HEALTH & SAFETY LABORATORY

Risk in a Regulatory Context

Some recent research

Nicola Stacey – 16th June 2016

Views and opinions are my own and do not necessarily reflect HSE policy

Overview

HEALTH & SAFETY LABORATORY

- Evaluation of qualitative risk estimation
  - Regulatory context
  - Research design
  - Results
- Foresight
  - What it is and isn't
  - Current projects
  - Introduction to SaRS 2016 Conference
- Q&A

Regulatory context

HEALTH & SAFETY LABORATORY

- Many regulations across Europe require risk assessment that is ‘suitable and sufficient’.
- Permissioning regimes – make a safety case.
- Reduce risk so far as is reasonable practicable – i.e. demonstrate ALARP (in the UK)
- Lack of suitable and sufficient risk assessment still cited in prosecutions

Purpose of risk estimation

HEALTH & SAFETY LABORATORY

- Obtain an estimate of risk level
- Understand hazard & how harm can occur
- Understand what contributes to the risk
- Decide if risk reduction is required
  - Need to be able to evaluate against criteria
- Prioritise action
- Assess impact of risk reduction measures

Why – qualitative risk estimation

HEALTH & SAFETY LABORATORY

- Increasing popularity
- Wide diversity of methods available
- Apparent arbitrary use of terms
- Inconsistency & Confusion
- Revision of RA standard

Aims

- What are the strengths and limitations of qualitative risk estimation?
  - in general
  - specific method being used
- What makes a good qualitative risk estimation method or tool?
- Different tools: same in > same out?
- Different users: same tool & info > same result?

How – Equivalence scales

HEALTH & SAFETY LABORATORY

S1	S2	S3	S4	S5	S6	S7	S8
Insignificant – No injuries	Minor – First aid treatment	Moderate – Medical treatment required		Major – Extensive injuries		Catastrophic – Death	
- Slight Injury (Normally reversible; or requires only first-aid)		Serious Injury (Normally irreversible; or fatality; or requires more than first-aid as defined in OSHA 1904.12)					
- Very low (injury without any lost time)		*Low (Injury with lost-time)*	*Medium (light disability)*	*Severe (severe disability)*		*Very severe (death)*	
Scratches, bruises that are cured by first aid or similar.		More severe scratches, bruises, stabbing, which require medical attention from professionals.		Normally irreversible injury. It will be slightly difficult to continue work after healing		Irreversible injury in a way that it will be very difficult to continue work after healing, if possible at all.	
Light injury (normally reversible) e.g. abrasion, laserations, bruises, injuries requiring first aid.		*Severe injury (normally irreversible, inc. Death) e.g. broken limb, amputation, severe cuts requiring stitches*					

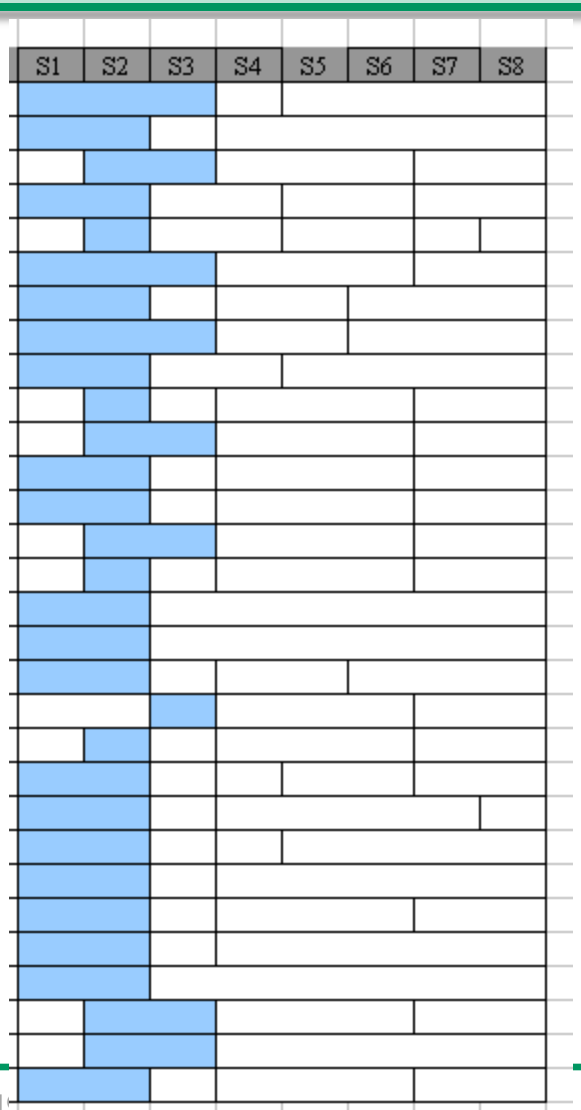
Findings from producing scales

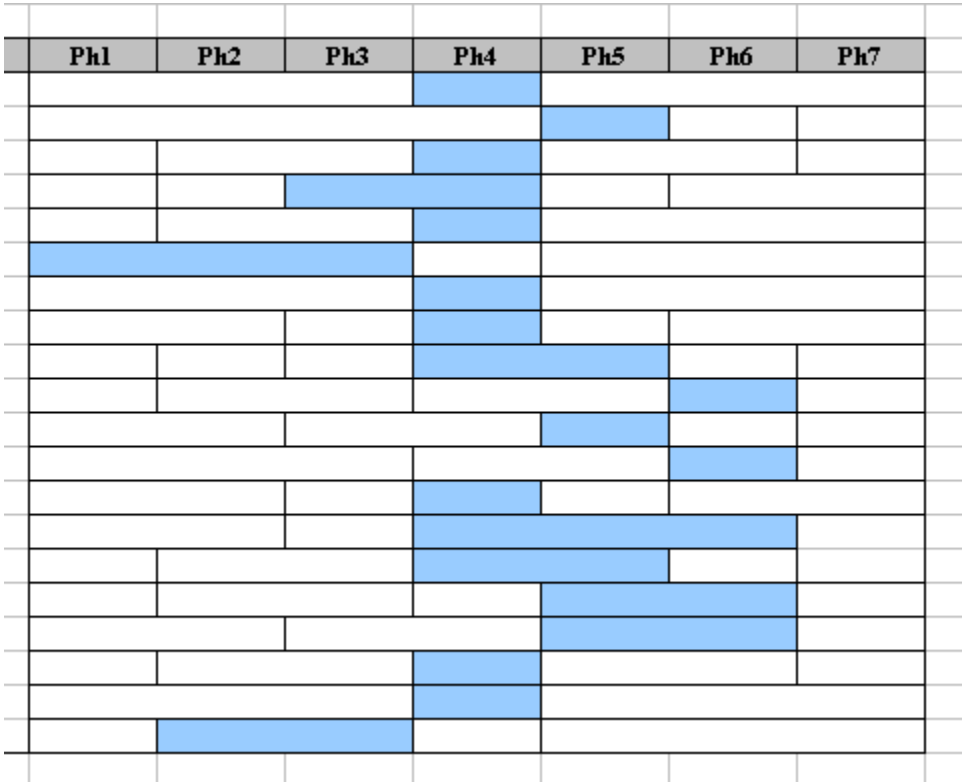
HEALTH & SAFETY LABORATORY

- Vague, imprecise, inconsistent and confusing definitions
- Overlap and gaps between choices
- Same labels but not equiv.
  - different definitions
  - other available choices
  - different order
- Same in did not give same out

