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THE CHALLENGES WHEN EXPERTS ASSESS RISKS

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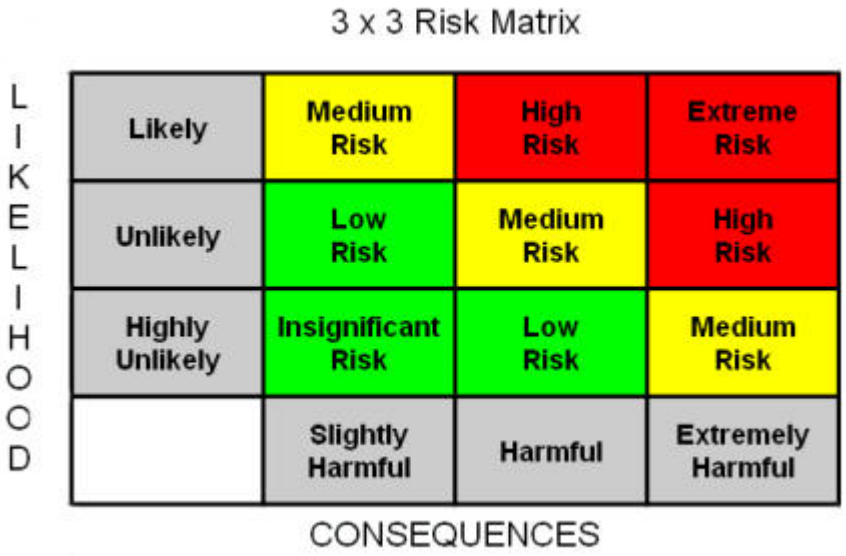
7th AHFE Conference, 27-31 July 2016, Orlando, FL

CREATING TOMORROW

CURRENT PRACTICE: RISK ASSESSMENT

- Expert judgment is asked when data is missing, unreliable or corrupted.
- Experts' accuracy has been questioned due to effects of cognitive biases.
- Contradictory findings about the performance of experts VS simple models.

CURRENT PRACTICE: RISK MATRICES



Advantages

- Easy to use graphical layout
- Simple linear illustration of risks

Disadvantages

- Risk is seen as single-dimension
- Various resolutions leading to divergent risk interpretations
- Same hazardous situations might have different implications
- Non-standardized probability and severity scales

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RESEARCH OBJECTIVE

The assessment of the level of consistency amongst safety experts of a single company when they were asked to assess possible outcomes and risk levels of past events.

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METHODOLOGY

- Large European air operator.
- 12 Air Safety Reports (ASR) stored in the company's database and being assigned various risk levels.
- 10 safety experts of the company were asked to:
  - State the most credible outcome
  - State the worst outcome
  - Use of 5 x 5 risk matrix to assign the risk level (4 risk areas: acceptable / low, moderate, high, unacceptable risks)
- Calculation of inter-rater agreement with Kendall's W test (values from 0:absolute disagreement to 1:absolute agreement).

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AGREEMENT AMONGST EXPERTS: WORST OUTCOME

	Worst outcome categories										
ASR	Death	Injury, no hospitalisation	Injury with hospitalisation	Hull loss	Loss of control	Runway excursion	Aircraft damage	Mid-air collision	Airprox	Hard Landing	Short landing
1	2	1	5								
2	6	1	1								
3	1			6	2	1					
4			1		2		2	5			
5	1	2		1	4		1				
6	7		2								
7	6	2	1								
8	1			5	1	1			1		
9	1			3	1	1				2	1
10	3						7				
11								10			
12	4		1		4			1			

Kendall's W: 0.220 (p=0.003)

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AGREEMENT AMONGST EXPERTS: MOST CREDIBLE OUTCOME

	Most credible outcome categories											
ASR	Injury, no hospitalisation	Injury with hospitalisation	Hard landing with damage	Loss of control	Damage to aircraft	Hull loss	Mid-air collision	Death	Runway excursion	Long landing	Physical distress	Loss of separation
1	1	1	6									
2	6	2										
3			6	1	2	1						
4	1				3		1					
5					4		1					
6	1	2			2			1				
7		5	3									
8		1	1		3				2	1	1	
9				1		1				5		
10		1			7							
11							5					2
12	1	6		1				1				

