



# **Review of Human Factors in Queensland Mining incidents**

**The HFACS-MI project**

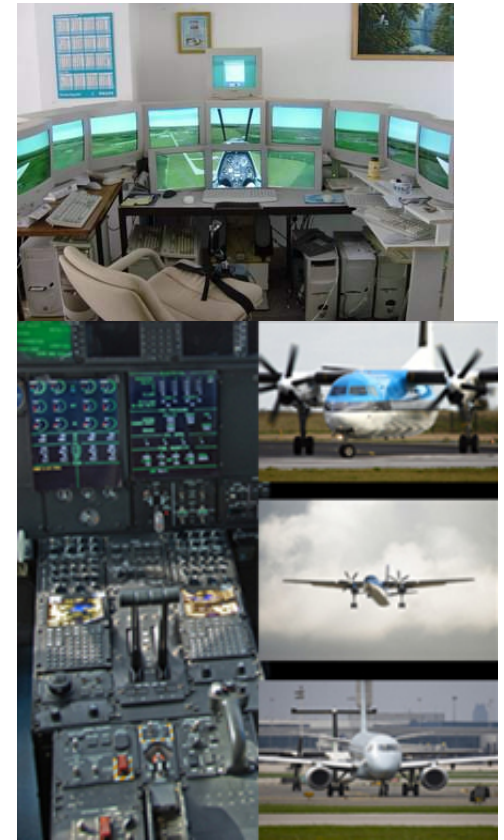
**Trudy Tilbury, Safety and Health**

# Points covered today

- What is human factors and why use it in Mining
- Introduction to HFACS-MI
- Main findings from HFACS-MI Analysis
- QME strategy
- Questions

# A general definition of Human Factors

“Human factors is the multi-disciplinary science that applies knowledge about the capabilities and limitations of human performance to all aspects of the design, manufacture, operation, and maintenance of *equipment and systems*”. (ATSB, adapted)



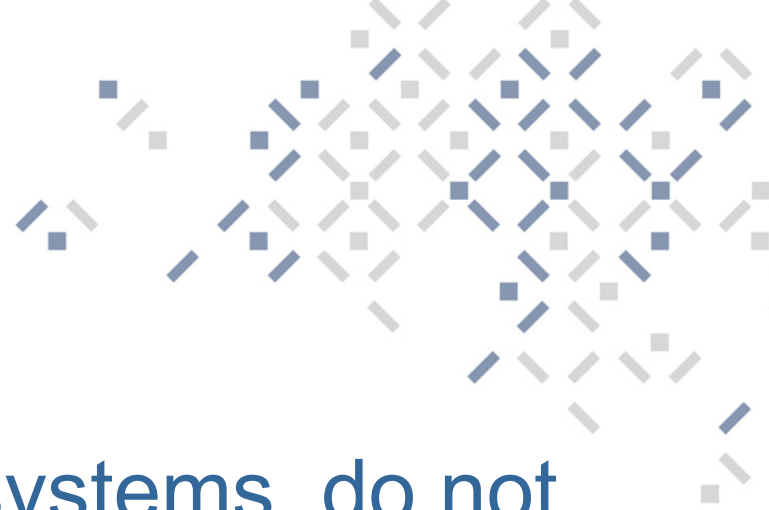
# Human Factors = evidence on people

Focus is on what people can and can't do in the real world of work rather than a design/ engineering view of people

Some systems, and the equipment used in them, are developed without information on the end users, or based on (sometimes) outdated standards