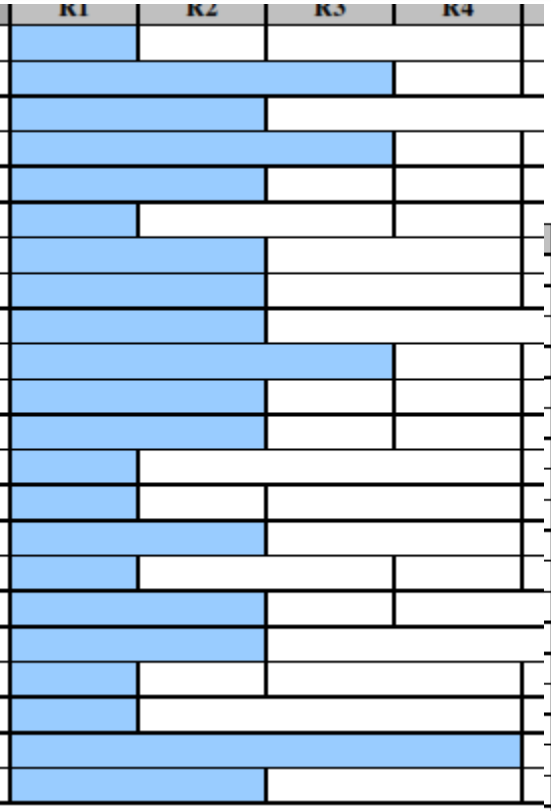
Sample hazard scenarios

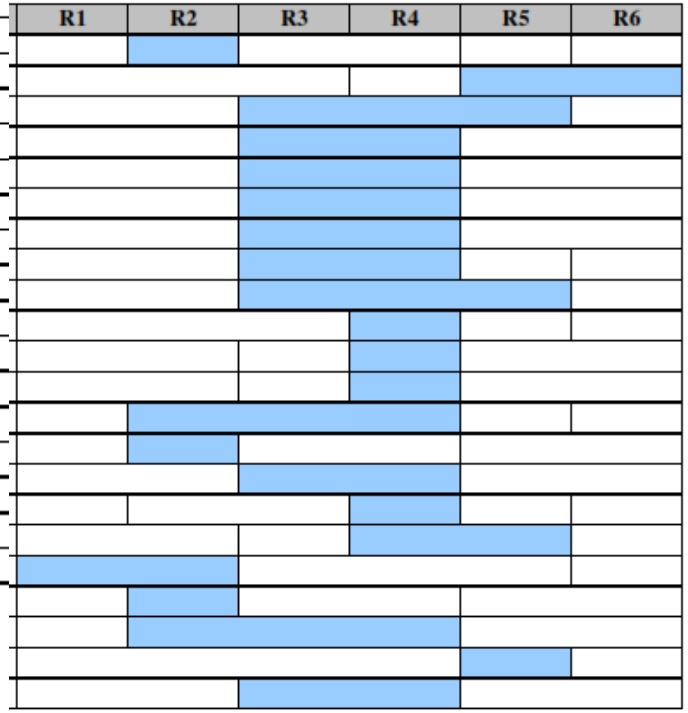
Variability in inputs

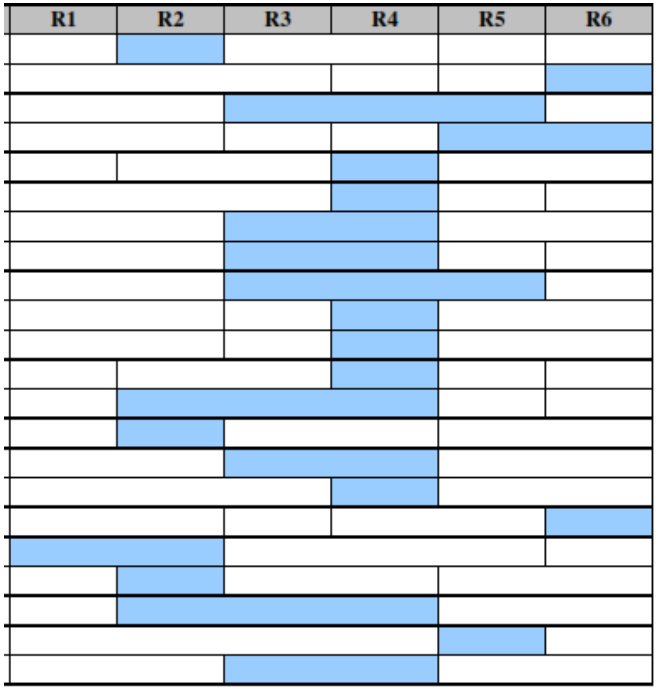




Variability in outputs





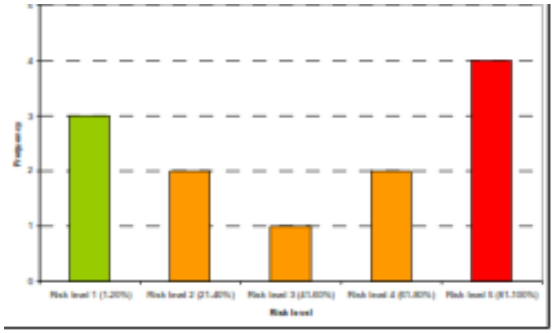


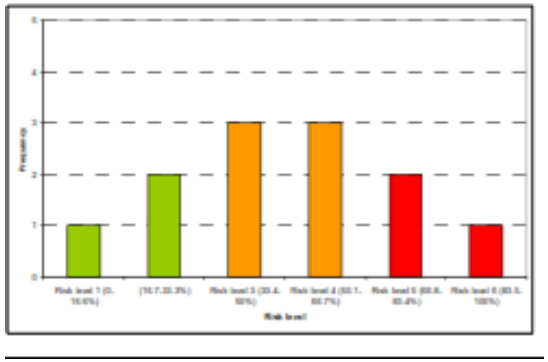
Reliability of tools

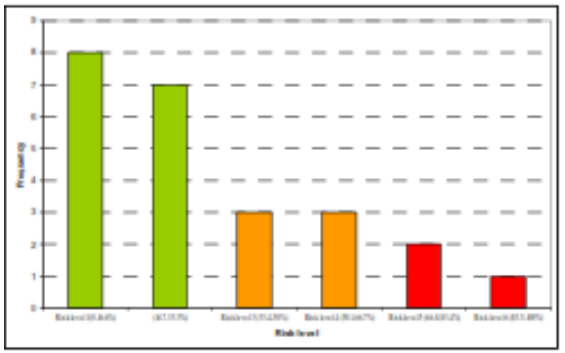
HEALTH & SAFETY LABORATORY

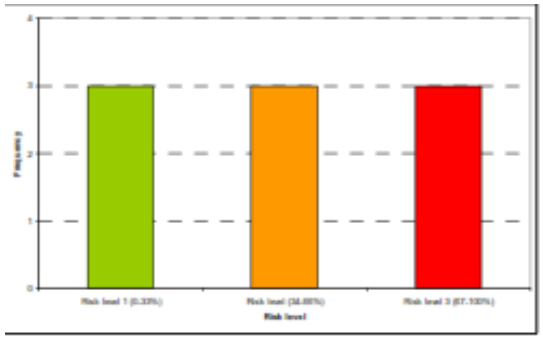
- Different tools: same in > same out?
  - Equivalent inputs ≠ equivalent outputs
  - Example scenarios ≠ equivalent outputs
  - Some tools tended to estimate risks higher on average and others lower.

