Review of Human Factors in Queensland Mining incidents

The HFACS-MI project

## Trudy Tilbury, Safety and Health

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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)
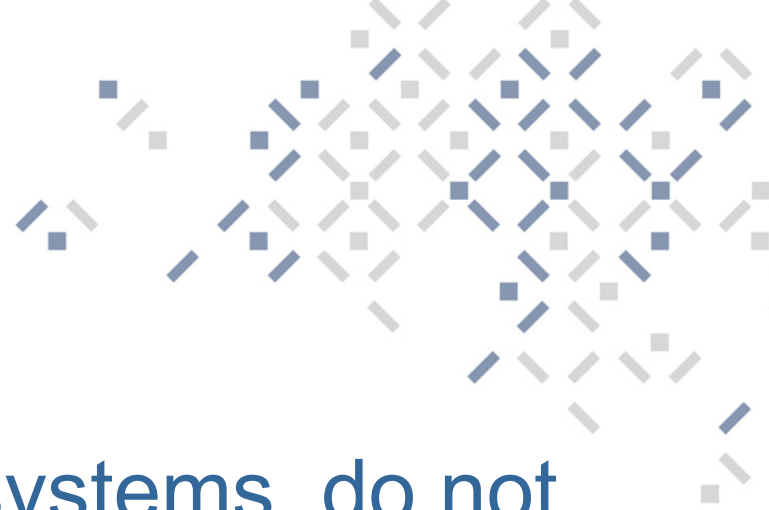
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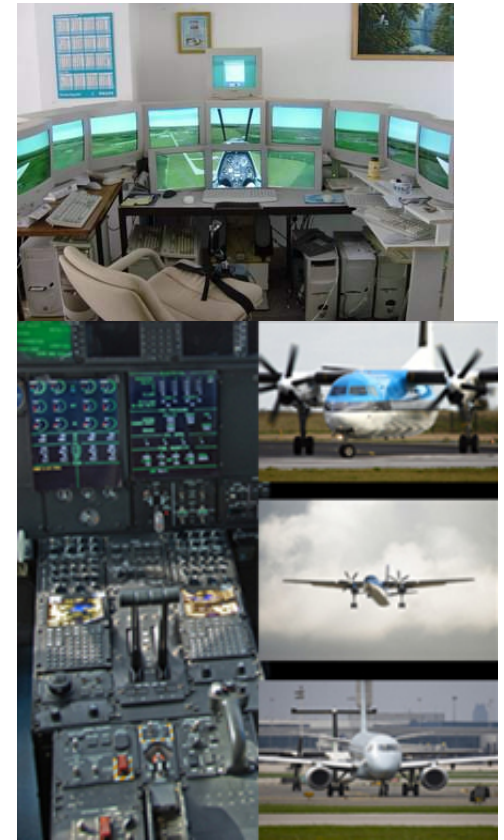
Human Factors = evidence on people

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systems, and the equipment used in them, are developed without information on the end users, or based on (sometimes) outdated standards

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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
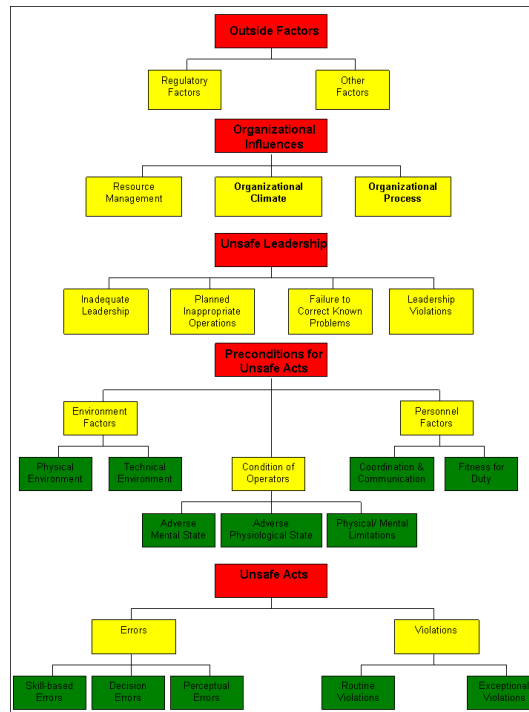
Introduction to HFACS-MI

