
Perception, Heuristics, Cognitive Bias and the Psychology of Safety

Helping People and Organisations Mature in Safety Development

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Prepared by:

Dr Robert Long
Director
Human Dymensions
10 Jens Place
Kambah ACT 2902

Contact:

Mobile: 0424-547 115
Email: rob@humandymensions.com

ABN: 34 123 347 080

Introduction

Managing safety is mostly dependent on judgment, perceptions and decision making. Whilst it is good and necessary to have legislation, standards and regulations in place, it is what humans decide to do with those regulations that determines whether they will be effective. Regulations of themselves do not make a safe workplace, it is when people comply with those regulations that their effectiveness is experienced. Similarly, education and training in themselves do not create safe behaviour, knowledge and information in themselves do not necessitate effective risk management.

It is also good to have safety management systems in place but we need to understand that human interactions with regulations, knowledge and systems is just as important as the systems themselves. This paper explores the human aspect of risk and safety management and discusses key issues in understanding the psychological and cultural dimensions of safety management.

How we make decisions, what we base our decisions on and, our behaviour, are all uniquely linked and interdependent. There is a view in safety and risk management which espouse that humans are the sum of their behaviours, this is the approach of Behaviour-Based Safety (BBS). There is another view which argues that human behaviour is evidence of thinking (cognition) and that behaviour is determined by right thinking, this is the approach of Cognitive Behavioural Theory (CBT). These views only partially account for how humans manage risk and safety. Humans are neither just machines (BBS) nor computers (CBT) but think and behave in context, in a culture and social environment, this is the approach of this paper and of the Psycho-Social Approach (PSA) to risk and safety management.

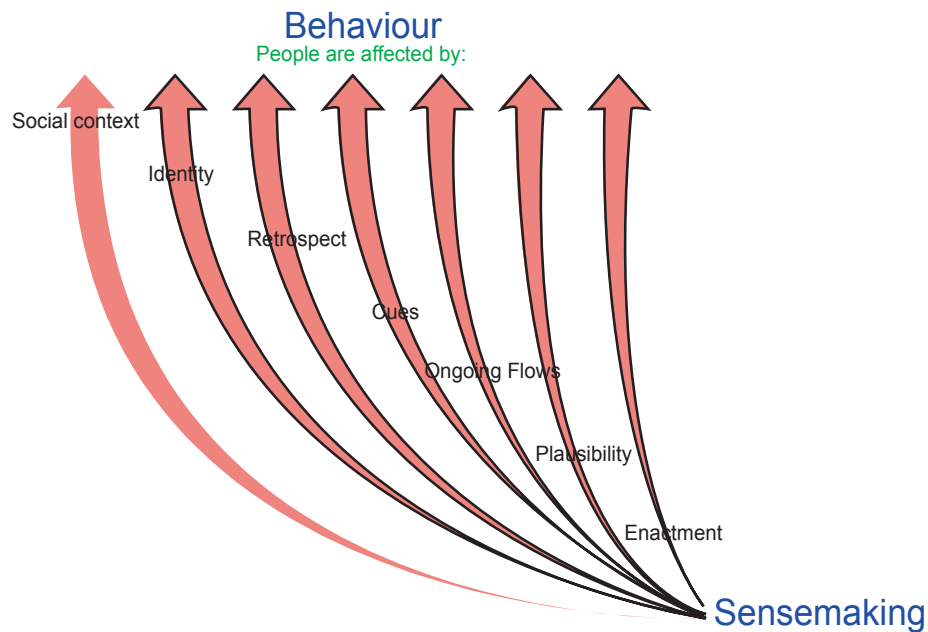
This paper discusses psychosocial factors which influence the judgement and the decision making process in managing safety. It examines three aspects of social psychology namely: perception, heuristics and cognitive bias and how these affect human judgement and decision making.

Perception

Perception is the process of awareness or understanding of sensory information, it is about receiving, collecting and apprehending with the mind or senses; what Weick calls “Sensemaking” (see figure 1). We tend to rely a great deal on our senses, and place a significant level of trust in our perceptions unfortunately, science has shown that our perceptions particularly, our visual cognition is highly unreliable. This is because we make sense of our world and the stimuli that come to us through a range of lenses and filters such as our: history, upbringing, culture, self-esteem, personality type, worldview and beliefs. It is for this reason that the idea of “common sense” is largely mythical, we share much less in common than we would like to believe.

When people view something they bring their sensemaking lenses with them and tend to take those preconceived ideas and see them whether or not they are really there. This is because humans understand new information through the bias of their previous knowledge, history and worldview. This is why learning and change is most often “scaffolded” ie. new knowledge is developed through the support and comfort of what is already known. The extent of a person’s knowledge creates their reality because the human mind can only contemplate that which it has been exposed to. When objects are viewed without understanding, the mind will try to reach for something that it already understands, in order to process what it is sensing. That which most closely relates to the unfamiliar from our past experiences, makes up what we see when we look at things that we don’t comprehend. In order to manage the massive influx of information, demands for change and data which bombard us each day we tend to rely on simple “rules of thumb” (called heuristics) to help make decisions. These rules of thumb can be most helpful at times in managing the constant demand for decision making in a stressful and busy world however, in the area of safety management they can also be counterproductive.

