



2015 AusIMM NZ Branch Annual Conference

Dunedin

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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

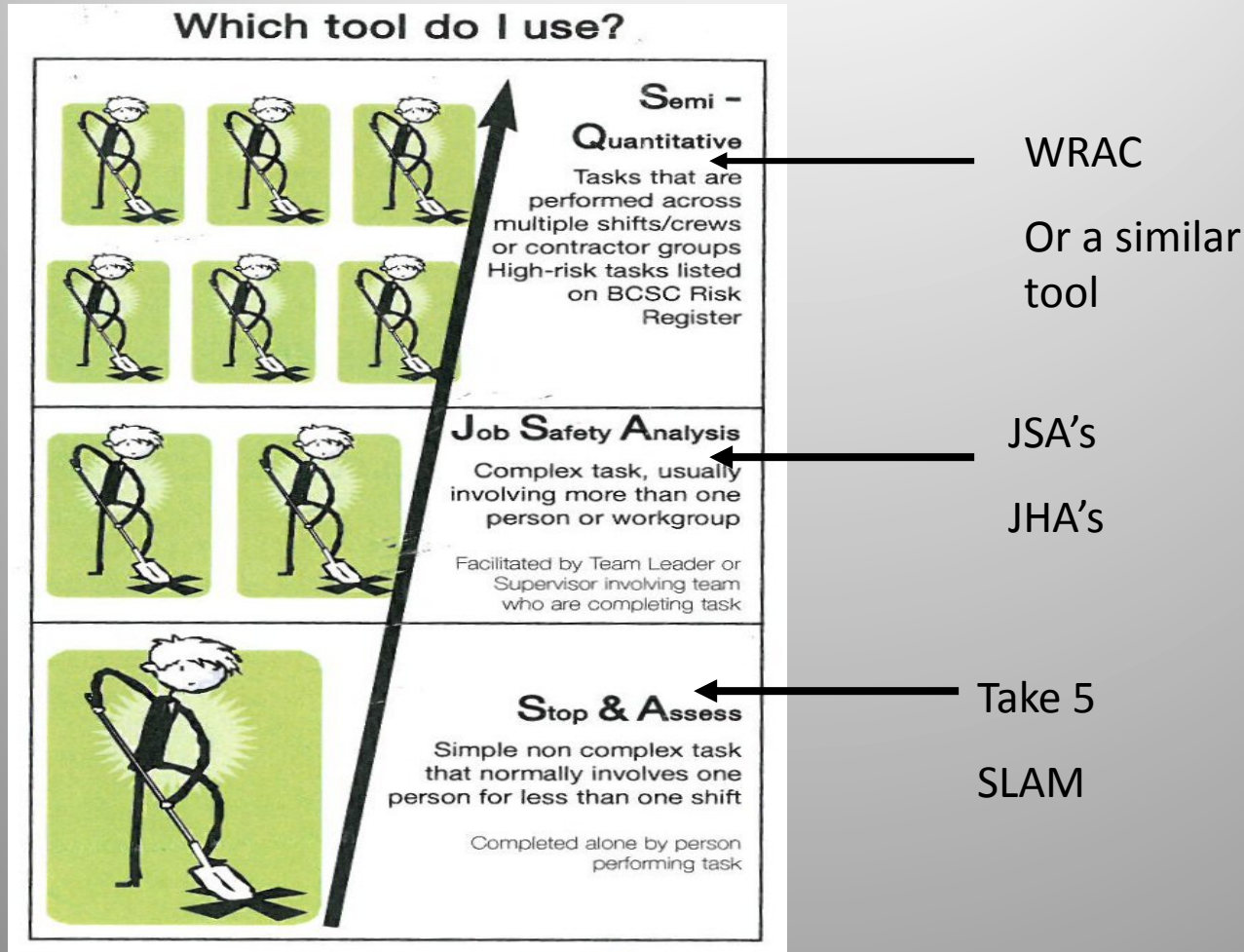
In Risk Management we tend to feel most comfortable with techniques that have been successful in the past - these are our hammers.