- 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
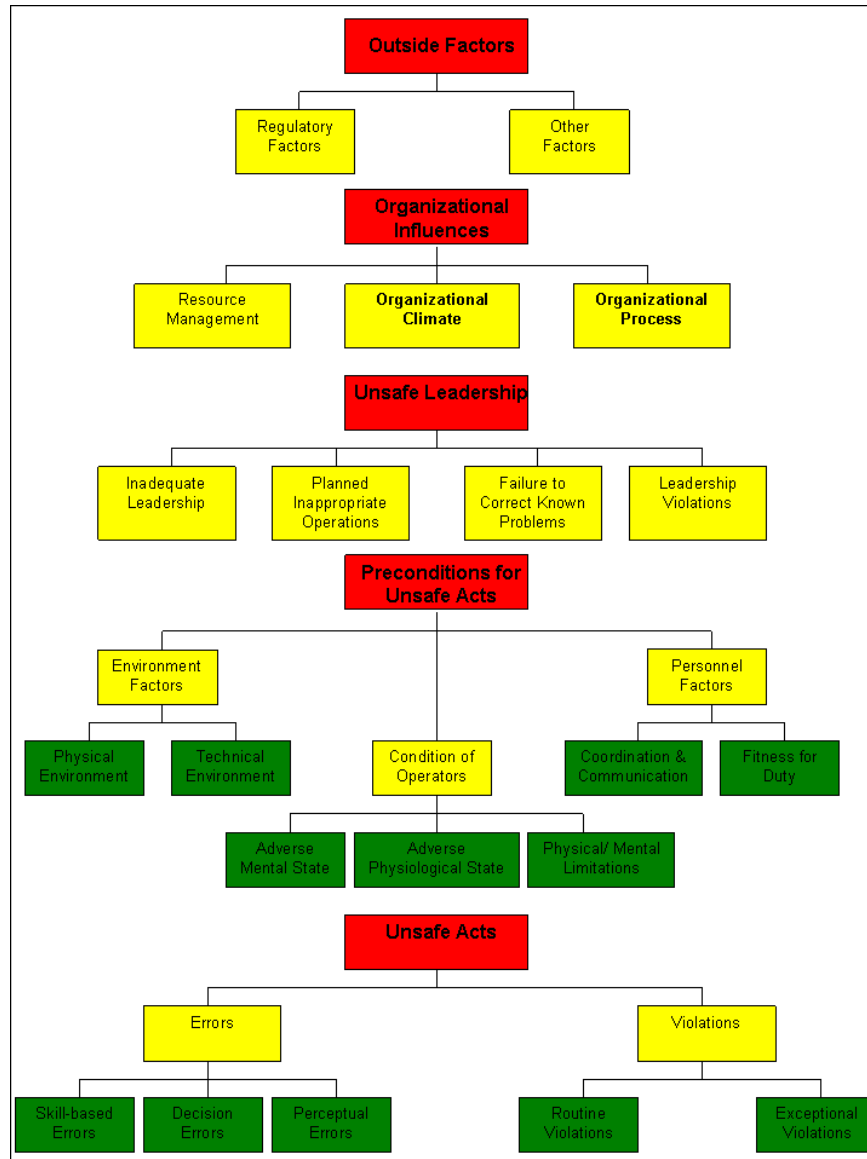
Human error in the HFACS-MI model

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.

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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 .

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Errors influenced by higher levels

