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Jim Knowles
Risk Assessment

Which tool do I use
“If the only tool you have is a hammer, you tend to see every problem as a nail”

Abraham Maslow
In Risk Management we tend to feel most comfortable with techniques that have been successful in the past - these are our hammers.
Risk Analysis Tools

There are a wide range of advanced tools that can be used to both identify and assess your risks, where conventional tools may not be suitable.
So which tool do I use?
A simple tool

Which tool do I use?

Semi-Quantitative
Tasks that are performed across multiple shifts/crews or contractor groups
High-risk tasks listed on BCSC Risk Register

Job Safety Analysis
Complex task, usually involving more than one person or workgroup
Facilitated by Team Leader or Supervisor involving team who are completing task

Stop & Assess
Simple non-complex task that normally involves one person for less than one shift
Completed alone by person performing task

WRAC
Or a similar tool

JSA’s
JHA’s

Take 5
SLAM
Risk Analysis Tools

WRAC
FMEA
FMECA
HAZOP
Take 5
JSA’s
JHA’s
Bow Tie
SLAM’s
Have we moved away from the KISS principle?

Many risk assessments have become overly complicated and are almost unusable particularly to the average “Joe” at the face
Do we fully appreciate the limits of risk assessments and the risk assessment techniques?

Who decides which tool to use?

Are we being diverted by decisions from corporate head office or by people removed from the real problems and those who have to deal with them?
Where it all started

Over 20,000 Miners trained in this process
So ‘why’ was it so successful?
WRAC

- It was the first tool of its kind in Australia
- It was promoted by the Inspectorate in NSW
- It was a simple tool to use
- The process was easy to teach
- It had a proven track record in the USA and Canada
- The mining industry was ready for it.
WRAC

It could be argued that the introduction of this simple but useful risk assessment tool has helped to make the Australian mining industry one of the safest in the world.
So is WRAC still the tool to use?
Do we need a change?
What has changed in the mining industry that we might need to change?
What are the alternatives?
Where we are now

Relatively simple easy to use

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### HSEQ Qualitative Risk Assessment (Level 2)

<table>
<thead>
<tr>
<th>Likelihood</th>
<th>Consequence</th>
<th>1 - Minor</th>
<th>2 - Medium</th>
<th>3 - Serious</th>
<th>4 - Major</th>
<th>5 - Catastrophic</th>
</tr>
</thead>
<tbody>
<tr>
<td>A - Almost Certain</td>
<td>Moderate</td>
<td>High</td>
<td>Critical</td>
<td>Critical</td>
<td>Critical</td>
<td>Critical</td>
</tr>
<tr>
<td>B - Likely</td>
<td>Moderate</td>
<td>High</td>
<td>High</td>
<td>Critical</td>
<td>Critical</td>
<td>Critical</td>
</tr>
<tr>
<td>C - Possible</td>
<td>Low</td>
<td>Moderate</td>
<td>High</td>
<td>Critical</td>
<td>Critical</td>
<td>Critical</td>
</tr>
<tr>
<td>D - Unlikely</td>
<td>Low</td>
<td>Low</td>
<td>Moderate</td>
<td>High*</td>
<td>Critical</td>
<td>Critical</td>
</tr>
<tr>
<td>E - Rare</td>
<td>Low</td>
<td>Low</td>
<td>Moderate</td>
<td>High*</td>
<td>High*</td>
<td>High*</td>
</tr>
</tbody>
</table>

* Risks classified in this area must be considered for quantitative analysis (Level 3 risk assessment). Critical risks must be escalated for quantitative risk analysis.