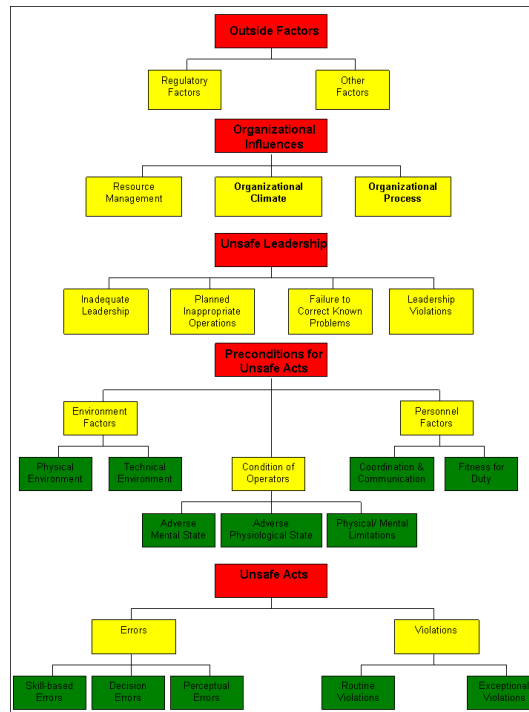
# Human Factors gaps



Most safety management systems do not address human error, for example:

- Ignoring potential human error/human factors completely - especially in risk assessments.
- Using training as a control without understanding that training **will not** have an effect on skill based (autopilot) errors or violations (adapted from HSE, Human Factors)

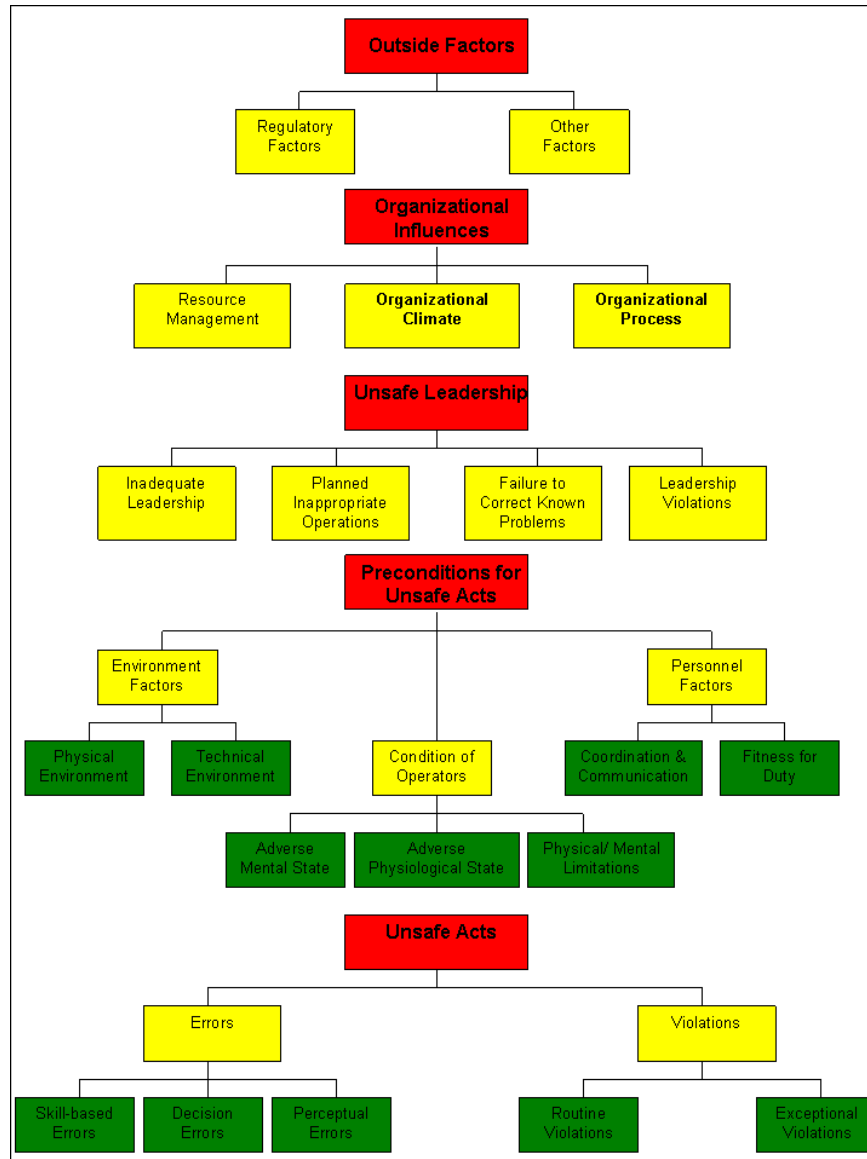
# Introduction to HFACS-MI



# Introduction to HFACS-MI

- HFACS is a ‘taxonomy’ or classification system looking at errors (unsafe acts), unsafe leadership and organisational factors
- HFACS-MI (developed by Clemson University specifically for use in Queensland Mining) is based on the work of James Reason
- The lowest level of errors (unsafe acts that happen directly before an incident) are skill based, decision and perceptual errors

