HUMAN & ORGANISATIONAL FACTORS IN OIL AND GAS

DMP Forum, Perth

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References to “Woodside” may be references to Woodside Petroleum Ltd. or its applicable subsidiaries.

Overview

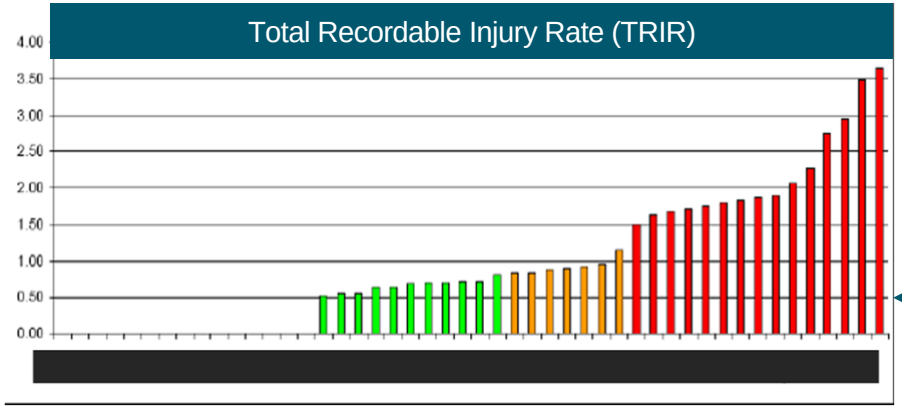
- Where it all started (for me)
- Six key concepts
- Our approach

Where it all started (for me)

“different organisations doing similar work are known to have different safety records and certain specific factors in the organisation are related to safety”,

“Third Report: Organising for Safety”, ACSNI*
Human Factors Study Group, 1993

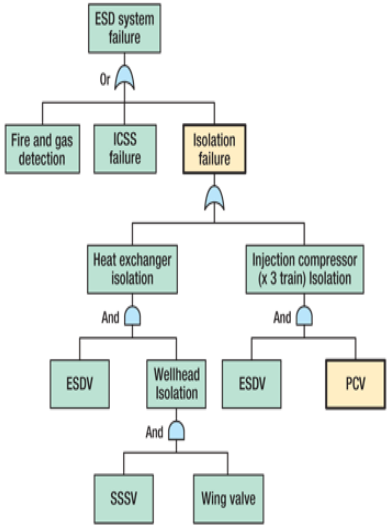
* Advisory Committee on the Safety of Nuclear Installations



Real data showing variation in safety performance across different facilities in an international organisation (not Woodside)

My UK HSE experience: Where do companies focus?

1. Engineering and hardware issues



... at the expense of human issues

2. Personal safety

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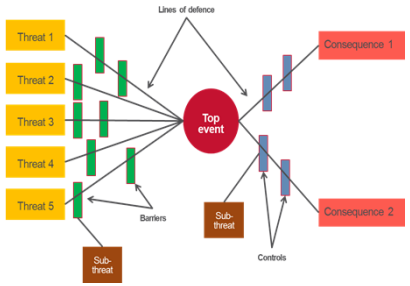

... at the expense of process safety

3. Front-line staff

To err is human

To blame it on someone else is even more human!

"Be careful out there"

... instead of those who design, lead and manage


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SIX KEY
CONCEPTS

Key concept 1: “Human error” is inevitable

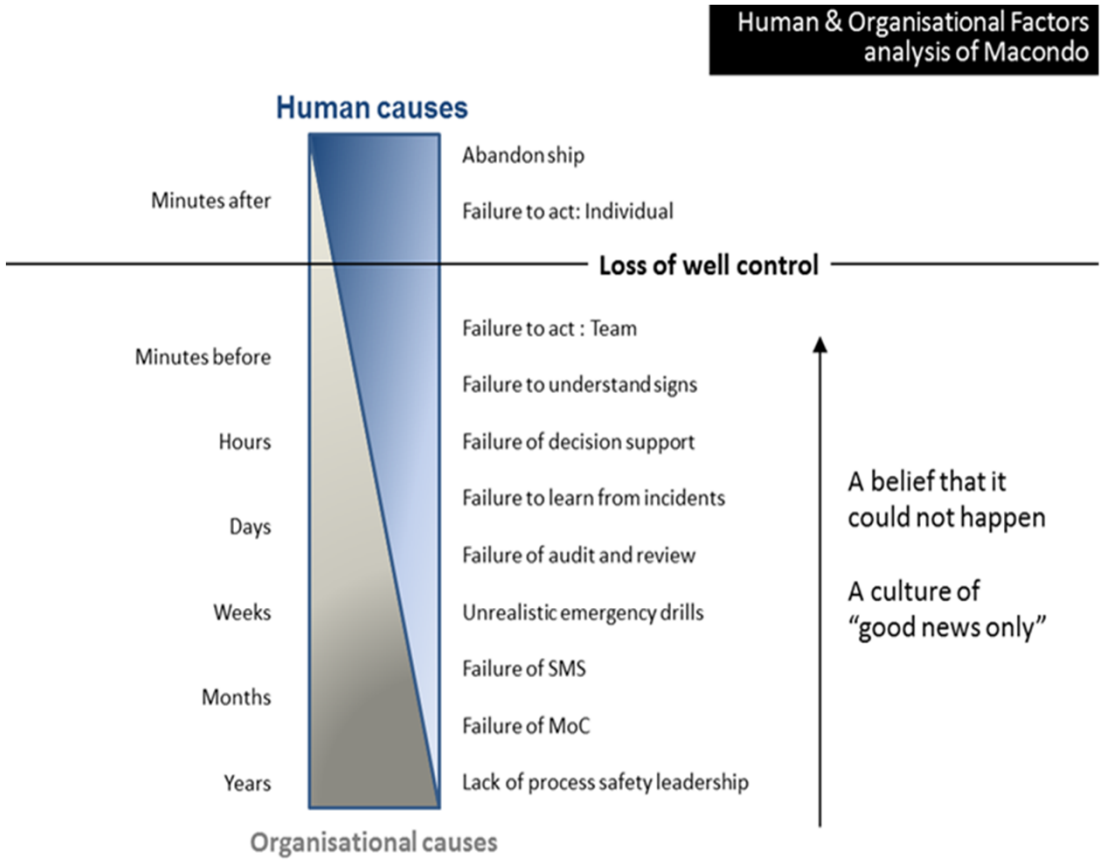
“It is generally understood that virtually all major accidents include Human Factors among the root causes and that prevention of major accidents depends upon human reliability”

