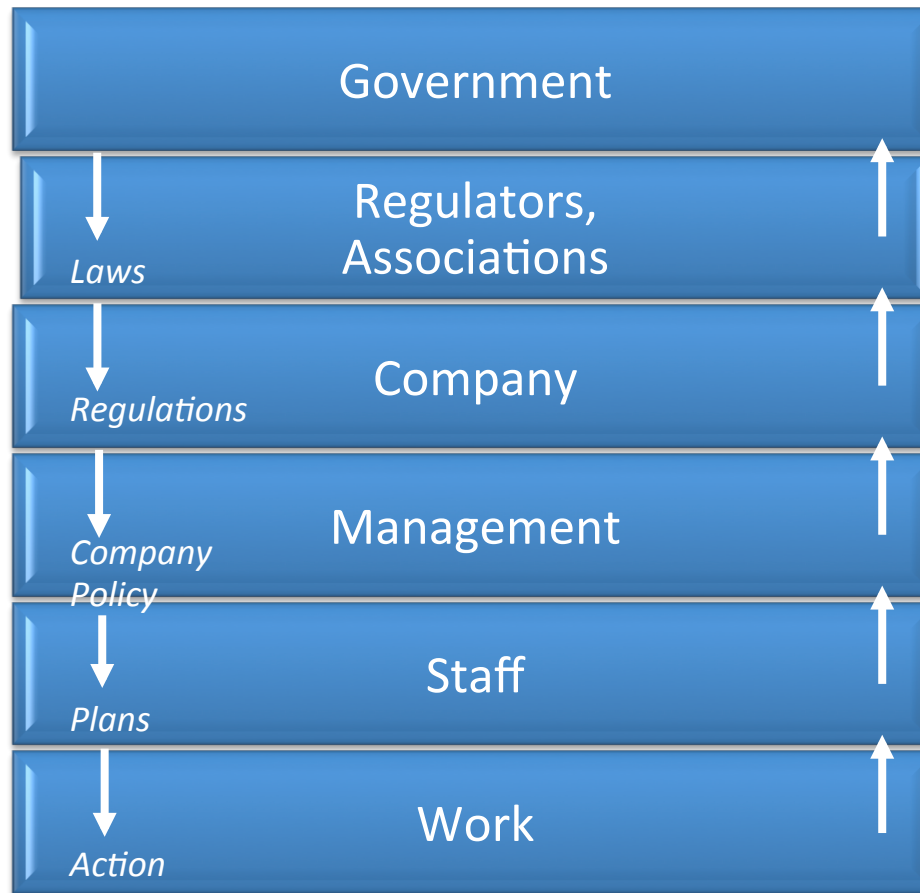
# Train driving with Automatic Train Protection System



# "Swiss cheese" model on accident causation (James Reason)



# System levels



Adapted from Rasmussen 1997

# No regulations

## Discotheque fire in Gothenburg 1998



# Regulation not enforced

## Fire at Borgholm Hotel 2004



*Fig. 5. Foto från Södra Långgatan ca kl. 06:45*



# Costa Concordia, 2012



# Passenger ship safety recommendations agreed by IMO's Maritime Safety Committee

The MSC adopted a resolution, which invites Member States to recommend that passenger ship companies conduct a review of operational safety measures, to ships flying their flag, on a voluntary basis and “with all possible urgency and efficiency.

Recommended interim measures include:

- carrying additional lifejackets, to be readily accessible in public spaces;
- reviewing the adequacy of the dissemination and communication of the emergency instructions on board ships;
- carrying out the muster for embarking passengers prior to departure from every port of embarkation, if the duration is 24 hours or more;
- limiting access to the bridge to those with operational or operationally related functions
- ensuring that the ship's voyage plan has taken into account IMO's Guidelines for voyage planning.

Maritime Safety Committee (MSC), 90th session, 16 to 25 May 2012

# Common factors - Regulator

- No regulations
- Inadequate regulations
- Regulations not enforced

# Interactions between companies in the Stockholm underground

(Illustration by Peter Sjöquist, Swedish Accident Investigation Authority, 2006)



# Accident investigation



On 15 January 2013, a commuter train crashed into a residential building in the Stockholm suburb, seriously injuring one person.