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



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

3. How Serious Is It?

Probability

- A Common
- B Has happened
- C Could happen
- D Not likely
- E Practically impossible

Consequences

- 1 Fatality or permanent disability
- 2 Major injury
- 3 Average Lost Time Injury
- 4 Minor injury
- 5 Medical treatment only or less

		Probability				
		A	B	C	D	E
Consequences	1	1	2	4	7	11
	2	3	5	8	12	16
	3	6	9	13	17	20
	4	10	14	18	21	23
	5	15	19	22	24	25

HIGH = 1 - 6
MEDIUM = 7 - 15
LOW = 16 - 25

Over 20,000
Miners trained in
this process

4. Act

Make it right or report it.



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WRAC

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

WRAC

- 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

HSEQ Qualitative Risk Assessment (Level 2)

Likelihood	Consequence				
	1 - Minor	2 - Medium	3 - Serious	4 - Major	5 - Catastrophic
A - Almost Certain	Moderate	High	Critical	Critical	Critical
B - Likely	Moderate	High	High	Critical	Critical
C - Possible	Low	Moderate	High	Critical	Critical
D - Unlikely	Low	Low	Moderate	High*	Critical
E - Rare	Low	Low	Moderate	High*	High*

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

Risk Class	Risk Management Response	Risk Class	Risk Management Response
Critical	Risks that significantly exceed the risk acceptance threshold and need urgent and immediate attention.	Moderate	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.
High	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.	Low	Risks that are below the risk acceptance threshold and do not require active management. Certain risks could require additional monitoring.

This is one of the better ones being used

Risk = **Consequence** x **Likelihood**
An uncertain event or condition that if it occurs will have an impact upon the achievement of objectives (both upside and downside).
The impact of an event, being a loss, harm, disadvantage or gain.
A qualitative description of probability or frequency.
(NB: ALWAYS ASSESS CONSEQUENCE FIRST)

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

Consequence Categories:
 The six defined HSEQ **social and environmental (non-economic)** consequence categories are:

- Health impact
- Environment impact
- Compliance impact
- 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

Consequences	Minor	Medium	Serious	Major	Catastrophic
Social and environmental (non-economic) consequence categories					
Health	Reversible health effects of little concern, requiring first aid treatment at most. Can include minor irritations of eyes, throat, nose and or skin, or minor unaccustomed muscular discomfort.	Reversible health effects of concern that would typically result in medical treatment. Can include temperature effects; travel effects; stress; and sunburn.	Severe, reversible health effects of concern that would typically result in a lost time illness. Can include acute / short-term effects associated with extreme temperature effects; or musculo-skeletal effects; vibration effects; nervous system effects; some infectious diseases.	Single fatality or irreversible health effects or disabling illness. Can include progressive chronic conditions and/or acute / short-term high-risk effects.	Multiple fatalities or serious disabling illness to multiple people. Can include effects of carcinogens, mutagens, teratogens and reproductive toxicants (known and suspected), and lifethreatening respiratory sensitization and malaria.
Safety	Low level short term subjective inconvenience or symptoms. Typically a first aid and no medical treatment.	Reversible injuries requiring treatment, but does not lead to restricted duties. Typically a medical treatment.	Reversible injury or moderate irreversible damage or impairment to one or more persons. Typically a lost time injury.	Single fatality and/or severe irreversible damage or severe impairment to one or more persons.	Multiple fatalities or permanent damage to multiple people.
Environment (on site) Environment (off site)	Near-source confined and promptly reversible impact (Typically a shift). Not applicable.	Near-source confined and short-term reversible impact (Typically a week). Near-source confined and promptly reversible impact (Typically a shift).	Near-source confined and medium-term recovery impact (Typically a month). Near-source confined and short-term reversible impact (Typically a week).	Impact that is unconfined and requiring longterm recovery, leaving residual damage (Typically years). Near-source confined and medium-term recovery impact (Typically a month).	Impact that is widespread-unconfined and requiring long-term recovery, leaving major residual damage (Typically years). Impact that is unconfined and requiring long-term recovery, leaving residual damage (Typically years).
Community	Community complaint resolved via existing site procedures. Isolated social/communities incident.	Non-compliance with external community relations standards. Unresolved low level community dissatisfaction.	Community dissatisfaction and/or social harm with business implications. Repairable damage to site or item of cultural significance. Breach of local laws relating to communities. Repeated community complaints requiring site management or business response.	Significant social harm with Group implications. Irreparable damage to site or item of cultural significance. Breach of international convention and/or national law relating communities, and/or non-compliance with formal community agreement. Severe community dissent, great than one year public exposure.	Permanent or irreversible social harm. Irreparable damage to site or item of international cultural significance. Formal censure by international agency for poor social performance. Severe, prolonged community dissent; greater than three years public exposure.
Reputation	Damage to reputation of reputation of work area within an operation.	Damage to reputation of several work areas within an operation. One off public exposure in local media, word of mouth or local mythologies.	Damage to reputation of Business. Significant public exposure in local media.	Damage to reputation of Product Group. Criticism from national NGO which impacts credibility with neighbours/regional government. Public exposure in national media.	Damage to reputation of Jim Knowles Group. Criticism from international NGO. Public exposure in international media.
Conformance/ Compliance	Non-conformance with internal operational procedure with low potential for impact.	Non-compliance with external standard, contract or operating procedure with low potential for impact.	Non-compliance with moderate potential for impact eg. one-off non compliance with work permit or licence; fine for breach of permit or licence.	Breach of licences, legislation, regulation or repeated non-compliance with high potential for prosecution. Breach of contract with penalty clauses imposed. Non-conformance with Corporate or Product Group work cycles or standards.	Suspended or severely reduced operations imposed by regulators.
Operational (economic) consequence categories (Based on annualised figures for operating, production and revenue)					
Capital expenditure	< 1.6%	1.6% - 5%	5% - 10%	10% - 30%	> 30%
Project Schedule	< 2.5%	2.5% - 7.5%	7.5% - 15%	15% - 45%	> 45%
Operating costs	< 0.6%	0.6% - 2.5%	2.5% - 7.5%	7.5% - 15%	> 15%
Production volumes	< 0.6%	0.6% - 2.5%	2.5% - 7.5%	7.5% - 15%	> 15%
Revenue	< 0.25%	0.25% - 1%	1% - 3.5%	3.5% - 7%	> 7%