# HFACS-MI





# Human error in the HFACS-MI model



A very common error is a ‘routine disruption error’ or autopilot error (skill based error in the Reason or HFACS model)

These errors happen when we’re on autopilot and we miss something (like a turn off for home). These errors are made by those who are fully competent or ‘unconsciously competent’



# Human error in the HFACS model

Another common error is a “decision error”

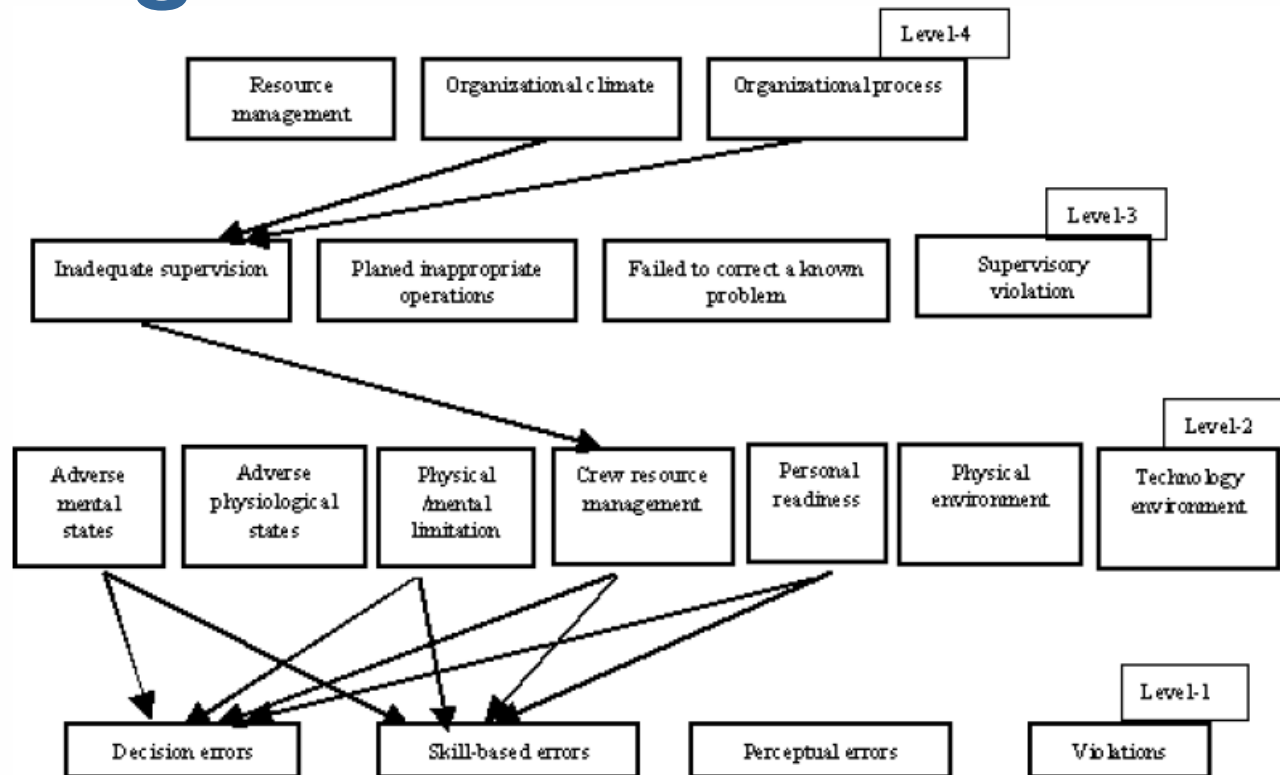
These errors are the ones where you have a plan, but take the wrong action usually because you don't have all of the information or knowledge, or because of previous experience.