# Woman crashes train into house in Sweden

Reuters, STOCKHOLM |

Tue Jan 15, 2013 12:26pm EST

“A cleaning lady stole a train and drove it off the end of the tracks and smashed into a house in Sweden on Tuesday, injuring only herself in an incident police are investigating.

It was not clear how the woman, around 20, got access to the key needed to start the train. She was taken to hospital with serious injuries, but the train was carrying no other passengers as it was in the early hours and no one in the house was hurt.

"The cleaner drove the train at high speed, considerably higher than normal on that stretch, to where the rails end and crashed into a house," said XX, spokesman at Stockholm Public Transport (SL).

The train ploughed past the end of the line and vaulted over a street separating the house from the depot, crashing through a balcony and into a downstairs room in the upscale suburb of Saltsjobaden. SL and police were investigating how she had gained access to the cabin and been able to drive the train.”

**TRUE or FALSE?**



# Common factors – Company risk controls (1)

- Production focus
- Inadvertant change of risk acceptance level, normalization of deviances
  - Decisions to continue production even if conditions are not fulfilled
- Safety issues are not identified and managed within the business processes
- Goals for safety
  - Not clear
  - No follow up
- Inadequate management of safety in procurements
- Inadequate feedback loops and follow up



# Common factors – Company risk controls (2)

- Technical equipment with safety implications is out of operation
- Risks at interfaces
  - Not identified
  - Not managed
- No clear lines of accountability
  - Company
  - Subcontracts

# Common factors – Management committment

- Lack of knowledge and understanding on safety issues
- Lack of managment follow up and knowledge of what is going on
  - Not paying attention to details

# Safety culture iceberg metaphor

Behaviour

Traditions

Habits

Technology

Organisation structure

Policies och Procedures

Goals

Beliefs

Perceptions

Attitudes

Fellings

Values

Norms

**Visible**  
(above the surface)

- Explicitly learnt
- Conscious
- Easy to change

**Non visible**  
(under the surface)

- Implicitly learnt
- Subconscious
- Difficult to change



# Safety culture – Group analyses

## Managers vs. Non-Managers

The group analyses demonstrated that sex, age, length of time in the organisation, length of time in the position had little influence on how safety culture was perceived. However...

Safety culture aspect	Study location		
	A	B	ANS
Working situation	<b>m</b>		
Communication	<b>m</b>		<b>m</b>
Learning	<b>m</b>	<b>m</b>	<b>m</b>
Reporting	<b>m</b>	<b>m</b>	<b>m</b>
Justness			<b>m</b>
Flexibility			<b>m</b>
Attitudes towards safety	<b>m</b>	<b>m</b>	<b>m</b>
Safety-related behaviours	<b>m</b>		
Risk perception			<b>m</b>

# High accident rate

## Swedish Armed Forces Helicopter Wing

Since year 2000 there has been several serious accidents involving military helicopters with fourteen casualties in total



Element	What?	Example
<b>Risk controls</b> - <i>What's been written about what is done and how its done</i>		Policy Safety rules Management systems <b>Report incidents and near misses</b>
<b>Knowledge</b> - <i>Why you think you are doing it</i>		Attitudes, beliefs, feelings <b>The understanding that problems need to be reported and must be handled/resolved</b> within a reasonable time to avoid/reduce this risk
<b>Behaviour</b> - <i>What you actually are doing</i>		Observable behaviors Norms, Decisions <b>The will to report – Action Feedback</b> <i>"Quick fix" culture/Acceptance of deviations</i> <i>"There is a lot initiative and willingness to solve problems. There is a impending risk for quick fix solutions"</i>