<table>
<thead>
<tr>
<th>Risk Class</th>
<th>Risk Management Response</th>
<th>Risk Class</th>
<th>Risk Management Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Critical</td>
<td>Risks that significantly exceed the risk acceptance threshold and need urgent and immediate attention.</td>
<td>Moderate</td>
<td>Risks that lie on the risk acceptance threshold and require active monitoring. The implementation of additional measures could be used to reduce the risk further.</td>
</tr>
<tr>
<td>High</td>
<td>Risks that exceed the risk acceptance threshold and require proactive management. Includes risks for which proactive actions have been taken, but further risk reduction is impracticable. However active monitoring is required and the latter requires the sign-off from business unit senior management.</td>
<td>Low</td>
<td>Risks that are below the risk acceptance threshold and do not require active management. Certain risks could require additional monitoring.</td>
</tr>
</tbody>
</table>
This is one of the better ones being used

<table>
<thead>
<tr>
<th>Risk</th>
<th>Likelihood</th>
<th>Likelihood description</th>
<th>Frequency</th>
<th>Substance Exposure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Almost certain</td>
<td>Recurring event during the lifetime of an operation / project</td>
<td>Occurs more than twice per year</td>
<td>Frequent (daily) exposure at &gt; 10 x OEL</td>
<td></td>
</tr>
<tr>
<td>Likely</td>
<td>Event that may occur frequently during the life-time of an operation / project</td>
<td>Typically occurs once or twice per year</td>
<td>Frequent (daily) exposure at &gt; OEL</td>
<td></td>
</tr>
<tr>
<td>Possible</td>
<td>Event that may occur during the life-time of an operation / project</td>
<td>Typically occurs in 1-10 years</td>
<td>Frequent (daily) exposure at &gt; 50% of OEL; Infrequent exposure at &gt; OEL</td>
<td></td>
</tr>
<tr>
<td>Unlikely</td>
<td>Event that is unlikely to occur during the life-time of an operation / project</td>
<td>Typically occurs in 10-100 years</td>
<td>Frequent (daily) exposure at &gt; 10% of OEL; Infrequent exposure at &gt; 50% of OEL; Infrequent exposure at &gt; 10% of OEL</td>
<td></td>
</tr>
<tr>
<td>Rare</td>
<td>Event that is very unlikely to occur during the life-time of an operation / project</td>
<td>Greater than 100 year event</td>
<td>Frequent (daily) exposure at &lt; 10% of OEL; Infrequent exposure at &gt; 10% of OEL</td>
<td></td>
</tr>
</tbody>
</table>

Consequence Categories:
The six defined HSEQ social and environmental (non-economic) consequence categories are:
- Health impact
- Environment impact
- Compliance impact

These are:
- Personal safety
- Community impact
- Reputation (Rio Tinto or business)

There are five defined Rio Tinto categories of operational (economic) consequence that are to be considered as part of an HSEQ risk analysis, where applicable. These are:
- Capital expenditure
- Operating cost
- Revenue
- Schedule
- Production volumes

Again simple and easy to use

But!!

Who has corporate memory of a 100 years
A little harder to follow!

Not so user friendly and definitely not designed for standard risk assessments
**Ouch! Where is this all heading?**