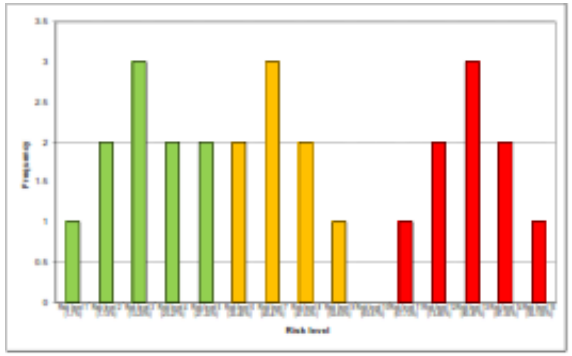
Profiles

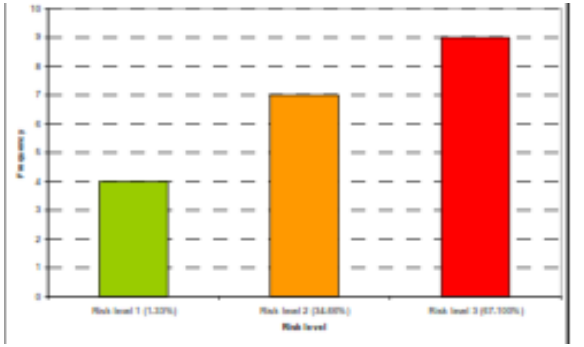




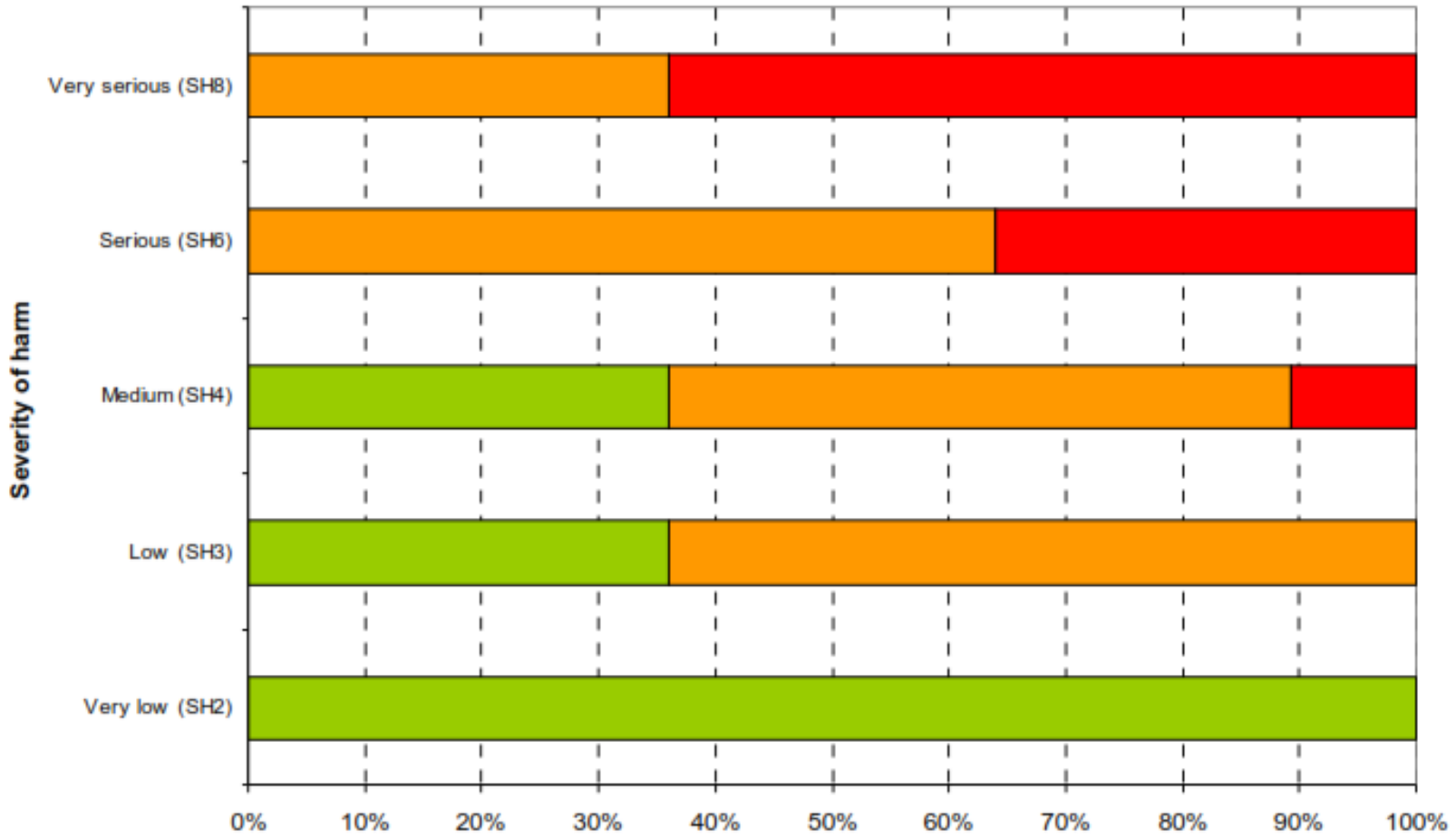