Kendall's W: 0.164 (p=0.027)

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AGREEMENT AMONGST EXPERTS: RISK LEVEL

	Probability level					Severity level				
ASR	A	B	C	D	E	1	2	3	4	5
1		2		3	5			4	6	
2	2		3	2	2		3	4	1	1
3	1	4	5					5	4	1
4	5	4				3	2	1	2	1
5	4	3	1			2	1	1	4	
6	4	1	3			2	1	1	3	1
7	4	3	2					5	4	
8	6	2	1				1	3	4	1
9	5	3	1	1		1	4	1	3	1
10	5	3	2				1	3	6	
11	7		1							8
12		1	5	2	2			5	5	

Kendall's W

Probability: 0.305 (p=0.006)
Severity: 0.315 (p=0.004)
Risk level: 0.241 (p=0.000)
Risk area: 0.550 (p=0.000)

CONCLUSIONS

- The findings of the study:
  - Showed low consistency amongst experts when using risk matrices.
  - Confirmed literature references about limitations of current risk rating matrices.
- Possible reasons:
  - Strong effects of cognitive biases.
  - Faulty perception of the association between working experience and expertise.
  - Lack of training in expert judgment methods.

WHAT IS COGNITIVE BIAS? – WHY?

- Cognitive Bias is:
  - a result of observation by a given person or persons that create a skewed perception of “reality”.
  - a pattern of poor judgment, often triggered by a particular situation.
- Cognitive biases exist:
  - Due to evolution and natural selection pressure.
  - To facilitate effective actions in given contexts or enable faster decisions, when the latter are of greater value for reproductive success and survival.

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CONFIRMATION BIAS

- Tendency to accept evidence confirming a held opinion while rejecting contradicting evidence.
  - "You see what you expect to see".
- The confirmation bias leads people to:
  - Seek information that confirms expectations.
  - Interpret ambiguous information in line with expectations.
- Application to risk assessment: Expose yourself and experts regularly to a variety of information – do not rely on ones' judgment.

ANCHORING BIAS

- Anchoring describes the common human tendency to rely too heavily on the first piece of information offered (the "anchor") when making decisions.
- Example: A safety manager asks an expert to assess a risk by presenting the risk level assigned in the past for the same hazard by other experts.
- Application to risk assessment: Avoid assessing risks based on previous estimations. Do not present your experts with existing values and asking for re-assessment.

AVAILABILITY HEURISTIC

- The availability heuristic tells us that we judge the probabilities of an event by how easy it is for us to recall instances of that event.
- This tends to lead people to overestimate the probability of events that are easy to imagine or to recall, for example, dramatic events like major incidents or those within personal experience.
- Application to risk assessment: Do not bias your experts by presenting them events and then asking for a risk assessment – ask from them to evaluate hazards and justify their judgment.

SOME OTHER TYPES OF BIASES IN RISK ASSESSMENT

- Severity bias: We assess the risks based on the actual severity of the events and not their potential.
  - -> look at how the events marched and not only at the results.
- Correlational bias: We tend to register far more the occasions when X and Y (two events) are found together than when they are not and as a result overestimate a causal link, if indeed there is one.
  - - > seek for meaningful connections, enlarge your sample and seek for same combinations with different outcomes.

RECOMMENDATIONS

- Consistent use of published expert judgment methods following respective training of safety professionals and experienced staff.
- Combination of hard data and human judgment is likely to support effective decision making.
- Diversity must be valued when collecting views (e.g. hazard identification, planning of remedial actions against threats).
- When assigning risk levels in matrices sufficient consistency and reliability are indisputably required.
- Risk matrices and other probabilistic risk assessment tools must hold only a supportive role in safety risk assessment.

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