IOGP, Report 460, 2010

(IOGP - International Association of Oil and Gas Producers)

The challenge is to create human reliability

Key concept 2: Don't just focus on the last person to touch the equipment



"The critical common element is an unwavering commitment to safety at the top of an organization: the CEO and board of directors must create the culture and establish the conditions under which everyone in a company shares responsibility for maintaining a relentless focus on preventing accidents"

Deep Water: Report to the President, 2011

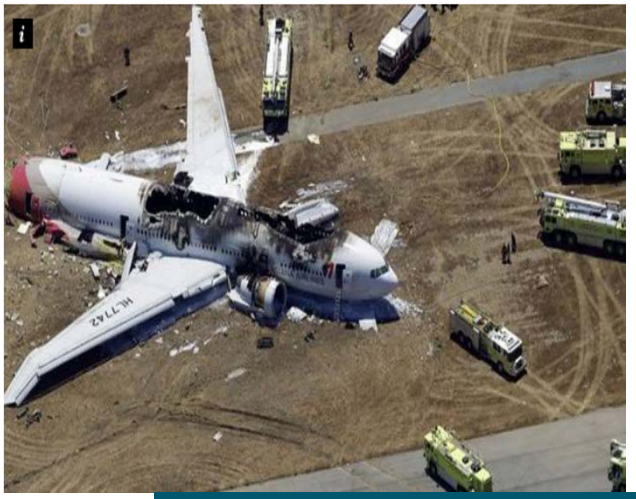
A tale of two aviation incidents

Asiana airlines crash caused by pilot error and confusion, investigators say

Investigation into San Francisco crash concludes pilots 'did not fully understand' systems and had unhealthy cockpit culture

www.theguardian.com (Wednesday 25th June 2014)

Asiana Airlines flight 214 crash caused by Boeing planes being 'overly complicated'



wwww.independent.co.uk (Wednesday 25th June 2014)

"Rather than being the main instigators of an accident, operators tend to be the inheritors of system defects created by poor design, incorrect installation, faulty maintenance and bad management decisions. Their part is usually that of adding the final garnish to a lethal brew whose ingredients have already been long in the cooking"

(James Reason, *Human Error,* 1990)

Key concept 3: Human reliability can be influenced . . .

. . . by **Performance Shaping Factors**,
such as fatigue, workload, distractions