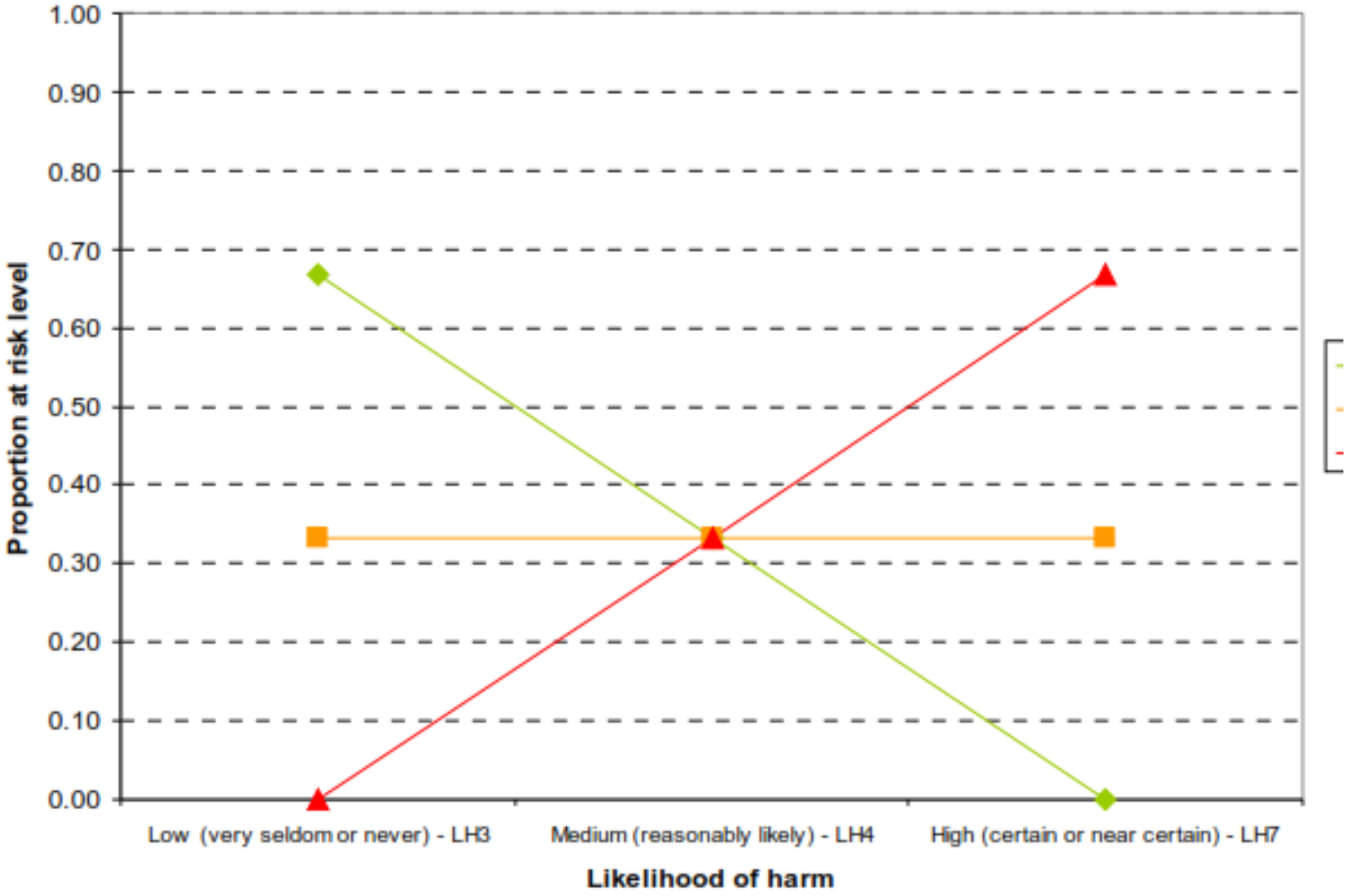




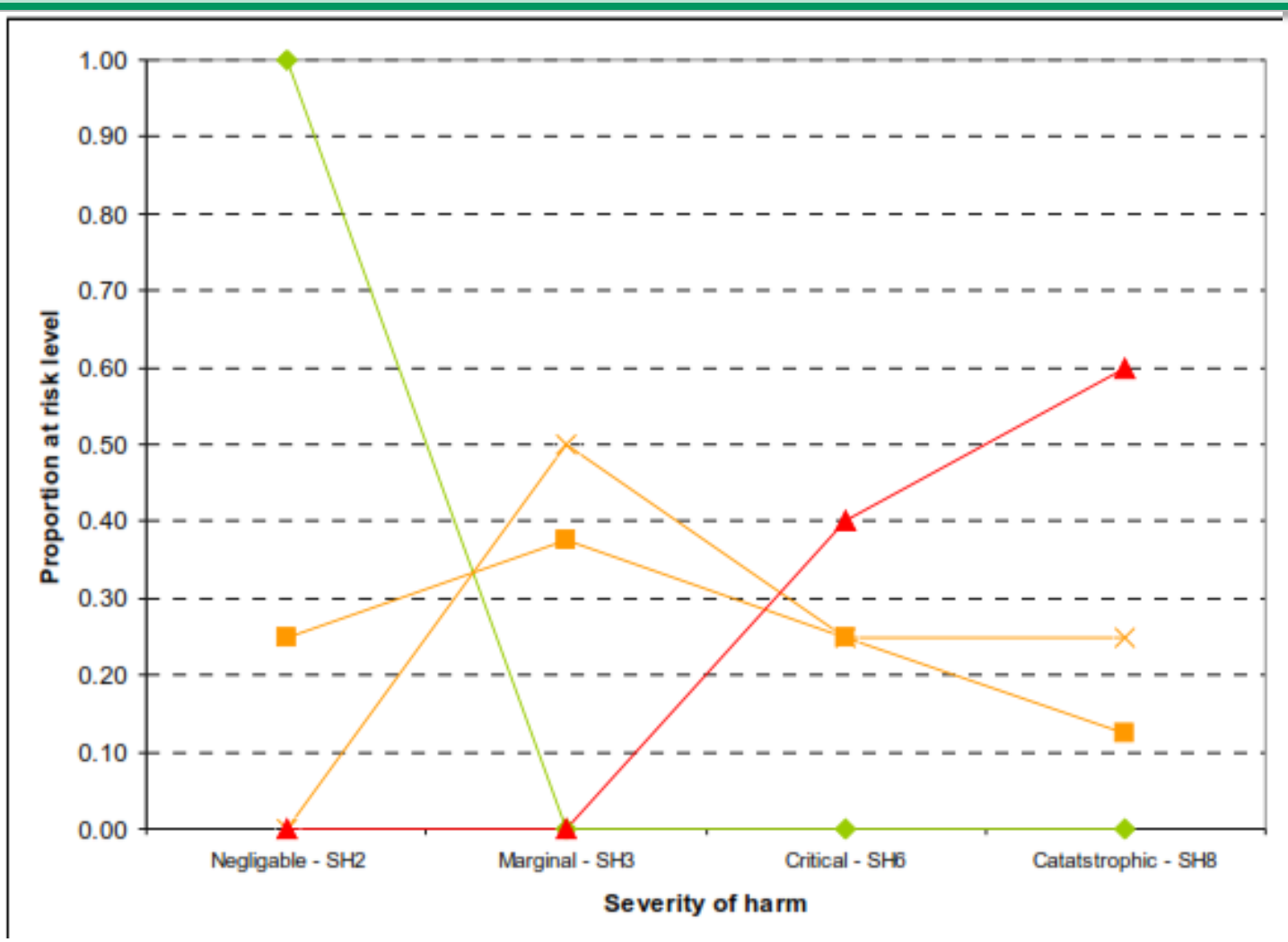
Profiles - sensitivity



Simple behaviour



Complex (or confusing?)