# Human error in the HFACS model

## Key point from HFACS model and Reason

Error at lower levels can be influenced or caused by decisions and ‘latent’ errors within the organisation or system. It is important to trace these errors back to the actual root cause .

# Errors influenced by higher levels



Indicates Lambda (PRE) Value in excess of 5%

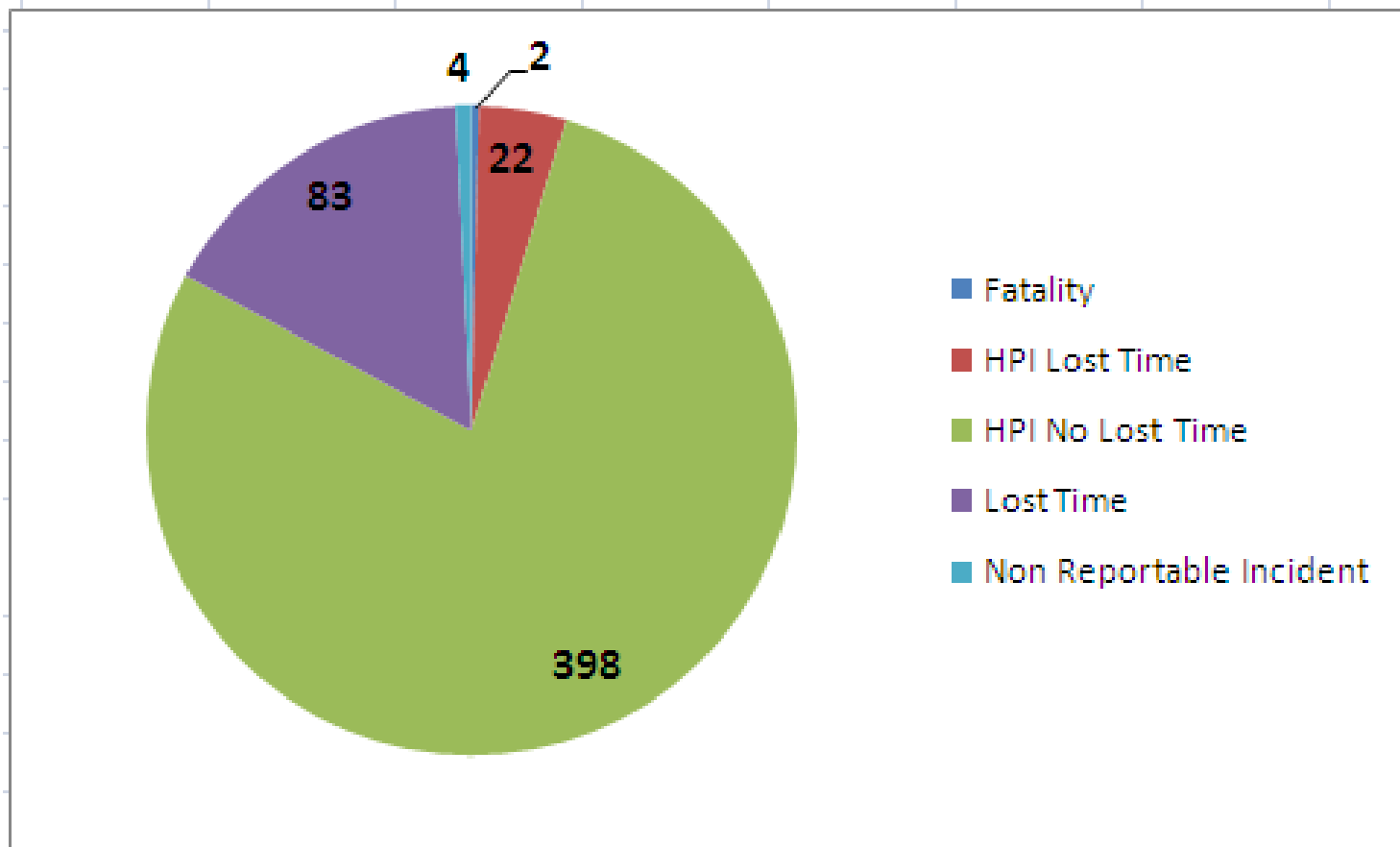
Li and Harris, 2006