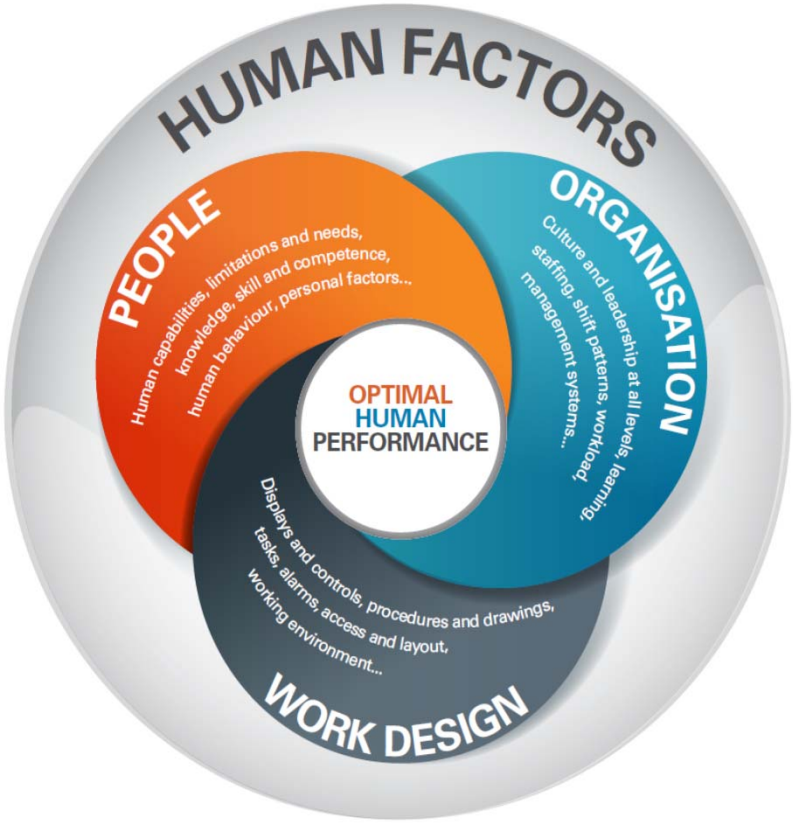
- **Human failures are not random!**

"People's actions are influenced by the organizations in which they work, shaping their choices in directions that even they may not realize"

NASA – Shuttle Columbia Accident Investigation Board

"Although actions or errors by operations personnel at the BP Texas City site were immediate causes of the accident, numerous latent conditions and safety system deficiencies influenced their actions and contributed to the accident"

CSB, BP Texas City Investigation Report



What might influence Homer’s behaviour?

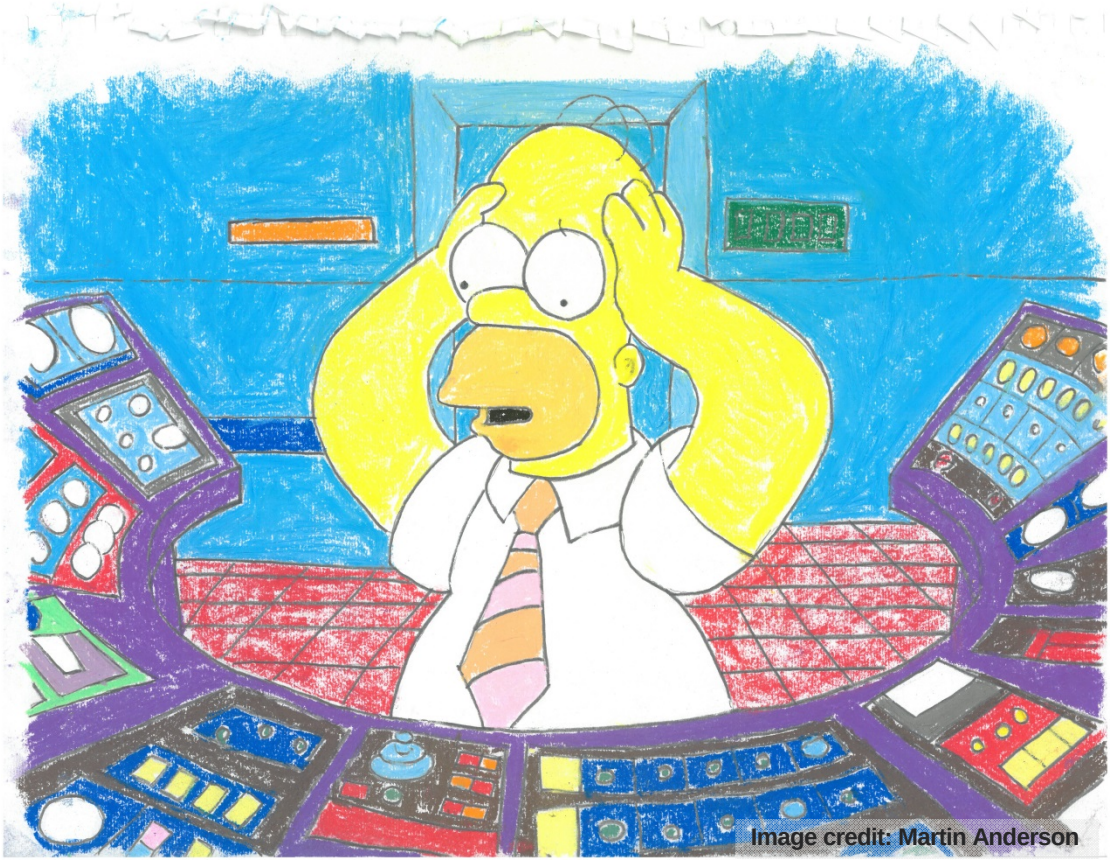


Image credit: Martin Anderson

Key concept 4: Whose behaviours and decisions?