Reliability of tools

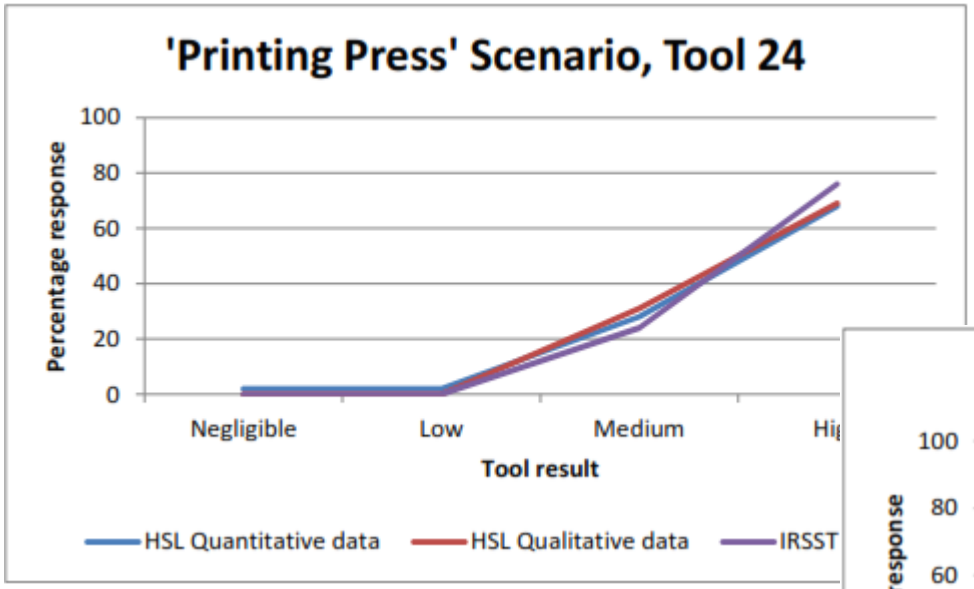
HEALTH & SAFETY LABORATORY

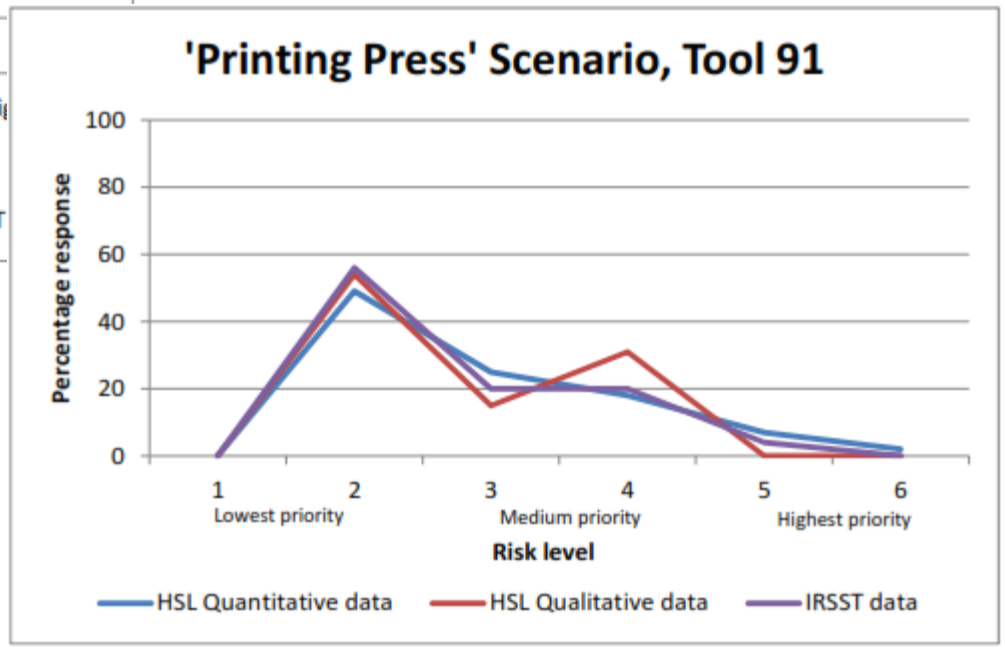
- Different tools: same in > same out?
  - Equivalent inputs ≠ equivalent outputs
  - Example scenarios ≠ equivalent outputs
  - Some tools tended to estimate risks higher on average and others lower.
- Different users:
  same tool & info > same result?

What we did

- Researcher led exercises
  (three tools, one scenario)
  - One to one
  - Group
- Online exercises
  (two tools, two scenarios)
- Canadian partners, six tools, five Scenarios
  - Researcher led, one to one (all day)