Ouch ! Where is this all heading?

SEVERITY FACTOR

Choose a description that best fits the **most likely** degree of gain, harm, injury or loss, taking into account the existing controls that are already in place and their potential effectiveness. Where there is more than one impact type possible, look across the table and choose the highest level and corresponding Severity Factor. See [Guideline](#) for more details on selecting the Severity Factor in situations where [does not hold 100% of the equity interest in an asset.](#)

HSEC Severity Level	Severity Level	Impact Types							Severity Factor
		Change in ESVA	Change in project return (-NPV)	Health and safety	Natural environment	Social/cultural heritage	Community / Govt / Reputation / Media	Legal	
7	a	>US\$1B	>US\$5B	> 500 fatalities or very serious irreversible injury to 5000 persons.	Very significant impact on highly valued species, habitat or eco system.	Irreparable damage to highly valued items of great cultural significance or complete breakdown of social order.	Prolonged international condemnation.	Potential jail terms for executives and or very high fines for company. Prolonged, multiple litigation.	1000
6	b	US\$100M – US\$1B	US\$500M – US\$5B	>50 fatalities, or very serious irreversible injury to >500 persons.	Significant impact on highly valued species, habitat, or ecosystem.	Irreparable damage to highly valued items of cultural significance or breakdown of social order.	International multi-NGO and media condemnation.	Very significant fines and prosecutions. Multiple litigation.	300
5	c	US\$10M – US\$100M	US\$50M – US\$500M	Multiple fatalities, or significant irreversible effects to >50 persons.	Very serious, long-term environmental impairment of ecosystem function.	Very serious widespread social impacts. Irreparable damage to highly valued items.	Serious public or media outcry (international coverage).	Significant prosecution and fines. Very serious litigation, including class actions.	100
4	d	US\$1M – 10M	US\$5M – 50M	Single fatality and/or severe irreversible disability (>30%) to one or more persons.	Serious medium term environmental effects.	On-going serious social issues. Significant damage to structures/ items of cultural significance.	Significant adverse national media/ public/ NGO attention.	Major breach of regulation. Major litigation.	30
3	e	US\$100,000 – 1M	US\$500,000 – 5M	Moderate irreversible disability or impairment (<30%) to one or more persons.	Moderate, short-term effects but not affecting ecosystem function.	Ongoing social issues. Permanent damage to items of cultural significance.	Attention from media and/or heightened concern by local community. Criticism by NGOs.	Serious breach of regulation with investigation or report to authority with prosecution and/or moderate fine possible.	10
2	f	US\$10,000 – 100,000	US\$50,000 – 500,000	Objective but reversible disability requiring hospitalisation.	Minor effects on biological or physical environment.	Minor medium-term social impacts on local population. Mostly repairable.	Minor, adverse local public or media attention and complaints.	Minor legal issues, non-compliances and breaches of regulation.	3
1	g	<US\$10,000	<US\$50,000	No medical treatment required.	Limited damage to minimal area of low significance.	Low-level repairable damage to commonplace structures.	Public concern restricted to local complaints.	Low-level legal issue.	1

Injury to 5000 people !