<table>
<thead>
<tr>
<th>HSEC Severity Level</th>
<th>Severity Level Change in ESVA</th>
<th>Change in project return (NPV)</th>
<th>Health and safety</th>
<th>Natural environment</th>
<th>Social/cultural heritage</th>
<th>Community / Govt / Reputation / Media</th>
<th>Legal</th>
<th>Severity Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>a</td>
<td>&gt;US$1B</td>
<td>&gt;US$5B</td>
<td>&gt;500 fatalities or very serious irreversible injury to 5000 persons.</td>
<td>Very significant impact on highly valued species, habitat or eco system.</td>
<td>Irreparable damage to highly valued items of great cultural significance or complete breakdown of social order.</td>
<td>Prolonged international condemnation.</td>
<td>Potential jail terms for executives and or very high fines for company. Prolonged, multiple litigation.</td>
</tr>
<tr>
<td>6</td>
<td>b</td>
<td>US$100M – US$1B</td>
<td>US$500M – US$5B</td>
<td>&gt;50 fatalities, or very serious irreversible injury to &gt;500 persons.</td>
<td>Significant impact on highly valued species, habitat, or ecosystem.</td>
<td>Irreparable damage to highly valued items of cultural significance or breakdown of social order.</td>
<td>International multi-NGO and media condemnation.</td>
<td>Very significant fines and prosecutions. Multiple litigation.</td>
</tr>
<tr>
<td>5</td>
<td>c</td>
<td>US$10M – US$100M</td>
<td>US$50M – US$500M</td>
<td>Multiple fatalities, or significant irreversible effects to &gt;50 persons.</td>
<td>Very serious, long-term environmental impairment of ecosystem function.</td>
<td>Very serious widespread social impacts. Irreparable damage to highly valued items.</td>
<td>Serious public or media outcry (international coverage).</td>
<td>Significant prosecution and fines. Very serious litigation, including class actions.</td>
</tr>
<tr>
<td>4</td>
<td>d</td>
<td>US$1M – 10M</td>
<td>US$5M – 50M</td>
<td>Single fatality and/or severe irreversible disability (&gt;30%) to one or more persons.</td>
<td>Serious medium term environmental effects.</td>
<td>On-going serious social issues. Significant damage to structures/items of cultural significance.</td>
<td>Significant adverse national media public/ NGO attention.</td>
<td>Major breach of regulation. Major litigation.</td>
</tr>
<tr>
<td>3</td>
<td>e</td>
<td>US$100,000 – 1M</td>
<td>US$500,000 – 5M</td>
<td>Moderate irreversible disability or impairment (&lt;30%) to one or more persons.</td>
<td>Moderate, short-term effects but not affecting ecosystem function.</td>
<td>Ongoing social issues. Permanent damage to items of cultural significance.</td>
<td>Attention from media and/or heightened concern by local community. Criticism by NGOs.</td>
<td>Serious breach of regulation with investigation or report to authority with prosecution and/or moderate fine possible.</td>
</tr>
<tr>
<td>2</td>
<td>f</td>
<td>US$10,000 – 100,000</td>
<td>US$50,000 – 500,000</td>
<td>Objective but reversible disability requiring hospitalisation.</td>
<td>Minor effects on biological or physical environment.</td>
<td>Minor medium-term social impacts on local population. Mostly repairable.</td>
<td>Minor, adverse local public or media attention and complaints.</td>
<td>Minor legal issues, non-compliances and breaches of regulation.</td>
</tr>
<tr>
<td>1</td>
<td>g</td>
<td>&lt;US$10,000</td>
<td>&lt;US$50,000</td>
<td>No medical treatment required.</td>
<td>Limited damage to minimal area of low significance.</td>
<td>Low-level repairable damage to commonplace structures.</td>
<td>Public concern restricted to local complaints.</td>
<td>Low-level legal issue.</td>
</tr>
</tbody>
</table>

Injury to 5000 people!
We should ask”
When they get to this level of complexity

• Do they really add value to the operation?

• Do they make risk assessments easier?

• How much time must have been spent in developing these systems?
The “Risk Manager”
"Well, it's a delicate situation, sir. ... Sophisticated firing system, hair-trigger mechanisms, and Bob's wife just left him last night, so you know his mind's not into this."
The “Risk Manager”

Our industry revolves around risk assessment and risk management. Yet how do we manage the quality of our “Risk Managers” at site.
The “Risk Manager”

What qualifications do they have?
Is it just an appointment?
What continued professional development do they get?
How much experience do they have/need?
Are risk management consultants qualified?
Does G2 or G3 make a risk manager?
Sometimes the olden tools are the golden tools !!
The Nertney Wheel

**Work**
- Competent People
- Safe Production
- Safe Work Practices
- Fit For Purpose Equipment

**Environment**
- Qualified Facilitators
- People trained in risk assessment techniques
- Allocation of time to conduct RA
- Not a rushed last minute job
- Right people on the RA

**Controlled**
- Management support
- From a good risk assessment

Methods:
- FMEA
- WRAC
- FMECA
- HAZOP
- TAKE 5
- SLAMS
- JHS’s
- JSA’s
- Bow Tie

From Jim Knowles Group
In conclusion we need to consider:

- Relevance and usefulness of increasingly complex systems
- Strengths/limitations of techniques that we currently use
- Impact of tampering with tools to make them to fit a corporate model?
- The Regulators interpretation
- Legislation/legal systems undermining the aims of Risk Management?
- Competencies of Risk Managers