Introduction

Investigation and bias – an introduction

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Bias inevitably throws us a curved ball

Bias is a tendency to prefer one thing over another. The term is usually used when that preference is unfair or based on incorrect or incomplete information. When used as a verb bias refers to the ways that people can be influenced to make a particular choice.

As an aside, in the sport of bowling, the bias is a weight in the bowl that causes it to turn.

The general consensus is that humans are naturally prone to bias. There are good reasons for this because it allows us to make decisions quickly, using a minimum of information. The problem is that it leads us to often make poor decisions or choices. Examples of commonly observed bias include[1]:

- **Confirmation bias** — making a decision based on the information that is consistent with our expectation whilst ignoring evidence that suggests another decision would be more appropriate;
- **Availability bias** — making a decision based on the information that is particularly vivid or memorable, without considering the other possibilities that may be more appropriate but less immediately obvious.

Bias leads to some unpleasant general traits in everyday life (e.g. racism, sexism) and results in behaviours at work that can contribute to accidents. Examples include:

- Assuming a digital pressure instrument is more reliable than an analogue gauge when there is a discrepancy between the two, simply because it looks more modern and sophisticated than the old-fashioned gauge;
- Paying more attention to a process indication displayed in the middle of a control system graphic than one that is at the edge because it grabs more attention;
- Mis-diagnosing the cause of a gas burner trip as a problem with the flame detector, because that is usually the cause, when this case is due to a change in fuel composition;
- Believing one person's explanation of a situation because they appear confident and assertive when other people have a more considered explanation but do not articulate it so well.

Because bias is an inherent human condition it cannot be avoided. People can be trained to be aware of it and taught strategies that may involve collecting data and analysing it objectively. Design can assist by making sure the most important items or sources of information are placed in the most prominent way, although this may only be effective for the most common problems and could actually contribute to bias when dealing with the more unusual. Procedures can be written to guide people to make a more objective evaluation of a situation before they make a decision.

The role of bias in the Challenger Space Shuttle disaster

The Challenger Space Shuttle exploded following take off due to fuel leaking caused by a failed rubber 'O' ring. The explanation is that cold ambient temperatures had made the rubber more rigid so that it did not expand to fill the gap between components. Concerns were raised before launch that the ambient temperature was lower than that considered during design and that proceeding created an unacceptable risk. However, evidence was presented to say all previous launchers had been totally successful and so there was no reason to delay. With a lot of pressure to launch Challenger on the agreed day managers decided that the view presented by the people who agreed with their desire to launch should be believed and the counter argument that would have resulted in a postponed launch could be ignored.

The role of bias in the Deepwater Horizon disaster

One of the activities performed on the Deepwater Horizon platform before the fire was a negative pressure test. This was supposed to confirm that the properties of the mud being used were sufficient to keep the hydrocarbons in the reservoir. The test was carried out and some variation in pressures was observed. This was unusual and people did not know what it meant. Someone speculated that this could be explained by the "bladder effect." People chose to believe this explanation and concluded that the test had demonstrated that the hydrocarbons were being controlled effectively. However, after the accident, investigators were unable to find any reference to the "bladder effect" when conducting negative pressure tests or evidence to suggest that this was a plausible explanation of why the test could be accepted as a success. Clearly the person had appeared to be plausible and others wanted to believe what they were saying as it would allow them to get on with the job at hand.

Bias during incident investigation

Investigators should be aware that bias can be the cause of errors committed by people involved in an incident. However, they need to recognise that they themselves can also be subject to bias; and that this can have a significant impact on the effectiveness of their investigation.

A common problem is a tendency to focus on ascertaining responsibility and apportioning blame instead of identifying

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the job and organisational factors that influenced how people behaved, which are usually far more important. This inevitably means that the actions of the people present at the incident come under greater scrutiny than the many other people who will have had some involvement in the system through previous design, construction, operations and maintenance activities.

A particular form of bias that can have a very significant effect on incident investigation is 'hindsight bias.' This is the tendency for investigators to work backward from what happened (the outcome) in order to determine the causes. The problem is that investigators have a view of the incident circumstances that was not available to the people involved at the time. Those people will have done what made sense to them given their goals, focus and knowledge. Understanding this "local rationality concept"[2] encourages investigators to consider why things made sense at the time, even though in hindsight behaviours and decisions may appear to be irrational. This allows a more objective assessment based on human factors to identify the underlying and root causes, which can be rectified to prevent future incidents.

As well as the hindsight bias, investigators are also subject to the normal confirmation and availability bias (as described above). This can affect the investigation process as follows:

- **Jumping to conclusions** — making an early judgement about the cause of the incident and then looking for evidence that confirms their original theory;
- **Smoking gun** — focussing on one piece of evidence that appears to indicate an obvious cause, when it may only be circumstantial and not backed up by other evidence;
- **Following the trend** — finding causes that match those found in other previous investigations or have been the subject of a recent initiative or training course;
- **Beliefs based** — investigators allowing their own opinion about what is important to influence how the investigation is conducted and/or reported (i.e. a human factors expert insisting that human factors receive the most attention);
- **Conspiracy theory** — loss of objectivity due a conviction that the incident was orchestrated in some way or that people are not telling the truth.

Conclusion

Bias is inherent within humans. In some ways it is a necessity for us to be able to make sense of complex world and to make decisions in a timely way. However, it can be a weakness, leading us to behave and react in ways that make sense to us at the time but with the benefit of hindsight are shown to be illogical or irrational.

People investigating incidents should be aware that they may be prone to bias. Keeping "an open mind" is not enough to overcome this tendency. They need a structure to work within that encourages and supports openness to discovering a range of potential explanations, to ask better questions and scrutinise information in an objective way before reaching conclusions[1].

People investigating incidents should receive training that explains biases so that they can be vigilant for them. Organisations need to allow investigators sufficient time and resources to enable them to properly adjust for these[1].

References

1. Human Factors in the Chemical and Process Industries - Making it Work in Practice. Edited by Janette Edmonds. Elsevier 2016.
2. Field Guide to Understanding "human error". Dekker. CRC Press 2014

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