

Accounting for hindsight bias: improving learning through interactive case studies

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Tragically, there is no shortage of case studies available to share learnings from catastrophic incidents across many industries, but we do not seem to be applying the learnings. We continue to see the same causal factors resulting in new incidents. It is possible that we fail to learn the lessons from case studies, because we are too caught up in trying to understand how the people in the incident failed to see all the warning signs that in hindsight are so obvious to us. The concept of hindsight bias started to be described in the 1970's, to explain the inclination after an event to believe you know the result all along, even when there was little or no evidence to predict it. Hindsight bias can play a part when we try and learn from incidents. For example, following the Clapham Junction railway accident, the report (Hidden, 1989) stated "There is almost no human action or decision that cannot be made to look more flawed and less sensible in the misleading light of hindsight. It is essential that the critic should keep himself constantly aware of that fact." This paper will explore how hindsight bias occurs and techniques, such as interactive activities, to avoid or minimise it when attempting to learn from case studies.

Keywords: learning, case studies, hindsight bias

We fail to learn

A key focus area for organisations is to look at what can be learnt from incidents to prevent reoccurrence. However we continue to see similar incidents play out across the world, suggesting that perhaps we are not very effective at learning from incidents. When we review the findings of an incident, we do it with the knowledge of what went wrong or what caused the incident. As humans we can look for a way to rationalise why the incident would not happen to us. This impacts why we fail to learn from others' errors. We justify that we would not have made that decision or taken that action, thereby rationalising that the incident could not happen to us. We even at times state that we would have known better and made better decisions. This rationale however fails to take into account the full context of the original decisions, or the fact that "the historical judge typically knows how things turned out" (Fischhoff, et al., 1975). This psychological response can be explained by hindsight bias.

Defining hindsight bias

There are three psychological phenomena that contribute to the effect of hindsight bias. These are a distortion of memory, beliefs about the likelihoods and a subjective belief about one's own ability to predict outcomes (Roese, et al., 2012). Roese goes on to explain that hindsight bias stems from various psychological inputs. These include the selective recall of information to make sense of the outcome, attempting to understand the outcome by misattributing an assumed prior likelihood and needing to see the world as orderly and predictable to avoid being blamed for future problems under similar circumstances.

This hindsight bias makes it difficult to objectively review a case study or incident without second guessing the actions taken by those involved. As highlighted in the Clapham Junction railway incident report (Hidden, 1989) "There is almost no human action or decision that cannot be made to look more flawed and less sensible in the misleading light of hindsight. It is essential that the critic should keep himself constantly aware of that fact." The fact is we cannot "unknow" information, so overcoming hindsight bias is perhaps more difficult than overcoming other types of bias, where knowledge that the bias is present can help to limit its impact.

How hindsight bias impacts learning from incidents

Case studies are widely used in industry as a way to learn from incidents. They illustrate the detailed causes of an incident, and this makes them a powerful way to expand understanding of what can go wrong. When using case studies, the temptation to pass judgement on those involved is very strong, but it is flawed. This judgement is made with currently available information that may not have been available at the time. There is an inherent uncertainty at the time that cannot be recaptured once the details are known. In 1975 Fischhoff stated "the very outcome knowledge which gives us the feeling that we understand what the past was all about may prevent us from learning anything from it." (Fischhoff, 1975). This sums up the idea that hindsight bias inhibits our learning from incidents.

In simplified terms this means that once we know the outcome of an event, we can see exactly what went wrong in leading to the outcome. We see this information with the benefit of knowing the outcome, and therefore we do not see the events unfold in the context under which they occurred. This clouds our judgement with information that was not known to the people in the event.

This then leads to the question of whether there is a better method of learning from case studies or past events.

Hindsight bias and case studies

Case study reports or videos typically start with the outcome and then build up the events that lead to the outcome. Take for example the BP America Refinery Explosion (CSB, 2007) front cover shown in Figure 1. There is no question of the outcome to this incident, it was a catastrophic event. The number of fatalities and injuries are shown on the front cover, in addition to a photo of the devastation. As we read through the report we start to question the decisions made by the workers

and the company, but we have the benefit of hindsight, something those involved in the incident did not have. The raffinate splitter tower was not overfilled with the context that it would overflow and trigger an explosion that would tragically kill 15 people. Yet it is very difficult, if not impossible to read the report without questioning every decision and subsequently rationalising why the reader would not have made that decision.