HFACS-MI analysis of Unsafe Acts for 500+ Qld  
Mining incidents from 2004

# HFACS-MI RESULTS

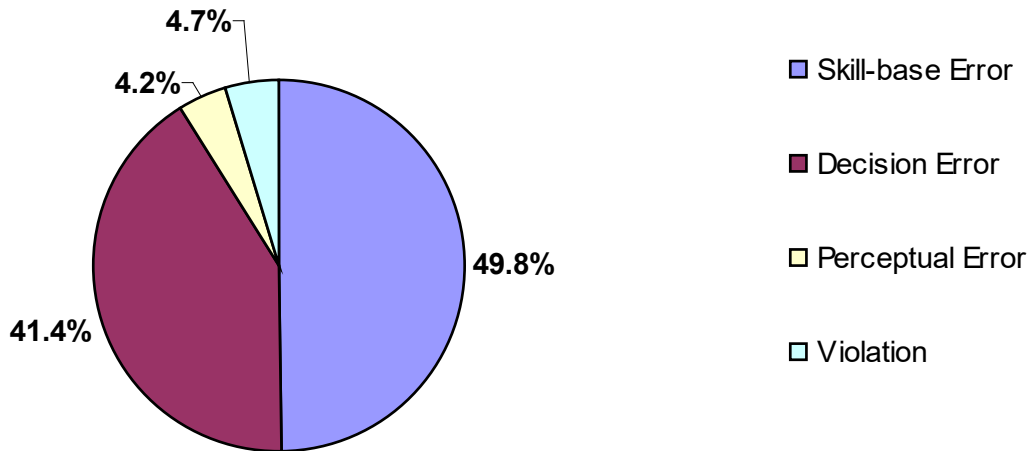
# Data used in analysis



# Unsafe Acts



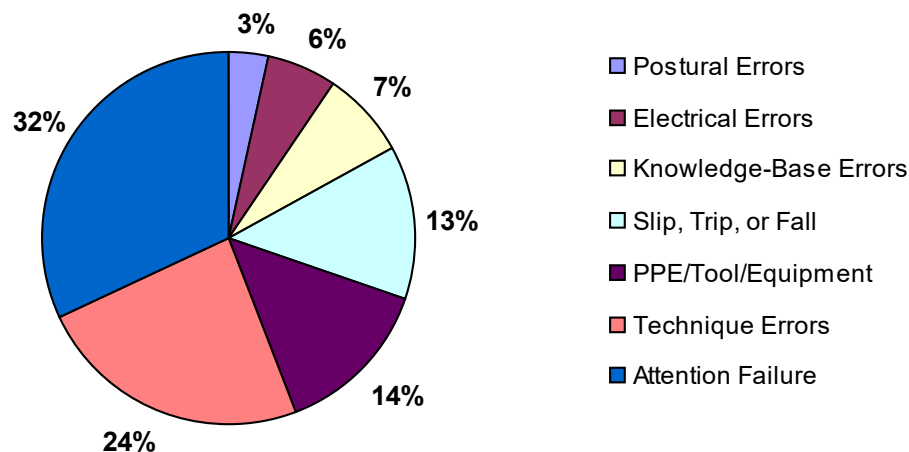
**Unsafe Acts of the Operator**



- 95% of cases identified at least 1 unsafe act
- Skill-based Errors most identified (50%)
- Perceptual Errors and Violations represent <10% of codes identified