+ Front line staff often have little control over a range of influences:
  - Shift patterns
  - Competing demands
  - Staffing levels
  - Quality of contractors
  - Competence programme
  - Permit system
  - Layout of plant
  - Procedures
  - Distractions
  - Design of controls and displays
  - Handover arrangements
  - Clarity of roles and responsibilities
  - Quality of supervision
+ "Behavioural safety" does not equal "human factors"
+ *"Behavioural safety and major accident hazards: Magic bullet or shot in the dark?"*, (Anderson, 2004)

Key concept 5: Human factors can be applied proactively

When something goes wrong

+

Before something goes wrong

Understand the human component

flickr.com/photos/pasukaru76/3998273279

- Applying human factors to investigations is part of the picture. . .
- . . . but what about applying human factors to incidents that haven’t occurred yet?

Key concept 6: Defining human factors as a set of key topics

Optimising human performance
Design of equipment, processes, tasks & environment
Organisational change
Supervision
Staffing levels and workload
Training & competence
Procedures
Safety critical communications (including handovers, permits & alarms)
Fatigue & shiftwork
Organisational & safety culture

Top 11 Human factors for WA mine sites, DMP, 2017

Key human factors topics in practice

Key human factors topics	Examples: CSB investigation of BP Texas City
Optimising human performance	No proactive analysis of DCS issues. Issues in previous start-ups not investigated.
Design of equipment, processes, tasks and environment	Control system did not support operations personnel
Organisational change	Various changes not evaluated for their impact on the control of major hazards
Supervision	Ineffective supervisory oversight and technical assistance during unit start-up
Staffing levels and workload	Insufficient staffing to handle board operator workload during the high-risk time of unit start-up
Training and competence	Inadequate operator training for abnormal and start-up conditions
Procedures	Not up-to-date or accurate. Start-up procedure lacked sufficient instructions
Safety critical communications	No policy for effective shift communication
Fatigue and shiftwork	Unit operators were likely fatigued (e.g. 12-hour shifts, 29 days in a row)
Organisational and safety culture	A work environment that encouraged operations personnel to deviate from procedure

BP Texas City refinery (2005). Images from U.S. Chemical Safety and Hazard Investigation Board (www.CSB.gov)

What if we don’t address human factors?

- Things take longer than they should . . .
- Things have to be re-done . . .
- People don’t do what we expected (or hoped for) …

- . . . stuff gets out of the pipes, and we hurt:
  - people
  - the system
  - the environment
  - the organisation

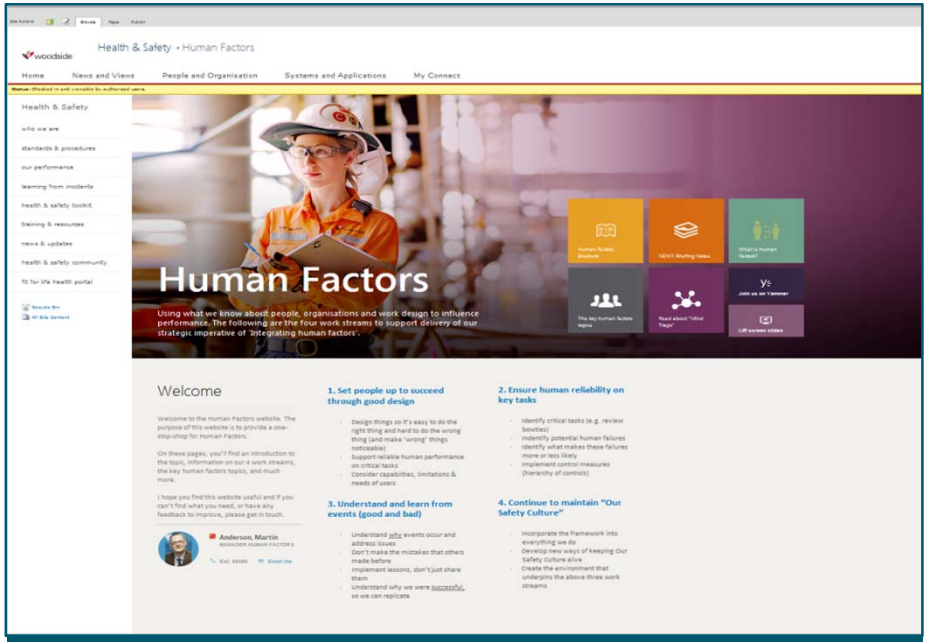
- When other organisations have hurt people, the system and the environment all in one go, it has cost $$ billions.