Figure 1 - Sensemaking



The concept of sensemaking is critical in navigating the issues of perception and decision making in safety management. Once we understand how humans make sense of things and how our perception is conditioned by that sensemaking we will be much better prepared to manage risk and safety. Weick calls sensemaking “the interpretation mindset”. It is this mindset which helps justify commitment to our worldview (beliefs we hold) and the way we interpret the things that we see and experience. Once committed to a particular mindset, and once justified, perceptions then often become self-confirming and, particularly difficult to shift or change.

Heuristics

Heuristics are educated guesses, simplistic judgements or “rules of thumb” (or thinking shortcuts), one such rule of thumb is the notion of “common sense”. A heuristic is a tool of thinking which helps individuals solve problems and come to a rapid solution when under pressure or when under stress or overload. These thinking tools (cognitions) are often based upon a long history or experiences which shape our attitudes, beliefs and values. Once a belief or value is in place they are often very hard to shift, pressure to shift from holding a belief or value triggers what is known as “cognitive dissonance”, a form of thinking stress. Cognitive dissonance is an uncomfortable feeling caused by holding two contradictory ideas simultaneously. For example: “smoking is a dumb thing to do because it could kill me” and “I smoke two packs a day”. The “ideas” or “cognitions” in question may include attitudes and beliefs, and also the awareness of one’s behavior. The idea of cognitive dissonance proposes that people have a motivational drive to reduce dissonance (contradiction stress, mental discomfort or state of tension) by changing their attitudes, beliefs, and behaviors, or by justifying or rationalizing their attitudes, beliefs, and behaviors. In the case of the smoker the best way to reduce the dissonance is to quit smoking but if they have tried and failed they must then reduce the dissonance by finding a justification of why smoking is OK or not that bad eg. reduces weight, calms nerves etc. the reality is that humans fail miserably when it comes to rational decision making.

Plous discusses the following heuristics (“rules of thumb”) which are often used to interpret and manage perceptions:

The Representativeness Heuristic: people often judge probabilities by the degree to which one thing is representative of another, that is, by the degree to which A resembles B. Tversky and Kahneman called this

the “conjunction fallacy” which is when people make assumptions about the relationship between certain facts without evidence. What this means is that based on what is represented to someone and based on their worldview (sensemaking) they are quite content to jump to conclusions. In safety this could mean that a worker may think that intelligence is linked to accidents, that people have accidents because they are “stupid” or “accidents only happen to idiots”. Similarly, if someone has never had an accident this can be attributed to superior intelligence or “I’m not an idiot so I don’t have accidents”. Unfortunately, the conjunction of the two is a heuristic with no evidence, incidents and accidents are not related to intelligence.

The Availability Heuristic: is when people access the frequency of something through the availability of information to them. In other words because people can bring to mind stronger memories of shark attack which they believe it is more widespread than being hit by lightning when in fact, the chance of being killed by lightning is three times more probable than fatality by shark attack. Common events are easier to imagine than uncommon events and are more available depending on their emotional significance. In safety, workers rely upon availability to calculate probability of an accident. For example, workers may remember the severity of a angle grinder accident but not the regular occurrence of accidents with hammers and so develop complacency around the use of one tool over being careful with all tools.

It should be clear that these dispositions have significance for risk perception and for decisions that need to be made about risk. It is easy to imagine how probability estimates associated with a new hazard that resembles an old hazard could be effected by the representative heuristic.

Cognitive Bias

These rules of thumb which we create allow humans to establish shortcuts to simplify decision making. The attraction for the “simplistic paradigm” is quite strong whereas, the attraction to explain all things in complexity is quite stressful. We simplify our experience of the world to make it more predictable and manageable and to help manage new information so it is aligned with old information. The power of heuristics distorts perceptions but seemingly helps us make decisions when confronted with complex decisions. Associated with this are a range of cognitive biases which distort the way we see the world. Cognitive biases are mental errors caused by our tendency to use simplified information processing strategies. The following are a selection for some common cognitive biases:

Anchoring and Adjustment

Giving disproportionate weight to the first information received and that initial information *anchors* subsequent judgements, this is more influential when thinking about the unimaginable or unthinkable. For example, how thick would a piece of paper be if folded on itself 100 times, most people answer a few meters when in fact the correct answer is 800 trillion times greater than the distance between the Earth and the Sun.

Attribution

Associating success with personal ability and failure with bad luck, chance or poor intelligence. eg. the language of “near miss” lends itself to attribution rather than “near hit”.

Comptability Bias

Comptability between one piece of information and the required response effects the importance of that information determining the response. For example: prioritising severity over frequency in risk assessment.

Confirmation Bias

If new information is consistent with our beliefs we think it is well founded and useful. For example, after a debate between two political rivals most supporters are convinced that their representative won the debate.

Fact/Value Confusion

Regarding and representing strongly held values as facts. For example, accidents only happen to idiots.

Overconfidence Effect

Feeling overconfident in the face of abundant data. For example, strong data about hand injuries in LTI figures yet not wearing gloves for a dangerous hand held task.