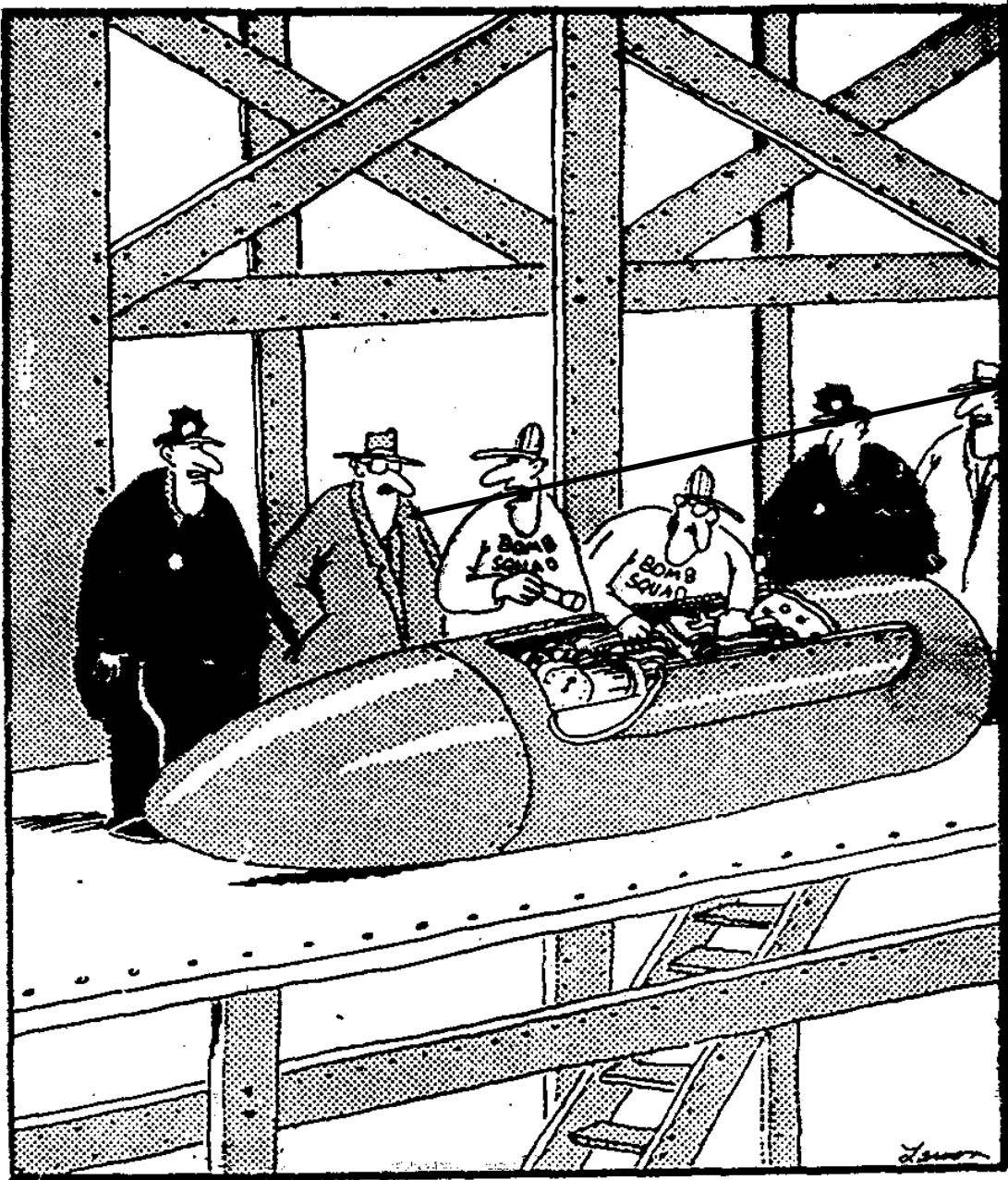


We should ask”

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”



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?