Photo credit: Martin Anderson

OUR APPROACH TO HUMAN FACTORS

Our human factors capability and resources

+ Central HF Team
+ Operations HF Adviser
+ Developments HF Adviser
+ Incident investigators
+ HFAT® trained staff
+ HF focal points



Approach based around the
10 Key HF topics

Internal resources based around the key topics

Human Factors: Key Topics

"Human factors uses what we know about people, organisations and work design to influence performance"

WE KEEP EACH OTHER SAFE

Introduction to Human Factors

- Introductory presentation
- Human Factors brochure
- E-learning module and
- Facilitation Guide

Risk Assessment & Critical Task Analysis

- Briefing Note
- Critical Task Analysis (CTA) Guideline
- Summary of CTA Guideline
- CTA Assessment form
- Performance Shaping Factors
- Risk Assessment Pocket Card
- NOPSEMA – Information Paper

Investigations

- Health Safety and Environment Event Investigation Guideline
- Set up to fail?
- HFAT® use at Woodside
- HFAT® focal points
- HFAT® refresher video
- HFAT® peer review checklist
- NOPSEMA – Information Paper
- Taking the First Steps

Our Safety Culture

- OSC Framework
- Introductory video
- Manager & Supervisor behaviours
- OSC Discussion Cards
- Discussion cards – User Guide
- OSC Pulse Check poster
- Pulse Check instructions
- HSEQ Leadership Field Guide

Human Factors in Design

- Briefing Note
- Human Factors Engineering Standard
- Human Factors Engineering Guideline
- Human Factors in Projects Guideline
- IOGP – Human Factors Engineering in Projects
- NOPSEMA – Information Paper

Organisational Change

- Briefing Note
- Organisational Change Guideline
- Assessment templates
- Summary of Guideline

Safety Critical Communications

- Briefing Note
- Shift handover guide

Procedures

- Briefing Note
- NOPSEMA – Information Paper

Fatigue and Shift-work

- Briefing Note
- Fatigue management guideline
- Safe Work Australia - Guidance

Supervision

- Briefing Note
- Worksafe - Guidance

Staffing

- Briefing Note

Training & Competence

- Briefing Note
- Safe Work Australia - Guidance

Mind Traps (Decision Making)

- Managing Mind Traps Briefing Note
- Confirmation Bias Briefing Note
- Mind Traps 1-page summary
- Situation Awareness 1-page summary
- Situation Awareness - Recap & Reset 2017

Distractions & interruptions

- Briefing Note
- Distractions 1-page summary
- Fatal distraction: Children left in vehicles

Maintenance Error

- Briefing Note

Gap analysis against the key topics

UK HSE top 10 HF topics		Brief description of topic	Company 1	Company 2	Company 3	Company 4
1. Managing Human Failures	1.1 Human Factors in Risk Assessment	Structured inclusion of influences on human failure (violations and errors) in design and risk assessment	Red	Red	Amber	Red
	1.2 Incident investigation	As above for incident investigation	Amber	Amber	Green	Red
2. Procedures		Providing user-friendly procedures, which support error-free performance	Amber	Amber	Amber	Amber
3. Training & Competence		Ability to undertake responsibilities and perform activities to a recognised standard on a regular basis. It is a combination of skills, experience and knowledge.	Amber	Amber	Green	Green
4. Staffing	4.1 Staffing levels	Right level of skilled people available for task	Amber	Amber	Green	Green
	4.2 Workload	Manageable workload, especially during upsets and emergencies	Red	Amber	Red	Amber
	4.3 Supervision	Experienced supervisors regularly present at work-site	Amber	Amber	Green	Amber
	4.4 Contractors	Competent contractors, properly-supervised	Amber	Amber	Green	Amber
5. Organisational Change		Human aspects of organisational change risk-assessed and controlled	Amber	Red	Red	Amber
6. Safety-Critical Communications	6.1 Shift Handover	Structured process for shift and task handover in place and working as intended	Red	Green	Red	Green
	6.2 Permit-To-Work	As above for permit-to-work	Red	Green	Red	Green
7. Human Factors in Design	7.1 Control Rooms	Ergonomic design principles used	Amber	Amber	Amber	Amber
	7.2 Human-Computer Interface	As above	Amber	Amber	Amber	Amber
	7.3 Alarm Management	As above, to prevent alarm floods	Amber	Amber	Amber	Amber
	7.4 Lighting, Thermal Comfort, Noise & Vibration	As above	Amber	Amber	Amber	Amber
8. Fatigue & Shiftwork		Work patterns designed to prevent / mitigate fatigue, and reduce error	Red	Green	Green	Amber
9. Organisational and Safety Culture	9.1 Behavioural Safety	Programmes target critical behaviours, and include process & occupational safety	Green	Amber	Green	Green
	9.2 Learning Organisations	Chronic unease exists, always looking for system causes of failures, and opportunities to learn or improve	Amber	Amber	Amber	Green
10.Maintenance, Inspection & Testing	10.1 Maintenance Error	Structured process to minimise such errors in place – coupled with widespread awareness of risk of maintenance error	Red	Amber	Red	Amber
	10.2 Intelligent Customers	The capability of the organization to have a clear understanding and knowledge of the product or service being supplied. Relevant to use of contractors.	Red	Amber	Green	Amber

Gap analysis findings: Fictitious data

Human factors focus areas

1

Set people up to succeed through good design

- ✓ Design things so it's easy to do the right thing and hard to do the wrong thing (and make 'wrong' things noticeable)
- ✓ Ensure our 'end-users' are involved in design
- ✓ Consider capabilities, limitations & needs of users