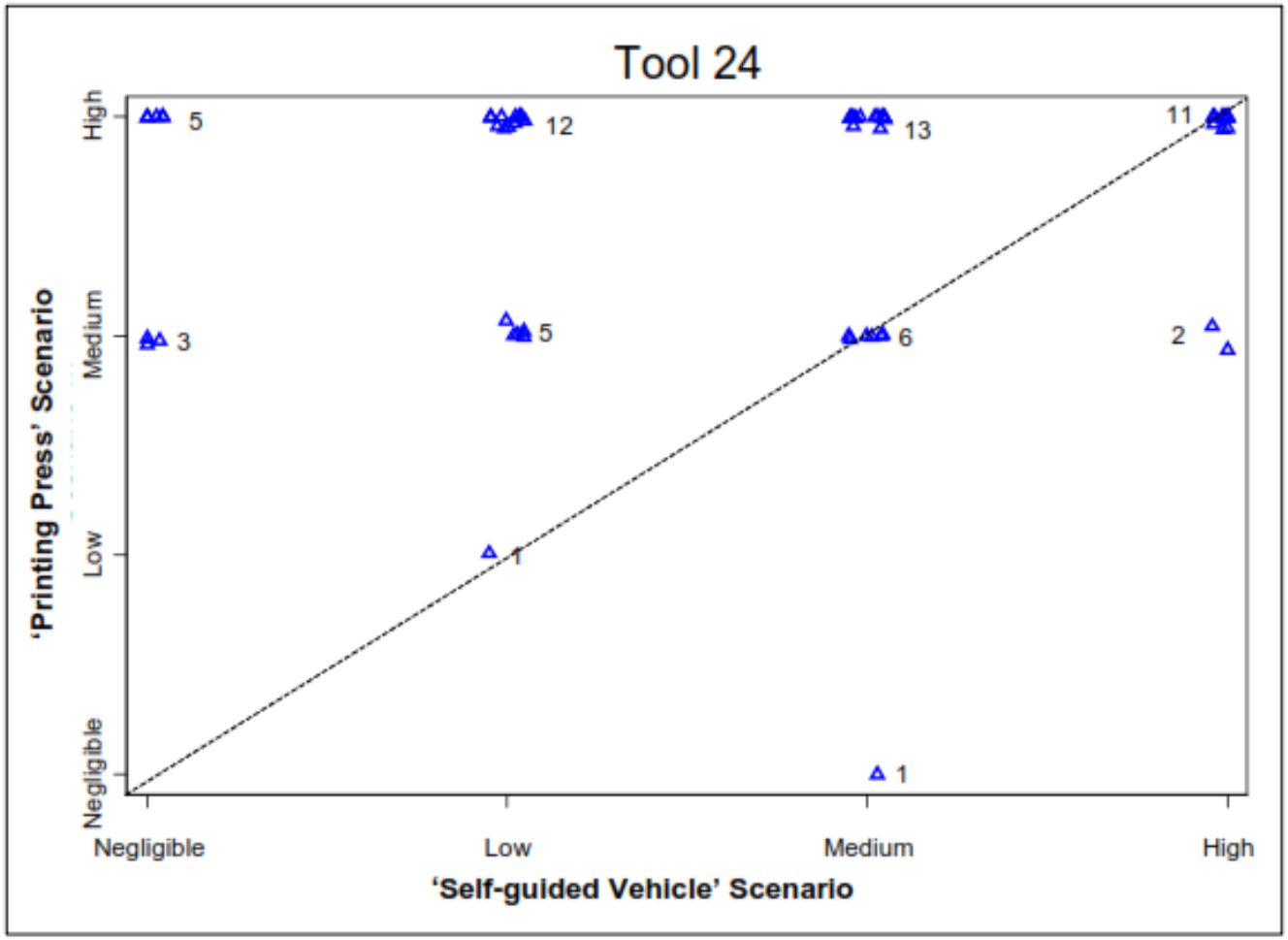
Different tools > different results



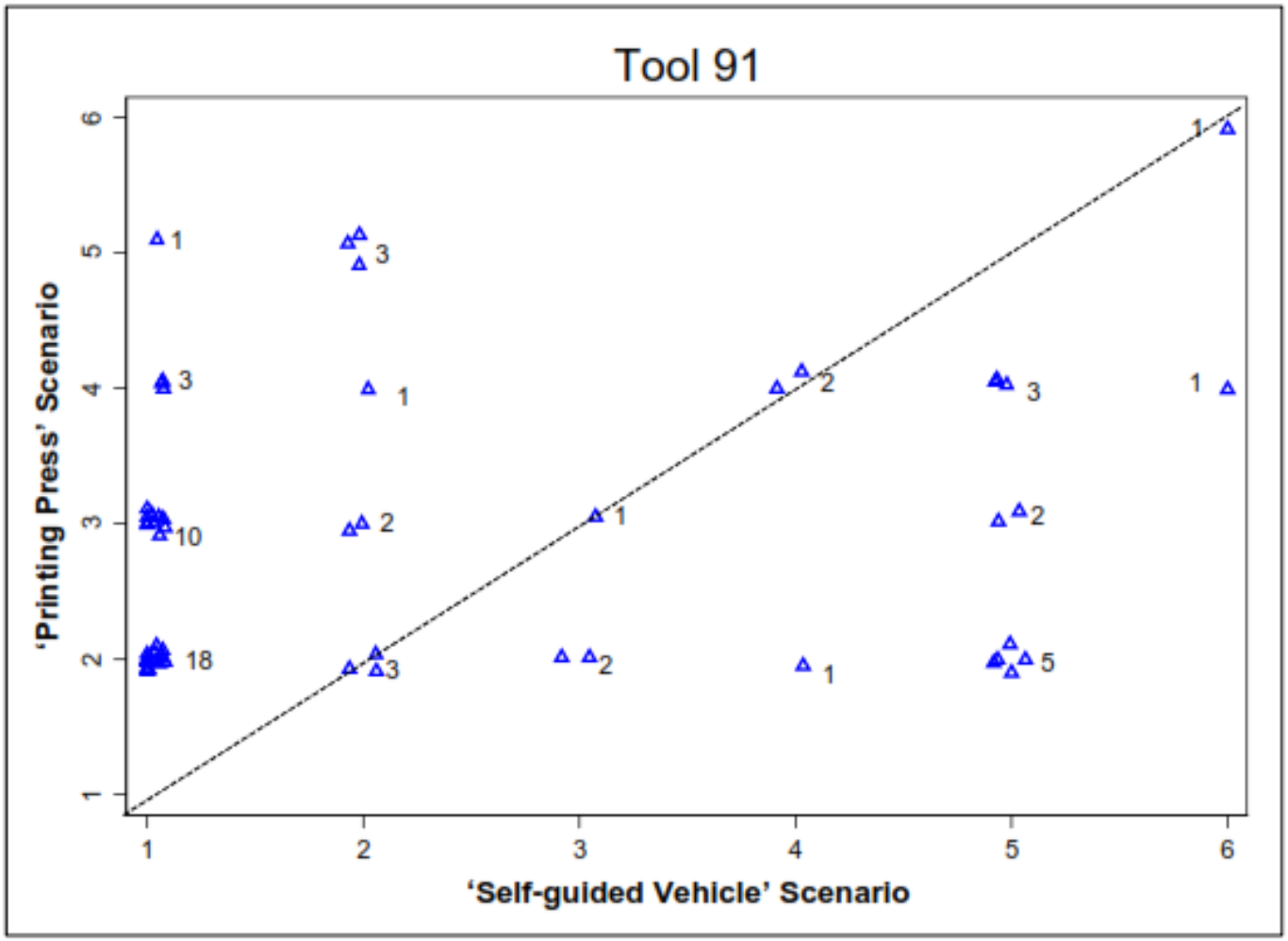


17-51 % participants got same result depending on tool used.

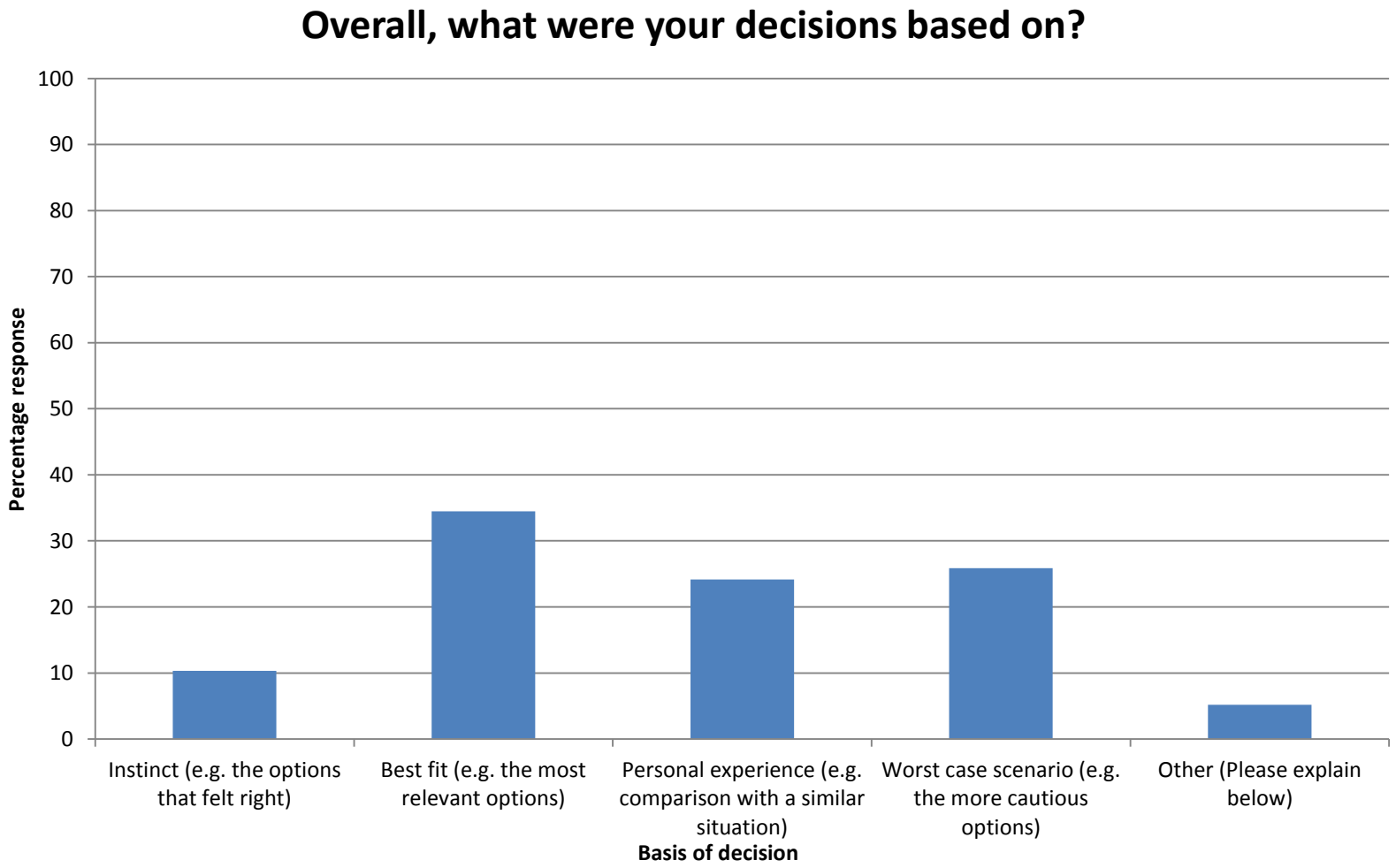
Ability to distinguish between scenarios