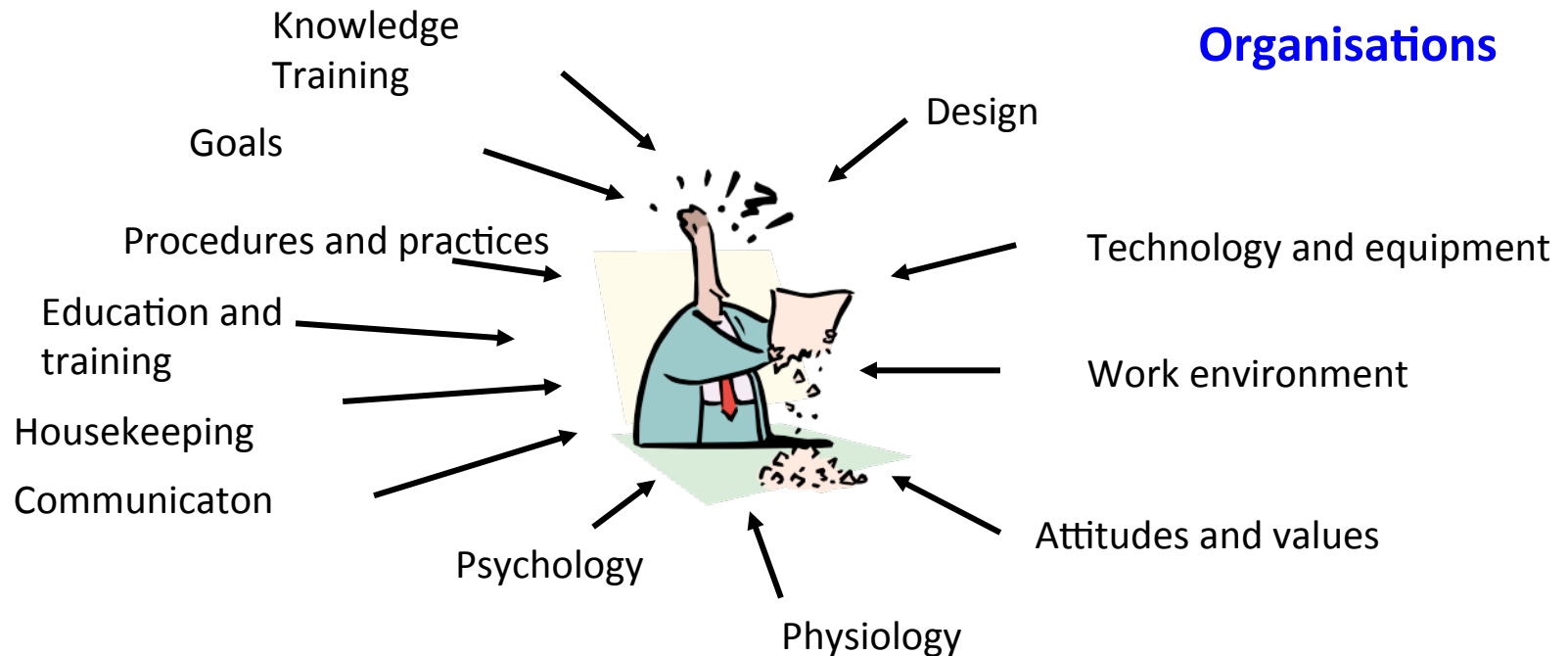
# HTO

## What effects human performance?

### HuMans

### Technologies

### Organisations

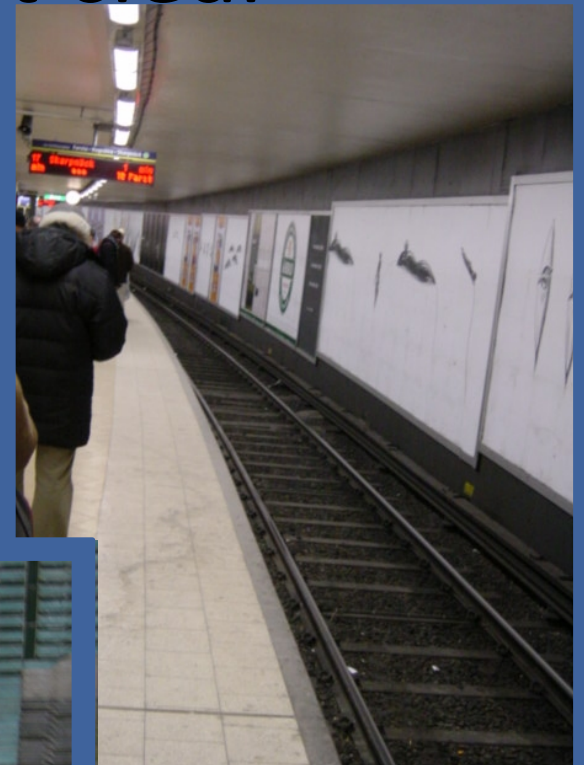


# Common factors - Procedures

- Inadequate procedures
- Procedures not updated
- Procedures not followed



# Common factor – Safety message is not clear -



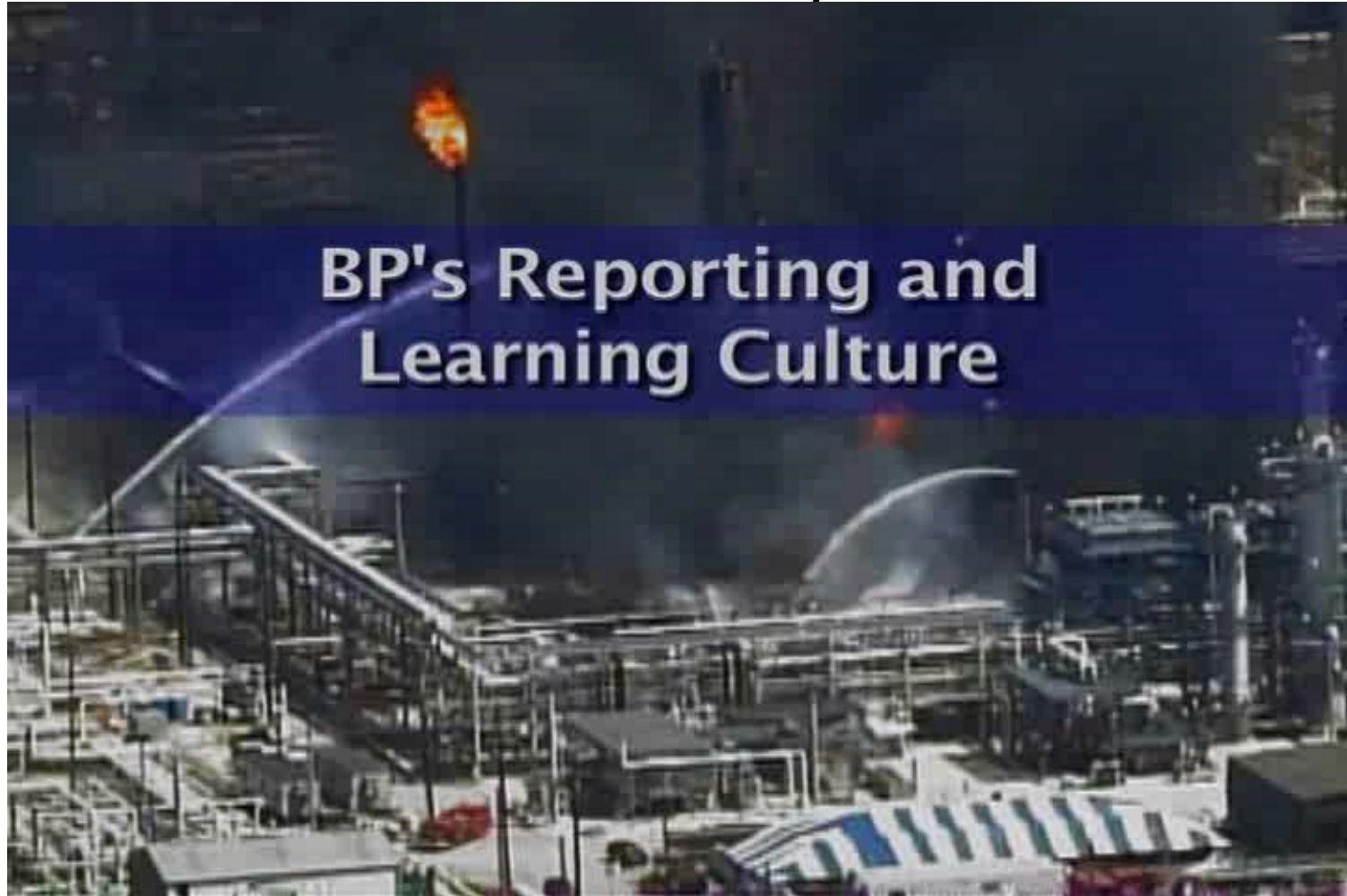
# Common factor – Inadequate design of workplace



Monitoring facility – heart clinic intensive care unit - hospital

# Trevor Kletz on the Texas City Oil Refinery accident, 2005

## From CSB safety video



# Summary of interaction between HuMans-Technologies-Organisations (MTO)

- A system safety view
- Several interactions
  - Identify the important HTO interactions
- Use of knowledge on human performance from the behavioural sciences in order to evaluate and design business processes, technical systems and organisations
- Application of methods and tools

# Thank you!

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