2

Ensure human reliability on critical tasks

- ✓ Identify critical tasks in your business area
- ✓ Understand the potential for human failure in these tasks and the conditions or influences that make them more likely
- ✓ Implement control measures (using the hierarchy of control)

3

Understand and learn from events (good and bad)

- ✓ Seek to understand how and why something went wrong
- ✓ Report and discuss errors, and understand the conditions that make errors more likely
- ✓ Understand why we were successful, so we can replicate success

4

Continue to maintain "Our Safety Culture"

- ✓ Engage people using the Discussion Cards
- ✓ Understand key behaviours in investigations
- ✓ Incorporate the framework into everything we do
- ✓ Create the environment that underpins the above key areas

Human factors in design

1

Set people up to succeed through good design

- ✓ Design things so it's easy to do the right thing and hard to do the wrong thing (and make 'wrong' things noticeable)
- ✓ Ensure our 'end-users' are involved in design
- ✓ Consider capabilities, limitations & needs of users

Also known as **Human Factors Engineering**:

"Designing plant, processes and systems in a way that optimises the human contribution"

Photo credits: Martin Anderson

Set people up for success - get the design right

- Misfuelling costs Australian motorists $10 million each year
- Average repair costs $7000
- The solution:
  - tell people not to do it?
  - standardise the pump colour coding?
  - segregation of fuel pumps?
  - warning sticker on fuel cap?
- Engineering solutions are more robust:
  - Assume people will pick the wrong pump
  - Make it physically impossible to misfuel

Photo credit: Martin Anderson

Human reliability on critical tasks

2

Ensure human reliability on critical tasks

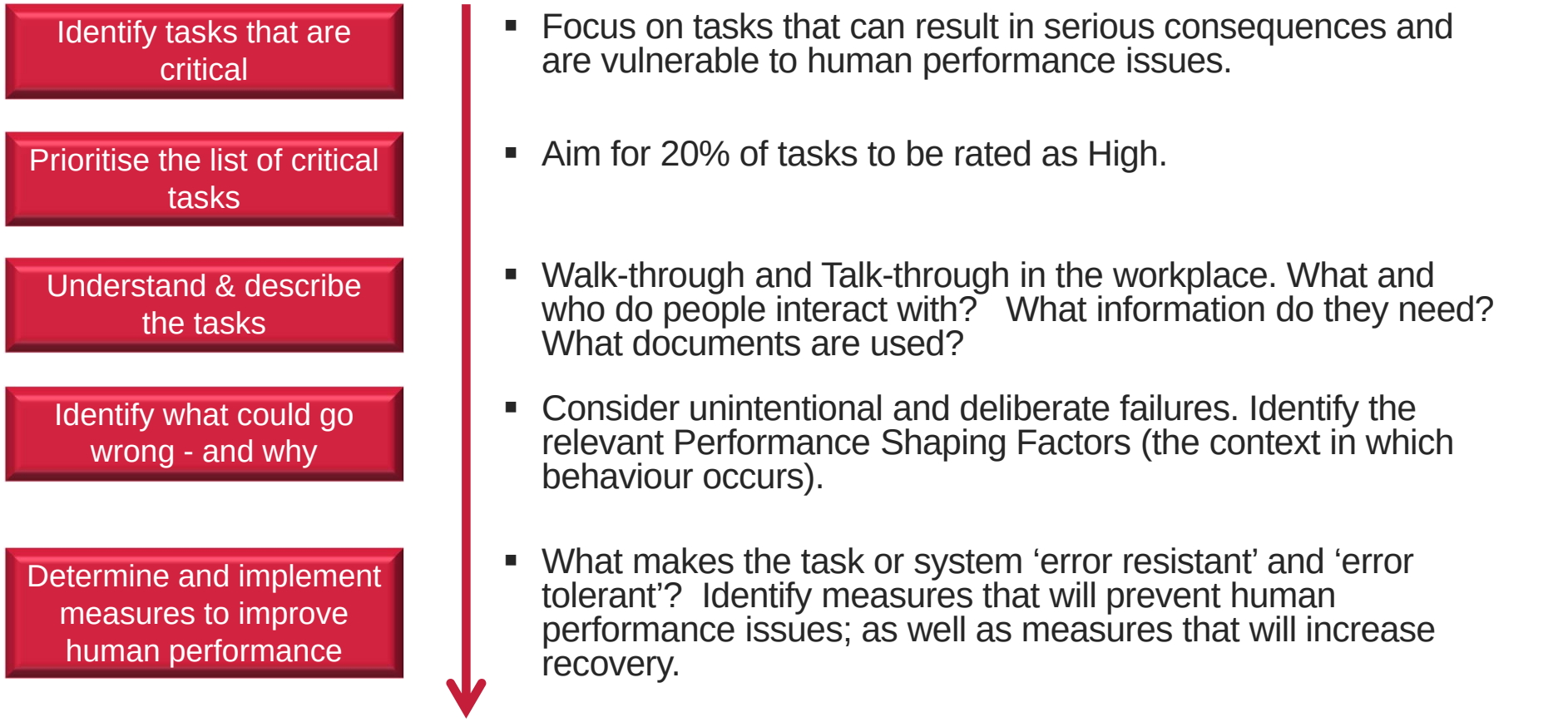
- ✓ Identify critical tasks in your business area
- ✓ Understand the potential for human failure in these tasks and the conditions or influences that make them more likely
- ✓ Implement control measures (using the hierarchy of control)