Ability to distinguish between scenarios



Strategies used



User experience

HEALTH & SAFETY LABORATORY

- Dissatisfaction with tool result
- Phrasing and terminology used unclear
- Difficulty distinguishing between terms
- Not enough options or gaps
- Too many input elements
- Too complicated or too simple
- Strategies used – affected by labels and descriptors

Conclusions

HEALTH & SAFETY LABORATORY

- Descriptions of labels important
- Tools generally weighted towards consequence
- Variety and variability
- Need to get assumptions out into open (teamwork)
- Multi-disciplinary approach to research was important

Features of a ‘good’ tool

HEALTH & SAFETY LABORATORY

- Underlying method
- Type of parameters
- Choices for each parameter
- Calculation and expression of result

Underlying method

- Follow a ‘standard’ type of method
  - e.g. matrix, graph, scoring
- One designed for the purpose and industrial sector you wish to use it for (suitable).
  - For machinery - as defined in ISO 12100

Choices

HEALTH & SAFETY LABORATORY

- Provide at least 3 and no more than 5
- Provide time reference for probabilities
- Include ill health as well as injury – give examples
- Avoid using same word or phrase to define one option (level) as is used as a label for another
- Avoid use of possible as a label
- Avoid use of equivalent words as labels
- Avoid mixing terminology (likely/probable)

Mind the Gap

HEALTH & SAFETY LABORATORY

- "*infrequent exposure (typically exposure to the hazard less than once per day)*"
- "*frequent exposure (typically exposure to the hazard more than once per hour)*"

Result

- At least 4 levels of risk.
- Even distribution of risk levels
- Avoid high sensitivity to any input

Further information

HEALTH & SAFETY LABORATORY

- Reports are in process of being approved to go on HSE website
- Hoping to be able to make the data available for others to analyse themselves
- Plan to produce series of papers with our partners – will all be open access
- email to express interest
- I will announce all of them in SaRS LinkedIn

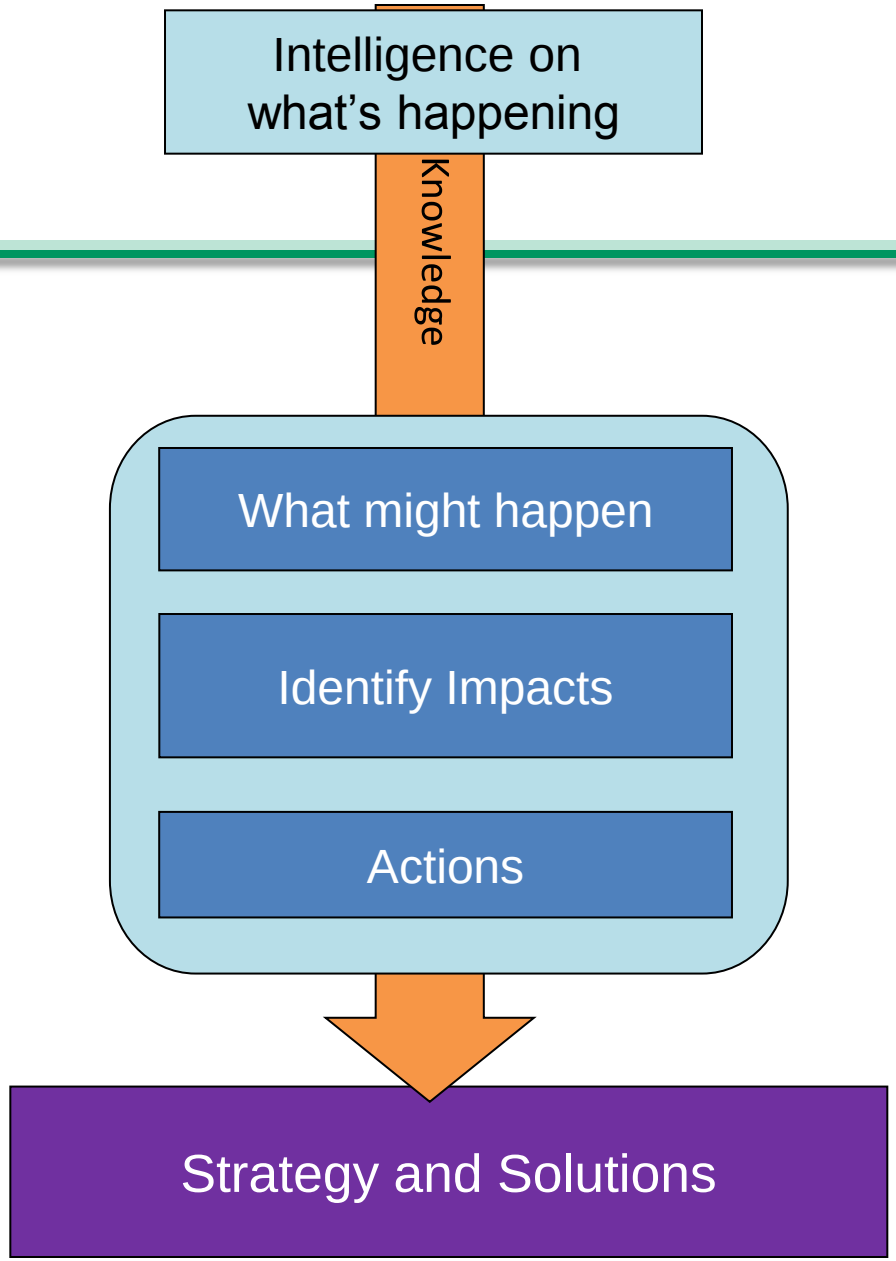
Earlier work

HEALTH & SAFETY LABORATORY

- Paques, J-J and Gauthier, F. 2007. *Analysis and Classification of the Tools for Assessing the Risks Associated with Industrial Machines*. Journal of Occupational Safety and Ergonomics Vol.13 No.2, pp173-187.
- Gauthier, F, Moulet, F, Chinniah Y, Healey N, and Stacey N. 2010. *A comparative analysis of risk estimation tools for industrial machines.* Proceedings of SIAS 2010: 6th International Conference Safety of Industrial Automated Systems