# Skill-based Errors (consciously competent, routine disruption)

Skill-based Errors- Nanocodes

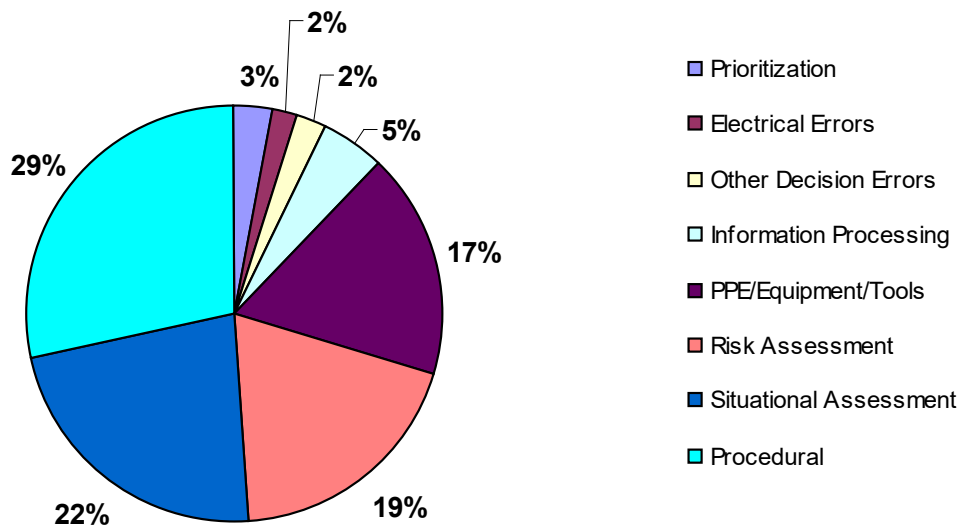


- Attention failures most identified (32%)
- Occur when operators are focused on multiple things at once.
- Technique errors refer to how things are done (24%)
- PPE/Tool/Equipment errors (14%)



# Decision Errors

Decision Errors- Nanocodes



- **Procedural errors (29%):** Incorrect application, applying incorrect procedure, lack of knowledge on correct procedure
- **Situational assessment (22%):** Identification of hazards
- **Risk assessment (19%):** using appropriate risk assessments, JSA, Take 5, etc.

# Where could HFACS-MI 'fit' in mining?



# Incompatible controls



# HFACS-MI Strategy



- HFACS is a ‘taxonomy’ or classification system, not an investigation tool or system
- Primary focus for the QME working group is to translate HFACS-MI findings into current systems, including investigations
- Primary focus for QME Ergonomist is to improve understanding of human factors and human error via website, seminars



# Using human factors principles in mining investigations



# Butchers Hill

- New equipment
- No formal  
lockout/tagout

Human factors issues  
(additional to safety)

Communication

Design

End of shift on a hot  
day



# Improving awareness of human factors

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**How Do I?**

- Determine an investigation?

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## Human Factors

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### Introduction

Human Factors is a science that focuses on how humans interact with the environment in their workplace. It examines the workplace factors that influence the decisions and actions of workers.

No one goes to work intending to be injured. The decisions and actions that workers take make sense to them at the time given their goals, knowledge and focus of attention.

The human factors approach to an investigation asks why a worker's decision or action made sense to that worker at the time.

[More Information \(PDF 116 KB\)](#) on Human Factors at WorkSafeBC.

## The interaction of human factors

**People**  
Individual factors  
Knowledge, expectations, attention, goals, health, fatigue, age, culture, body size, strength, stress, etc.

Human factors - Inspectors human factors toolkit - Microsoft Internet Explorer provided by Natural Resources and Water

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Address http://www.hse.gov.uk/humanfactors/inspectors/toolkit.htm

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## Human factors: Inspectors human factors toolkit

A toolkit is available for use by HSE inspectors to support the consideration of human factors in site inspections, accident investigations and assessment of company documentation such as COMAH safety reports. This can be accessed from the link below.

- Inspectors human factors toolkit [1MB]
- Introduction to the inspectors human factors toolkit [327KB]

or select a topic from the list below:

### Core topics

- Competence assurance [32KB]
- HF in accident investigations [42KB]
- Identifying human failures [73KB]
- Reliability and usability of procedures [14KB]

### Common topics

- Emergency response [32KB]
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- Safety critical communications [32KB]
- Safety culture [14KB]

### Specific topics

- Alarm handling [42KB]
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# Questions?



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