Li and Harris, 2006

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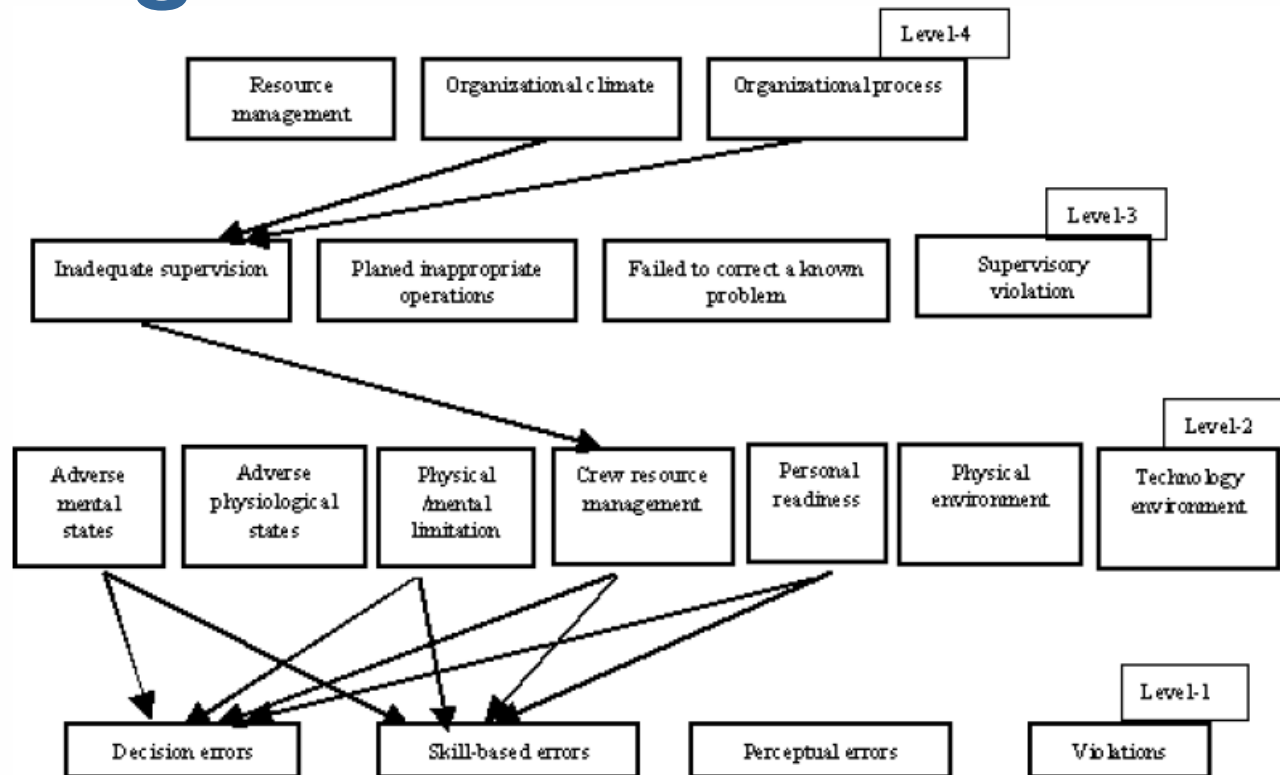
HFACS-MI analysis of Unsafe Acts for 500+ Qld Mining incidents from 2004

