HOF: a regulator’s perspective

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MSAC fatalities review

In 2014 the Mine Safety Advisory Council engaged Peter Wilkinson of The Noetic Group to undertake a fatalities review.

Recommendation 2: Drawing on the discipline of Human Factors, including human and organisational factors expertise, identify the reasons which make it more likely risk controls will be successfully and reliably implemented.
Incident prevention strategy

The Mine Safety Regulatory Reform Incident Prevention Strategy outlines a process of holistic reform to develop an outcomes-focused, risk-based approach to regulating mine safety.

The strategy identified three main project areas:

1. Risk-based intervention.
2. Human and organisational factors.
3. Quality data.
HOF info for industry
Human and organisational factor analysis

The Resources Regulator engaged the Keil Centre to help develop a bespoke human factor analysis tool for investigators and inspectors.

The aim was:

- to build a web-based tool
- develop a human failure taxonomy for unintentional and intentional behaviour
- develop a taxonomy for performance shaping factors specific to the mining industry
- map the path of decision making for HOF
- design and deliver training on HOF to inspectors and investigators.
Case study

What happened?
An incident occurred in an underground coal whereby a multi-skilled mine worker was moving a bull hose when he uncoupled two hoses without isolating the main air supply.

What was the result?
This action resulted in whipping of the pressurised hose until the hose was isolated. A deputy and another multi-skilled mine worker were standing near the area when the incident occurred.

Aim of the review
• trial the SHOF tool
• identify the PSFs which may have deteriorated and contributed to the condition.
Typical Incident Analysis Process

Traditional Analysis
- Gather Evidence
- Assemble Timeline
- Identify critical factors & causes; write recommendations
  - CF1
  - CF2
  - CF3

Human & Organisational Factors Analysis
- Define behaviour(s) to be understood
- Unintentional Behaviour
  - Sensory
  - Thinking
  - Action
- Intentional Behaviour
  - Routine
  - Situational
  - Exceptional
  - Sabotage

Examine the Performance Shaping Factors
- Identify absent or insufficient controls
- Formulate recommendations / actions

Keil Centre
<table>
<thead>
<tr>
<th>Failure type</th>
<th>Definition</th>
<th>Characteristics</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensory Error</td>
<td>Where information input via sensory channels is degraded.</td>
<td>• Associated with expectancy and attentional focus</td>
<td>• Mishearing an instruction from a colleague</td>
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<td>• Not seeing an oncoming vehicle</td>
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<td>• Not detecting smell of chemical/product</td>
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<td>• Reading the wrong pressure gauge</td>
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<td>• Misreading a speed indicator</td>
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<tr>
<td>Action Error:</td>
<td>Where a simple, frequently performed physical action goes wrong.</td>
<td>• Associated with familiar tasks requiring little conscious attention:</td>
<td>• Opening wrong valve</td>
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<tr>
<td>Slips and Lapses</td>
<td></td>
<td>• Slip: where the right action is intended but the wrong action is performed</td>
<td>• Moving a switch in the wrong direction</td>
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<td></td>
<td></td>
<td>• Lapse: where the required action was omitted due to a momentary memory</td>
<td>• Forgetting a crucial step in a procedure</td>
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<tr>
<td></td>
<td></td>
<td>lapse</td>
<td>• Driving vehicle away with fuel hose still attached</td>
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<tr>
<td>Thinking Error:</td>
<td>Action is carried out as planned, but wrong course of action is taken.</td>
<td>• Misapply a good rule, or apply an inappropriate rule</td>
<td>• Ignoring alarms in a real emergency based on a history of false alarms</td>
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<tr>
<td>Mistakes</td>
<td>Decision making errors, errors of diagnosis or judgement involving conscious</td>
<td>• Misdiagnose an indication and apply inappropriate corrective action</td>
<td>• Misjudging vehicle capability due to experience in a different vehicle</td>
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<td>mental processes.</td>
<td></td>
<td>• Applying outdated procedure which doesn’t fit the current conditions</td>
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<tr>
<td>Routine</td>
<td>Deviation from rules and procedures as the normal way of operating order to</td>
<td>• Non-compliance has become the norm</td>
<td>• Driving at a speed outside the speed limit, because everybody does it</td>
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<td>get the job done.</td>
<td>Consensus within team or organisation that it is not necessary to follow the</td>
<td>• Omitting pre-start inspections because supervisor never checks them</td>
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<tr>
<td>Situational</td>
<td></td>
<td>rule/procedure 'to the letter'</td>
<td></td>
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<td></td>
<td></td>
<td>• Organisation/team 'turns a blind eye'</td>
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<tr>
<td>Exceptional</td>
<td>The non-compliance is intended to solve a novel problem in highly unusual</td>
<td>• Taking shortcuts or not following procedures in order to overcome an obstacle,</td>
<td>• Changing sequence on a procedure to save time and get the job done</td>
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<tr>
<td></td>
<td>circumstances, such that compliance is perceived as the only way to</td>
<td>such as time/production pressure, broken down equipment or impending weather</td>
<td>• Omitting an independent inspection when a supervisor can’t be located</td>
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<td></td>
<td>resolve the problem, and get the job done.</td>
<td>conditions</td>
<td></td>
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<tr>
<td>Sabotage</td>
<td>An egregious act, where non-compliance is intended to cause harm or damage.</td>
<td>Unlike other non-compliance which seeks to get the job done, sabotage is</td>
<td>• Acts of arson</td>
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<tr>
<td></td>
<td></td>
<td>characterised by malicious intent to cause harm.</td>
<td>• Deliberately putting plant into unsafe state</td>
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<tr>
<td>Behaviours that contributed to this incident</td>
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<tr>
<td>---------------------------------------------</td>
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<tr>
<td>Person performing behaviour</td>
<td>Multi-skilled mine worker</td>
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<tr>
<td>The task they were engaged on at the time</td>
<td>Breaking the join in the air hose</td>
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<tr>
<td>What they did (or did not do)?</td>
<td>Did not check for isolation or test for dead at the manifold valve</td>
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<tr>
<td>What was the result?</td>
<td>Hoses whipping around</td>
<td></td>
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<tr>
<td>Was the behaviour intentional?</td>
<td>Yes</td>
<td></td>
<td></td>
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<tr>
<td>Based on the evidence, the intentional behaviour that best describes this behaviour is?</td>
<td>Situational (please refer to appendix A for definition of behaviours)</td>
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</tbody>
</table>
| Reason for selecting this behaviour type: | • wanted to save time  
• perceived it was not necessary as from a distance he thought the bull hose (spinning valve) was open  
• did not check for isolation |
### Performance shaping factors taxonomy