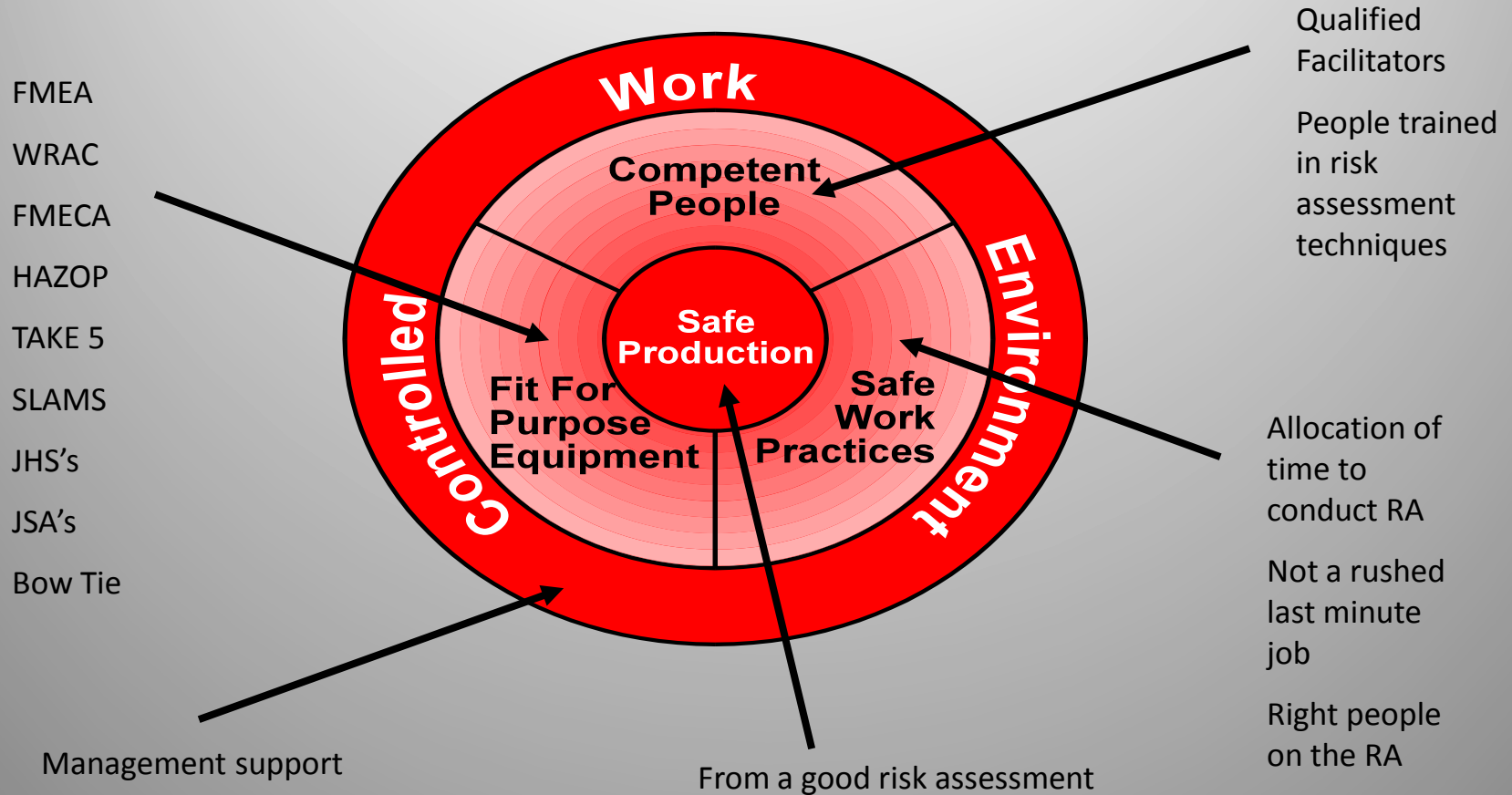
How much experience do they have/need?

Are risk management consultants qualified?

Does G2 or G3 make a risk manager?

Sometimes the olden tools are the
golden tools !!

The Nertney Wheel



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