HFACS-MI RESULTS

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Data used in analysis
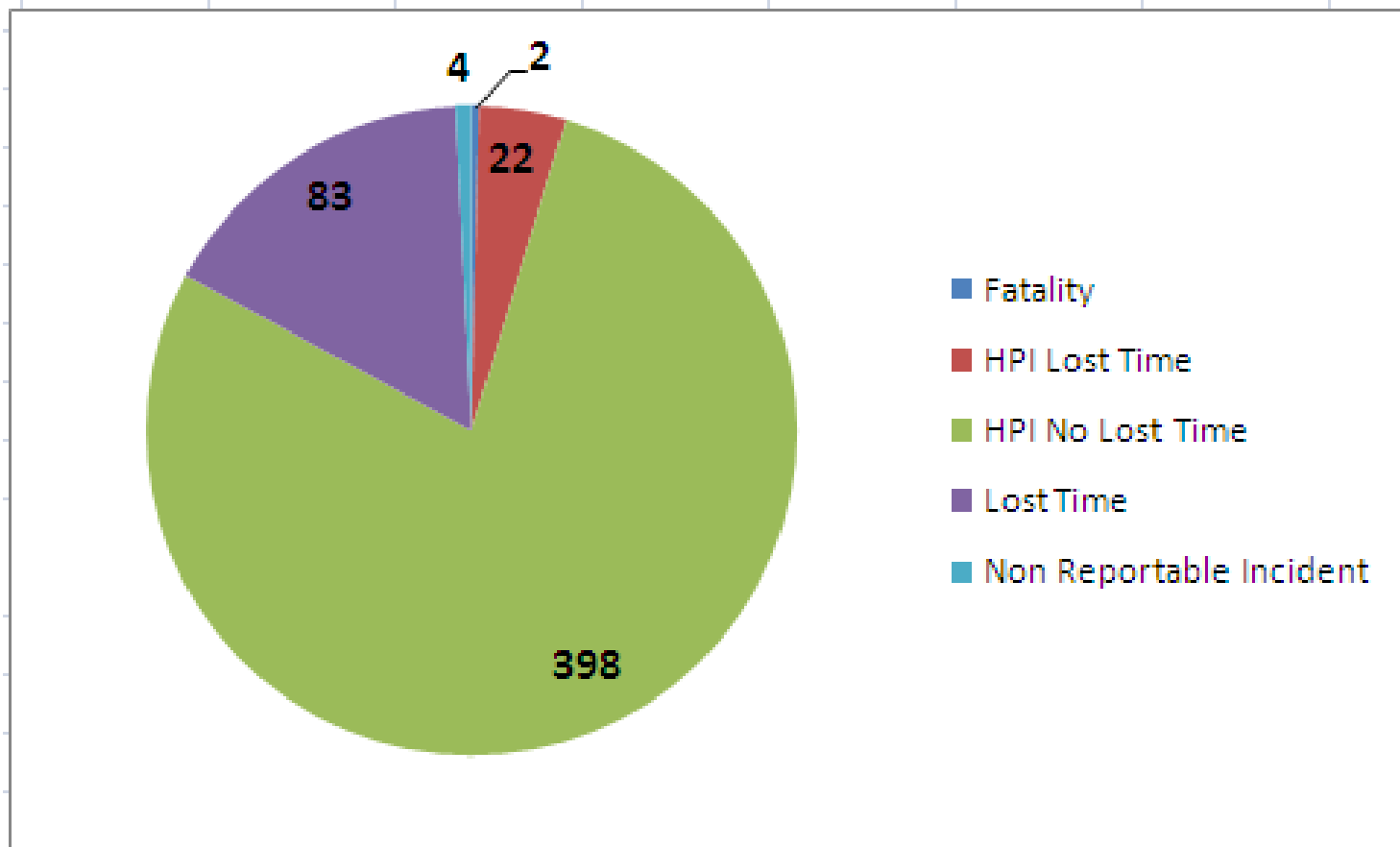
Unsafe Acts

Unsafe Acts of the Operator

- Skill-base Error
- Decision Error
- Perceptual Error
- Violation

49.8%
41.4%
4.2%
4.7%
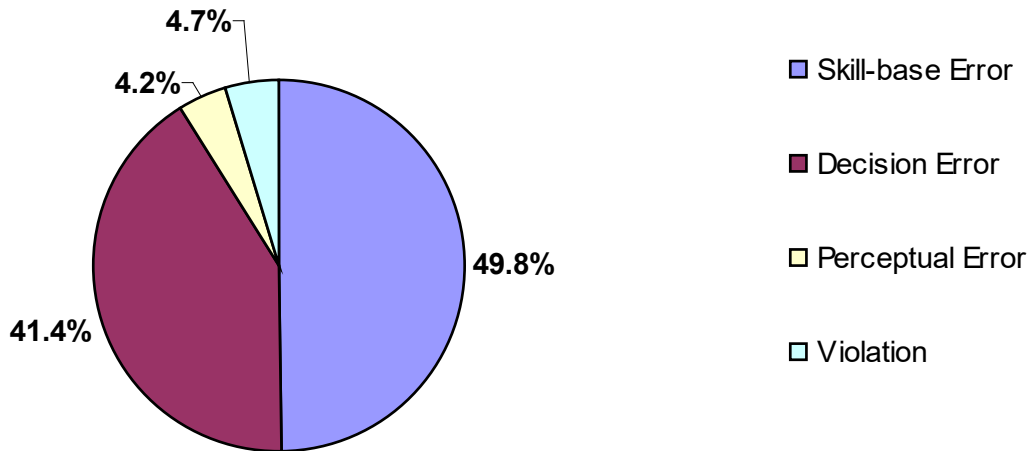
- **95% of cases identified at least 1 unsafe act**
- **Skill-based Errors most identified (50%)**
- **Perceptual Errors and Violations represent <10% of codes identified**

Skill-based Errors (consciously competent, routine disruption)