Figure 1 CSB BP America Refinery Explosion Investigation Report front cover (CSB, 2007)



Viewing case study reports in this manner makes sense logically as a way to lay out the facts for all to understand. However we do not typically read books or watch movies already knowing the outcome. We prefer to immerse ourselves in the story as it develops. This is highlighted by the typical social media outcry that occurs if someone unveils the plot of a new movie or book without the use of a “spoiler alert”, giving the audience the option to not learn of the plot. The typical case study robs us of this experience, because we look for case studies of particular types of incidents, rather than case studies of particular types of plants. For example if we are operating a gas plant we would look for gas explosion case studies rather than gas processing plant case studies. We have the knowledge that the explosion occurred and then go about dissecting the events that lead to it. This in itself has merit if we use it to understand causes and look to see if we have barriers to prevent or mitigate the incident in our plant. However due to hindsight bias it becomes less valuable if we are using them to train people in how to operate facilities or how to be more aware of hazards. As stated by Wears & Nemeth “We do not learn much by asking why the way a practitioner framed a problem turned out to be wrong. We do learn when we discover why the framing seemed so reasonable at the time.” (Wears, et al., 2007)

Ways to minimise the impacts - interactive case studies

The author’s frustration with a lack of learning from case studies has led to a different way of presenting a case study that is aimed at helping the audience understand how their decisions and actions can have an impact on the safety of their facility. The new method developed by the IChemE Safety Centre (ISC) also attempts to immerse the audience in the events as they unfold, requiring them to participate in decisions along the way. Attempting to make decisions in the context in which they were initially made provides the audience with an opportunity immerse themselves in a similar situation. This provides an experience element which is not possible by just reading a report or watching a video, but the experience is painless, as opposed to an actual incident experience.

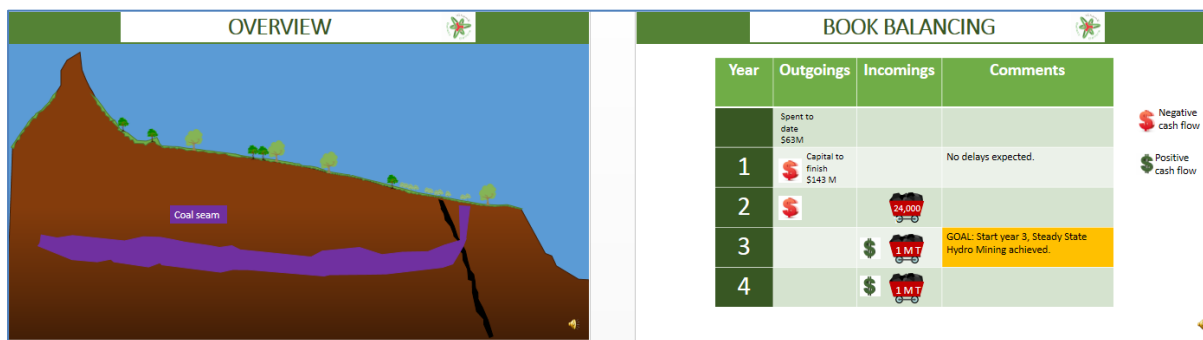
The basis of the case studies

The case study tools consist of a series of short videos, with breaks in between for facilitated discussion. Detailed notes are provided for the facilitator, so the tools can be used by any workgroup with one person who takes on the role of facilitator. In this way they can be used in formal training sessions or as team discussions on shift, through to management meetings. The material has been presented in video form to ensure that the material is provided in a consistent manner, and is reusable.

The incidents are told as a story and attempts have been made to make it generic and anonymous. This is to try and prevent the audience from succumbing to hindsight bias as a result of guessing which case study it is. Real incidents are used as the basis for the videos to address the audience stating ‘but that would never happen’ as the events unfold. Once the actual incident is disclosed, the story becomes real.

The sessions typically begin with an introduction to the facility type and the team involved in the facility, as well as introducing the audience to the role they will be playing in decision making. This provides a chance to set the context of the case study as close to that of the pre incident conditions. See Figure 2 for an example of setting the context. In this example we see a coal seam proposed to be mined and the financial project plans.

Figure 2 Example of setting the context



Once the context is set, the events that led up to the incident start to unfold. At suitable points in the story the audience are given a chance to make a pivotal decision. They are presented with the summary information and then the video stops for the audience to make their decision. See figures 3 and 4 for examples of the decision making information. In figures 3 and 4 we see some detailed information that we have built up in the video followed by the options for our decision making. The type of decision making in each case study remains consistent, so as to create a degree of familiarity with the decision framework used. The audio component of the video provides instructions on how to answer the question. For example, accompanying figure 4 the audio instructs “So we would like you to review the four options that have been proposed and sign off for the different functions. There is a hand out where you either tick for yes - I think that function would recommend sign off or Cross for no - I don’t think that function would recommend sign off. You can sign off or reject multiple options.”

The facilitator then discusses the audience decision before restarting the video to see what decision was made by the people involved in the real event. Each case study typically has three decisions to be made. Once the final decision is made that leads to the event, the actual incident is revealed. The learnings of the particular incident are then discussed in the video. Once the videos conclude the facilitator holds a final discussion on the learnings and what people have taken away from the experience.