- Traditionally, we consider how the system can harm the person
- We need to also consider the opposite:
- What can the person do (or not do) that could harm the system?
- This involves proactively identifying and managing potential human performance issues on critical tasks

"Identification of critical human tasks should be the first step for organisations seeking to improve their control of error risk" (NOPSEMA, 2015, N-06300-IP1509)

"members should work towards adopting practices to identify and understand safety-critical human tasks. They should also work on the operational and management practices that need to be in place to ensure operators are able to perform these tasks reliably", (IOGP, Report 460, July 2012)

Critical Task Analysis: Human factors risk assessment



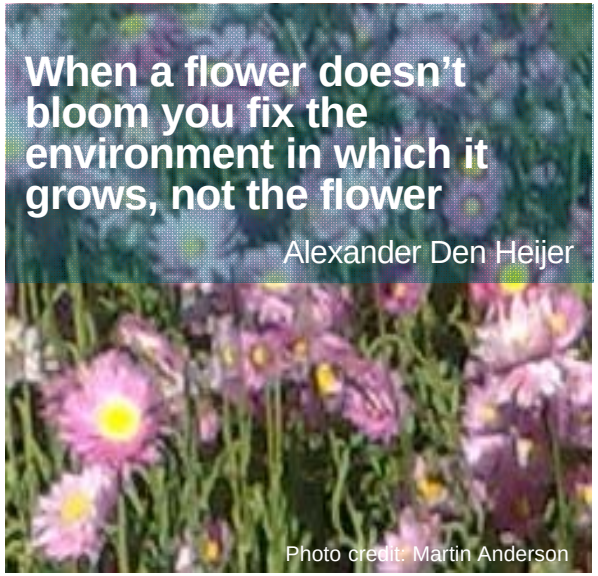
- Focus on tasks that can result in serious consequences and are vulnerable to human performance issues.
- Aim for 20% of tasks to be rated as High.
- Walk-through and Talk-through in the workplace. What and who do people interact with? What information do they need? What documents are used?
- Consider unintentional and deliberate failures. Identify the relevant Performance Shaping Factors (the context in which behaviour occurs).
- What makes the task or system ‘error resistant’ and ‘error tolerant’? Identify measures that will prevent human performance issues; as well as measures that will increase recovery.

3

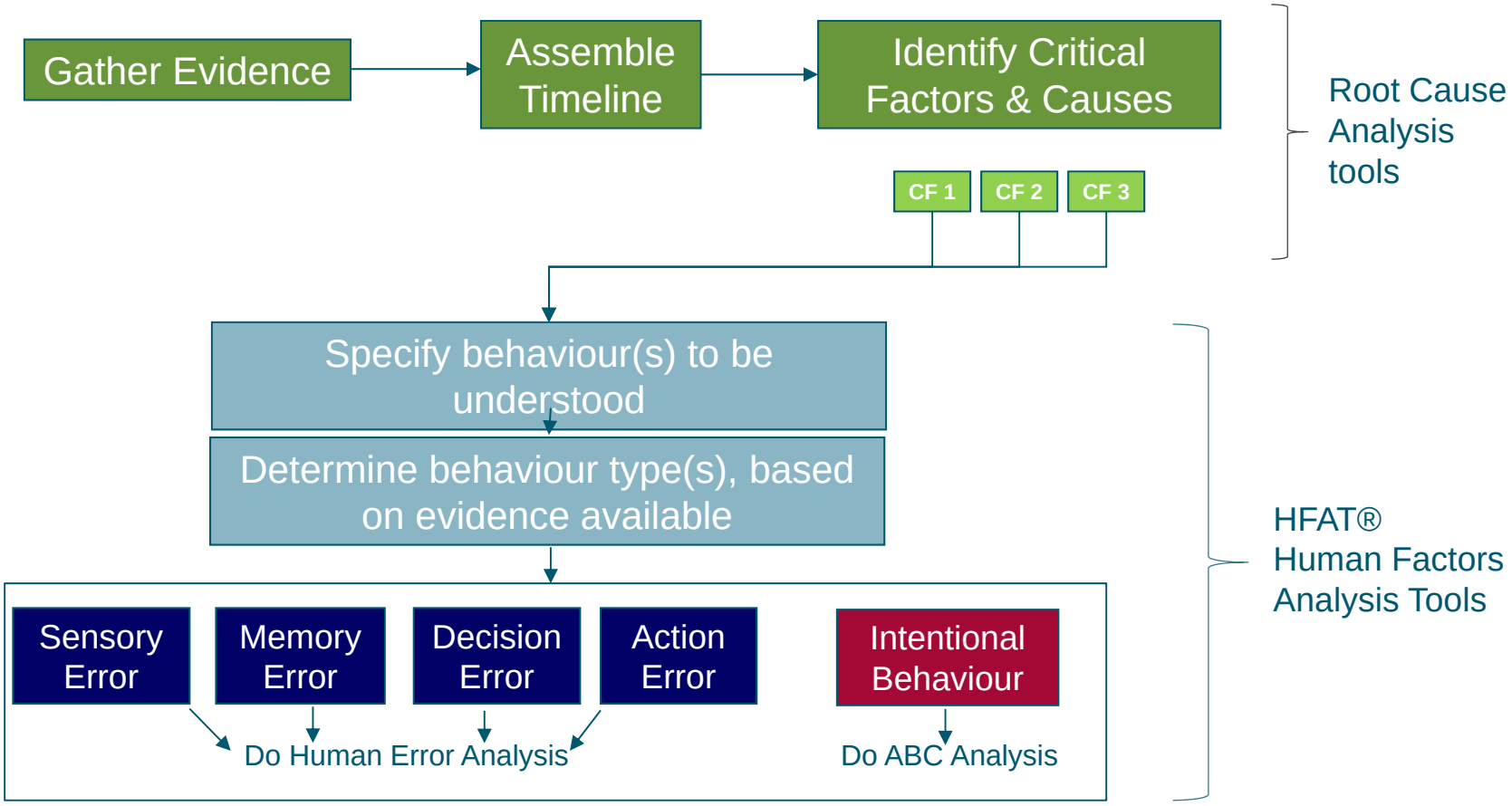
Understand and learn from events (good and bad)