Skill-based Errors- Nanocodes

Legend:
- Postural Errors
- Electrical Errors
- Knowledge-Base Errors
- Slip, Trip, or Fall
- PPE/Tool/Equipment
- Technique Errors
- Attention Failure

Pie chart values: 3%, 6%, 7%, 13%, 14%, 24%, 32%
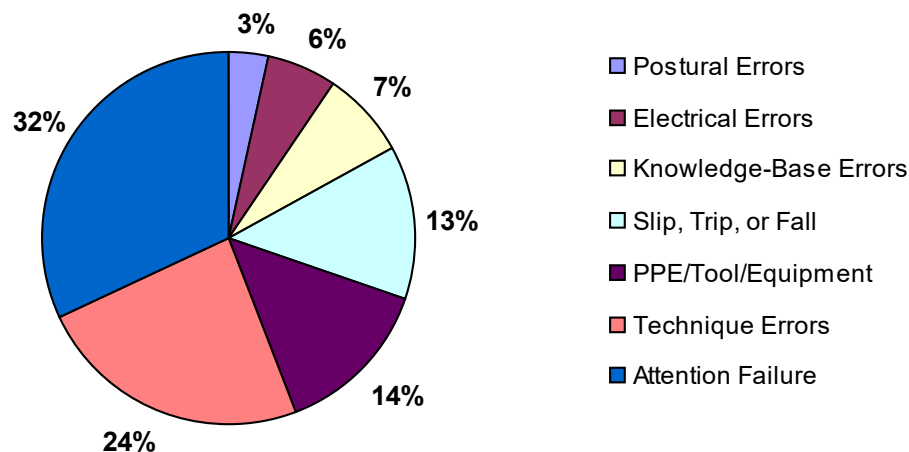
- **Attention failures most identified (32%)**
- **Occur when operators are focused on multiple things at once.**
- **Technique errors refer to how things are done (24%)**
- **PPE/Tool/Equipment errors (14%)**

Decision Errors

Decision Errors- Nanocodes

Legend:
- Prioritization
- Electrical Errors
- Other Decision Errors
- Information Processing
- PPE/Equipment/Tools
- Risk Assessment
- Situational Assessment
- Procedural

Pie chart values: 2%, 3%, 2%, 5%, 29%, 17%, 22%, 19%
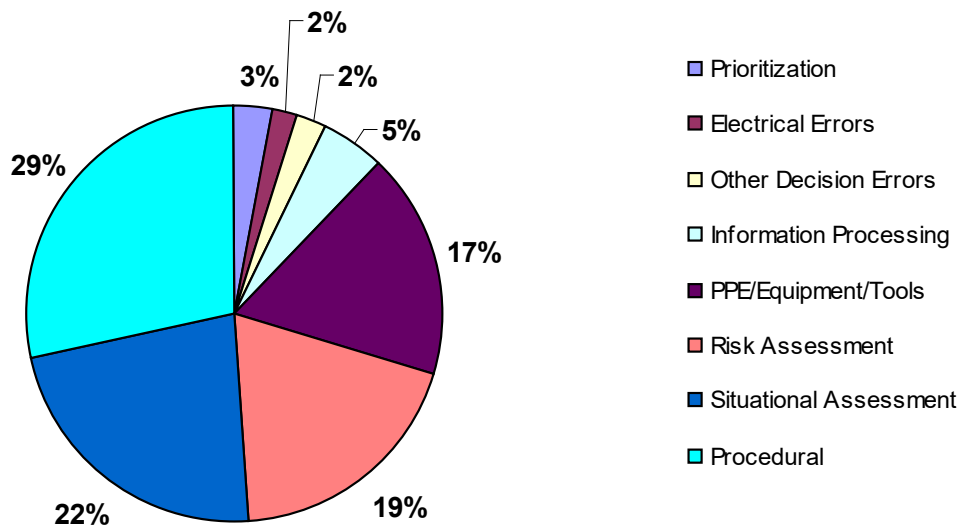
- **Procedural errors (29%): Incorrect application, applying incorrect procedure, lack of knowledge on correct procedure**
- **Situational assessment (22%): Identification of hazards**
- **Risk assessment (19%): using appropriate risk assessments, JSA, Take 5, etc.**

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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

Questions?

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