#### Personal factors
- **Individual technical competence**
  - Task demands
  - Familiarity with task
  - Level of experience
  - Learning/ knowledge of task
  - Training sufficiency
  - Training recency
- **Individual non-technical factors**
  - Situation assessment
  - Perception & understanding
  - Confidence/ motivation/ attitude
  - Job satisfaction/ morale
  - Attention/ alertness/ vigilance

#### Job factors
- **Technical competence**
  - Task design
  - Task/ shift handover/ takeover practices
  - Fatigue
  - Fitness/ physical health issues
  - Substance use
- **Non-technical factors**
  - Procedures
  - Procedure availability/ access/ location
  - Procedure accuracy or completeness
  - Procedure clarity or complexity
  - Procedure format (physical)
  - Procedure validity/ feasibility/ suitability
  - Compatbility with other procedures

#### Work Environment
- **Environmental Conditions**
  - Weather
  - Air quality/ Noise/ Vibration
  - Temperature/ Humidity/ Light
  - Visual display quality
  - Workplace layout
  - Arrangement of work area
  - Fit for purpose equipment & tools

#### Team factors
- **Team dynamics**
  - Team composition (skill set/ experience)
  - Role clarity
  - Team staffing levels
  - Supervision & leadership effectiveness

#### Organisational factors
- **Organisational culture**
  - Organisational learning
  - Consistency of safety message
  - Social norms & pressures (Org level)
  - Normalisation of risk
  - Discipline, rewards & benefits
- **Planning & Co-ordination & Planning**
  - Planning & Co-ordination systems
  - Co-ordination between teams
  - Co-ordination between workgroups
  - Interdepartmental comms & co-ordination
- **Work practices**
  - Team risk management practices
  - Permit to work practices
  - Accountability
  - Investigation & audit findings
  - Team communication quality
  - Supervision & assistance
  - Bullying
- **Safety Management**
  - Risk management arrangements (Identification, Analysis, and Control selection)
  - Change management
  - Safety trend analysis & review practices
  - Fatigue risk management
  - Fatigue management practices
  - Fatigue risk management practices
- **Organisational arrangements**
  - Contractor management
  - Maintenance, inspection & testing plant/ equipment
  - Procurement & commissioning
  - Interdepartmental comms & co-ordination
  - Industrial relations

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**NSW Government Planning & Environment Resources Regulator**
## Performance shaping factors identified

<table>
<thead>
<tr>
<th>Performance shaping factors</th>
<th>Personal factors</th>
<th>Job factors</th>
<th>Environmental conditions</th>
<th>Team factors</th>
<th>Organisational factors</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Situational assessment</strong></td>
<td>Task design</td>
<td>Light</td>
<td>Team communication quality</td>
<td>Safety trend analysis and review practices</td>
<td></td>
</tr>
<tr>
<td><strong>Perception and understanding</strong></td>
<td>Communication method</td>
<td></td>
<td>Team risk management practices</td>
<td></td>
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<tr>
<td><strong>Confidence, motivation and attitude</strong></td>
<td>Communication quality</td>
<td></td>
<td>Mentoring and supervision practices</td>
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<tr>
<td><strong>distraction</strong></td>
<td>Procedure availability, access, location</td>
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<td><strong>Sleep problems</strong></td>
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PSF findings

• communication, including communication within the team and to the team
• team supervision
• risk management effectiveness, including quality and feedback
Recommendations

- SLAMS need to be completed at the time and location of the task in consultation with all people involved. This will ensure that the team communicates and coordinate roles and responsibilities.

- SLAMS need to be reviewed to consider the effectiveness of controls, with feedback to workers to enable continuous improvements.

- If isolation is required, the supervisor should communicate this to the workers undertaking the task.
Where to from here?

• ongoing program of training for investigators and inspectors
• mentoring and coaching program to follow training
• tool will be integrated into work processes
• investigation reports will include HOF
• integrate HOF into proactive targeted assessment program
• greater focus on informing industry about HOF and importance of reviewing controls in respect to SMS and their sociotechnical systems
Questions?
More information

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