- ✓ Seek to understand how and why something went wrong
- ✓ Report and discuss errors, and understand the conditions that make errors more likely
- ✓ Understand why we were successful, so we can replicate success

+ Investigator non-technical skills
+ Learning lessons
+ Links to non-HSE events
+ Incorporating the HFAT® approach
+ Investigating successes



Investigation approach



Maintaining Our Safety Culture

4

Continue to maintain "Our Safety Culture"

- ✓ Engage people using the Discussion Cards
- ✓ Understand key behaviours in investigations
- ✓ Incorporate the framework into everything we do
- ✓ Create the environment that underpins the above key areas

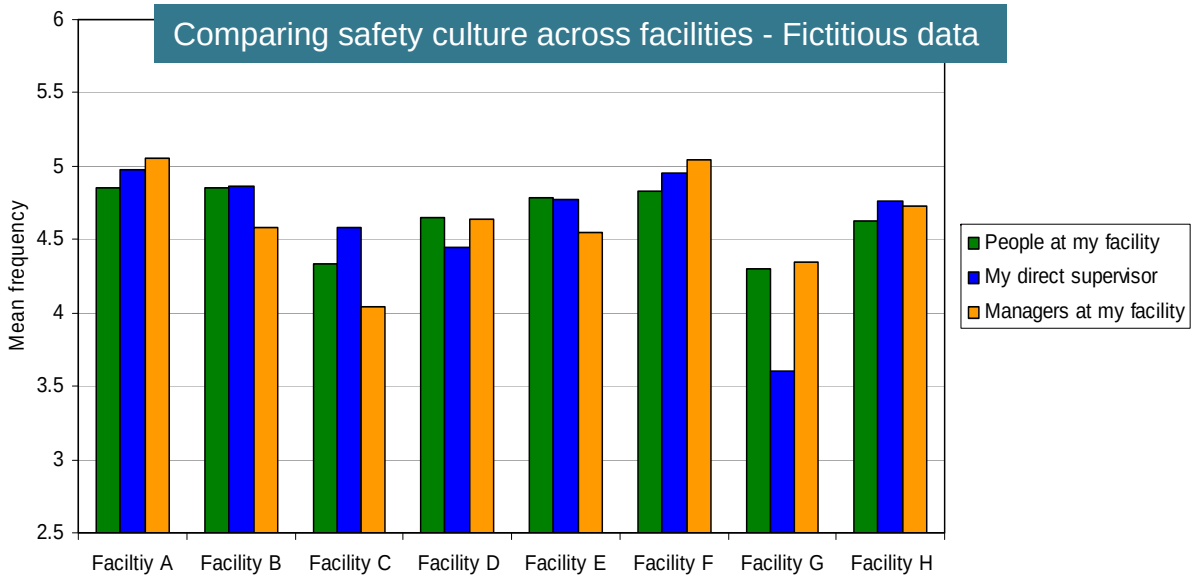
Theme	Everyone	Supervisors	Managers/Executives
Standards	Follow rules	Ensure compliance	Set high standards
Communication	Speak up	Encourage the team	Communicate openly
Risk management	Be mindful	Promote risk awareness	Confront risk
Involvement	Get involved	Involve the team	Involve the workforce

"Our Safety Culture" Framework

Photo credit: Martin Anderson

Our Safety Culture Discussion Cards

Assessing Our Safety Culture



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