Figure 3 example of decision question

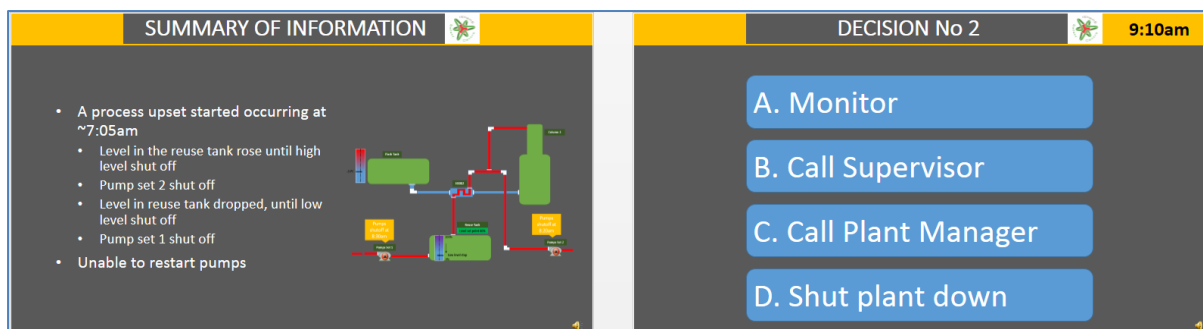
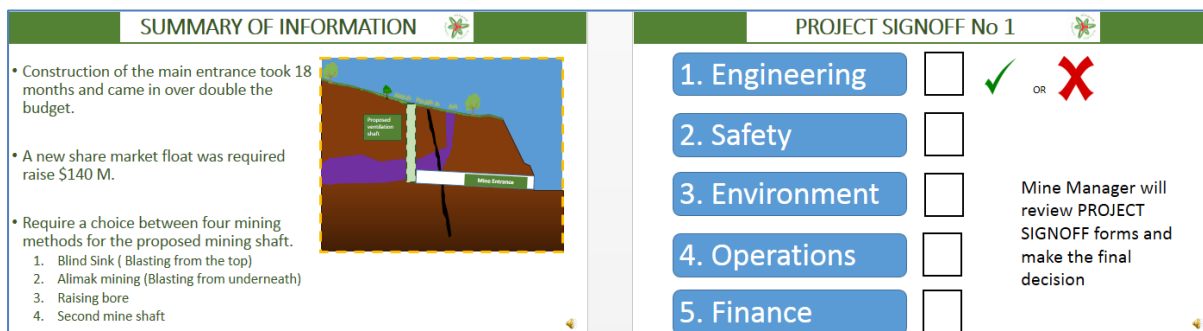


Figure 4 example of decision question



The presentation of the material in this manner also allows us to create some of the initial pressures felt by the individuals involved, such as time delays or financial constraints. For example with financial constraints, the case study will reference the money spent, or focus the audience on cost cutting. This starts to provide some of the original context. At times this can mean we present additional unnecessary information as part of the case study. This is done not to confuse the audience, but to show some of the information overload that people experienced in the real case. The audience needs to figure out what is important and what is not to be able to make the decisions.

Application of the case studies

These case studies take the facts of an incident and simplify them in terms that can be understood by a wide range of people. This makes the application of the case studies very broad. The case studies also explore a range of different issues that occurred in the lead up to the incident. This means they can be used by a range of different workgroups in an organisation, as each workgroup will take different learnings away from the experience. For example the case study on developing a coal mine can have applications for senior executives and directors on governance and investment decisions, as well as for front line operators on factors that influence certain decisions, in the face of safety concerns. They are also designed in such a way to ensure the delivery of the facts are consistent by the use of videos, and have comprehensive facilitation notes, so the discussion can be led by someone from within the organisation, from a manager to a team leader.

Conclusion

The types of case studies referred to in the paper are in the early stages of release, so quantified research is not available on their effectiveness as a tool for learning. They have however been run a number of times across varied audiences and received positive feedback and both engaging and well presented. Interestingly, the participants often make the same decisions that were made in the real event. This can be a very eye opening experience for the participants. The case studies put the learner in the event as it unfolds and encourages them to make decisions without knowing the outcome. This is a step toward experiential learning, without having to suffer the actual consequences. The lack of real consequences for the participants may reduce the experience of learning, but it is still a greater experience than simply reading a case study or watching a video knowing the outcome. There are currently three different types of case studies available, a gas plant, a coal mine and a tank farm.

This methodology can be used to build a case study of any incident where you have sufficient information to develop the decision making context. It is important though that the identifying details are disguised to prevent the hindsight bias creeping in.

Research conducted on hindsight bias has mainly been constrained to the legal and medical fraternities. This paper has remained quite anecdotal, rather than a research paper. A further research topic may be to look in detail at how hindsight bias can be minimised or overcome in a process safety setting.

Seeing an incident unfold in the context of what else is occurring at the time can help us understand why people made the decisions they did. This can be more powerful than just questioning the decision that they made. Understanding the why allows us to address similar issues in our facilities.

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Acknowledgements

The author would like to acknowledge Brett Mahar from Process Safety Verification for developing the presentation materials used in the interactive case studies. The idea for this method was jointly developed in discussion with Brett.