Order of Effects

Remembering data more easily at the beginning than the end.

The Primacy Effect

Characteristics appearing early in a series of information create stronger impressions than characteristics appearing later. For example, Ashe's experiments found that the placement of words in a report made an impression on people's emotions and could create negative or positive responses to data.

Recency Effect

Being partial to data that is most recent and easiest to remember. For example, people can be made to think more positively by listing the positives for an argument first and the negatives second. So, if you are asked if you would like to speak first or last on a program, always take the first position. If there is a delay in time between the first and last presentation before an action is taken (eg. 2 weeks) than you should present last.

Redundancy

Increasing confidence level as the data becomes more redundant. For example, the development of complacency as a time of extreme risk expires and people relax as the perception of risk decreases.

Rosy Retrospection

Looking back and remembering the "good times". For example, workers remember an alliance project when relationships were rosy and incidents were low, and develop pessimism and negativity based on the recency effect.

Sample Bias

Placing high value on a small sample that is flawed due to an inadequate sampling methodology. For example, based on "common sense" one asserts that glasses do not reduce the probability of eye injuries because there were no eye injuries on a job where people did not wear safety glasses.

Selective Perception

Seeking data that will confirm your views. For example, looking at LTI statistics and finding no reported hand injuries with forworkers or steelfixers.

Status Quo Bias

Preferring alternatives that support the current conditions, because its a safer strategy and involves less risk. For exmample, “if it ain’t broke don’t fix it” heuristic which argues against change, relying on the past record as if the probability of an incident has been reduced.

Sunk Cost Effects

Making choices that support past decisions, even when the chances appear no longer valid. For example, using past experiences to refute new procedures such as, we didn’t need to do this in the old days and we were all OK, noone got injured. Unfortunately, selective recall according to the Recency Effect.

Wishful Thinking

Preferring the decision because the outcome is desired. For example, reducing safety paperwork in the face of operational,. cost and production pressures.

Conclusions - What can be done?

In order to combat cognitive bias and heuristics the following are necessary:

- Whenever faced with a decision that requires the assessment of future probabilities, remember to consider all the data before making a decision.
- Gather data from various sources.
- Intentionally seek out data that both supports and discounts your view.
- Ensure that Mavericks, Mavens and Devil’s Advocates are not far from executive decision making.
- Define alternayives clearly, the status quo should never be the only option.
- Consider the problem on your own first, then gather input from others.
- For all decisions with a long history, verify that you are not giving undue consideration to sunk costs.
- Study the research on cognitive bias and require safety leaders to do the same.

Humans distort their perceptions and decision making particularly when under stress. Heuristics and cognitive bias can help explain why a skilled operator will “filter out” hazards (through over confidence or complacency), why a senior leader will not terminate a porr performer he has coached or mentored without any measureable performance improvement (sunk cost effect), or why a leader will hold on to a safety system that delivers weak safety performance in the face of overwhelming evidence to the contrary (status quo bias).

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Dr Robert Long – Director Human Dymensions Pty Ltd

PhD., MEd., MOHS., BEd., BTh., Dip T., Dip Min., Cert IV TAA, MACE, MSIA

Rob has extensive experience and expertise across risk management and OHS in construction, mining, government, education and community sectors. He holds formal qualifications in OHS and is a member of the Safety Institute of Australia and the Australian College of Education. Rob's was a senior consultant in OHS for SAFEmap International and Safety4Life Australia and is currently Director of Human Dymensions Pty Ltd specialising in organisational learning and the psychological and cultural dimensions of OHS in organisations. Rob developed and implemented the Nationally awarded PROACT OHS program for the MBA in 2005/2006 and has developed a range of innovative safety cultural training and assessment tools which are currently deployed in industry with great success.

Rob is able to use his expertise in analysis, training, organisational psychology, research, cultural evaluation and human behaviour to serve a wide range of needs. He has provided OHS consultancies to National and International companies/Alliances including BMA Coal, BlueScope Steel, Pt Kembla Coal, Master Builders Association, Universities, Government (eg. Defense, CSIRO, Finance), Brambles International, Baulderstone, West Gate Freeway Alliance, Port Botany Extension Project, United Group and BOC Gases. Rob is particularly skilled in organisational and safety cultural analysis having developed a unique survey methodology based on the work of implicit research at Harvard University and the work of Prof. K Weick at Michigan University. Rob uses this unique safety cultural "iProfile" tool and iRIM methodology to assist organisations develop OHS solutions-focused interventions, evidence-based training and support for change management for effective OHS outcomes.

Rob is currently undertaking organisational and cultural safety analysis for: West Gate Freeway Alliance, Baulderstone, Department of Defense, Department of Finance and Port Botany Project. Rob has more than 20 refereed papers in journals and 3 chapters in books and is regularly requested to speak at National and International conferences on OHS and organisational learning. Rob is a certified DiSC and Myers-Briggs (MBTI) trainer.

Rob has been a lecturer in Education, Curriculum Design, Learning Theory, Social Work and Management at University of Canberra, ACU National and Charles Sturt University.