Questions

HEALTH & SAFETY LABORATORY

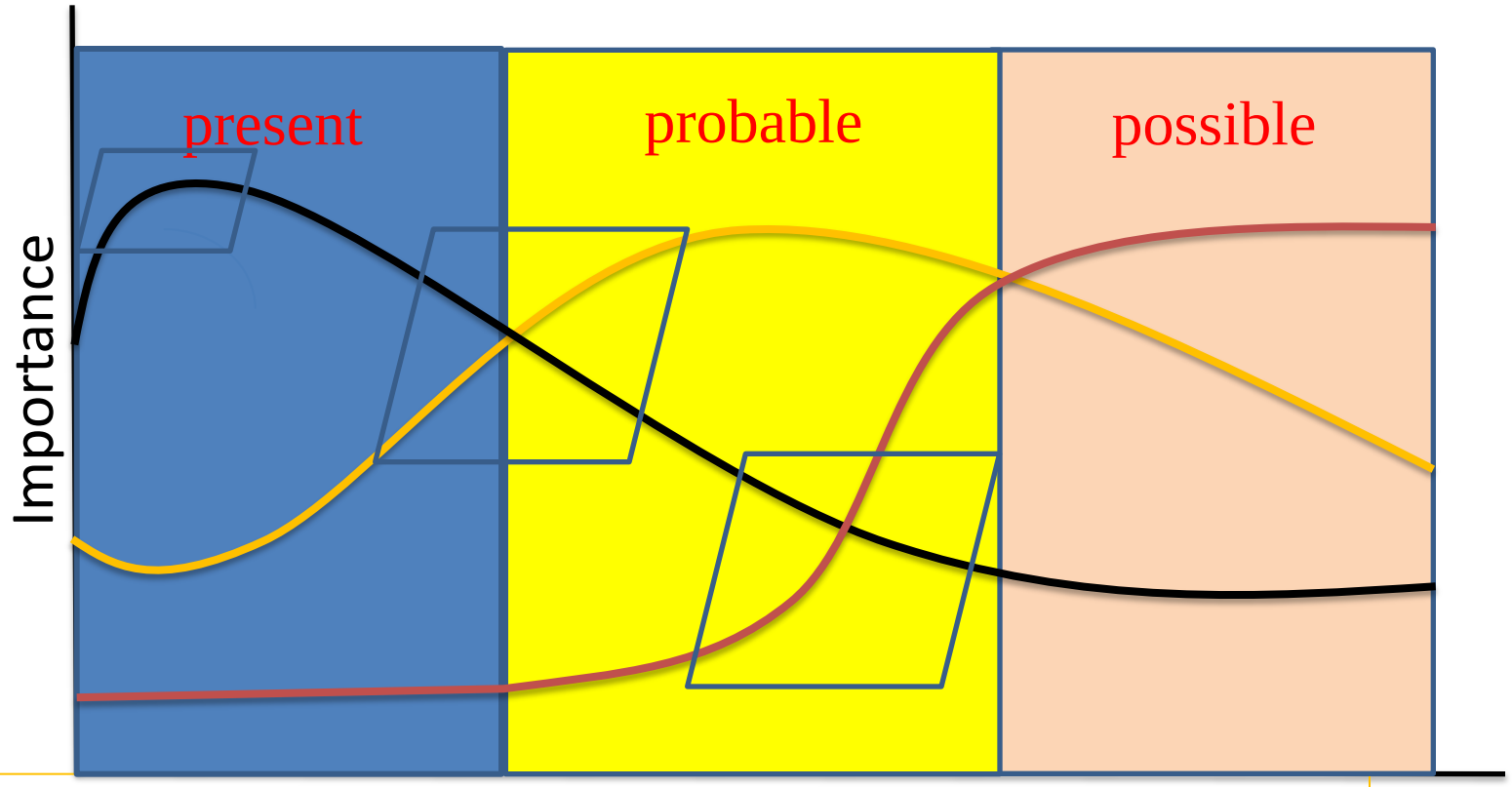


HEALTH & SAFETY LABORATORY

HEALTH & SAFETY LABORATORY

- Forecasting
  - When the past is a reasonable guide to the future (ageing population)
- Foresighting
  - If a problem is complex, with high probability of significant change (nature of the workforce)
  - An iterative, ‘creative’, active ‘process’
  - Letting go once incorporated into policy or research plans

Three horizons to scan



Horizon 1: current and near future

Horizon 2: further out future

Horizon 3: distant future

Looking for developments

HEALTH & SAFETY LABORATORY

- Science and technology
- Workplace (who, how and where)
- Socio-economic factors that affect the labour force and market
- Public attitudes to risk, health, safety and the environment
- National, European and International political agendas

…that could significantly affect health and safety

Role of hindsight

HEALTH & SAFETY LABORATORY

- Important to understand the current position and how it has developed
- This will influence responses to events in the future
- Existing trends may continue
- Generally pace of change is accelerating, so look back twice as far as looking to the future

Futures techniques

HEALTH & SAFETY LABORATORY

- Scenarios
- Plausibility Matrices
- Wind-tunnelling
- Visioning
- Road-maps
- Back-casting

Need to match technique to objectives

Feedback

HEALTH & SAFETY LABORATORY

Logistics Sector

- "..helped us enormously to focus on the key issues when we refreshed our intervention plan"

Transport Forum

- "I learned a lot" it "Just all worked really well"
- "Futures workshop was an excellent event"
- "Given us food for thought"

Waste and Recycling Sector

HEALTH & SAFETY LABORATORY

- Growing sector
- Lots of innovation
- E.g Robot waste pickers

Perfect Storm: Cyber security

HEALTH & SAFETY LABORATORY

- Threats expected to soon out way the benefits of being online
- Increasing reliance on knowing where to find information rather than knowing information
- Internet of things – lights out factories
- Reaching duty-holders

Perfect Storm: Vulnerable workers

HEALTH & SAFETY LABORATORY

- Increasing work intensity
- ICT enables 24/7 availability
- Increasing sedentary lifestyle
- Remote working
- Ageing workforce

Summary

HEALTH & SAFETY LABORATORY

- Learn from the past, learn from one another
- Can’t predict future but you can prepare for it
- Futures techniques helps manage uncertainty
- Match technique to objectives, clients needs
- About anticipating future threats and opportunities – gives a strategic edge
- Get stakeholder commitment to take action

HEALTH & SAFETY LABORATORY

Asking Questions

To provide answers

Please check out the survey on use of ICT on SaRS web-site

SaRS 2016

HEALTH & SAFETY LABORATORY

Join us at HSL in Buxton

6th October

Call open

- papers and posters