

Kaleidoscopic learning



Image courtesy of [Pixabay](#): A typical view of a kaleidoscope

Foreword:

“I wish we’d thought about that.” “If only we’d known.” “If only we made the time to learn from what happened on other projects.” “If only we thought ahead.”

We probably find ourselves thinking these thoughts after an event occurs more often than we’d like. Some events will catch us by surprise, but others shouldn’t do so. Can hindsight help us with foresight? We can’t predict the future, but we can prepare and be ready to respond to events – both negative and positive.

Most of us prefer not to look at downsides, especially really bad ones – it feels much better to be optimistic (it’s how we are “wired”). But with the right approach, we can combine positive thinking and negative thinking towards purposeful and positive action. The purpose of this paper is to describe “kaleidoscope learning” by focusing on two techniques that can help us learn from the past, think about the future, and prepare for uncertainty.

A kaleidoscope is a childrens toy that shows patterns changing constantly with a twist of a lens. Can we “twist the kaleidoscope lens” to look backwards and forwards to prepare for a range of outcomes? The first technique we cover is Counterfactual Thinking – to look back and think “What if?” The second is the PreMortem, and its “positive twin”, the ProMortem – to look forwards with “prospective hindsight” and imagine possible really bad (or good, with a ProMortem) scenarios. By using these two techniques together we can take a kaleidoscopic approach to assessing our ability to achieve objectives. With a twist of our lens we can see how things could change, prepare ourselves to deal with events through good contingency planning, and set the right objectives in the first place.

Learning with purpose – from the past, for the future

To learn and grow, and achieve ambitious objectives, we have to venture into the unknown, and this requires us to take risks. As we think through how to achieve our objectives, we need to take *informed* risks to make *informed decisions*. This isn't easy, because our biases tend to cloud our thinking. When we undertake something new – be it a project, an initiative or a journey – we often exhibit biases that cause us to ignore the downsides to what might happen – such as *optimism bias* and *the planning fallacy*. We demonstrate optimism bias when we don't think enough about how things could evolve in a negative way. We demonstrate the planning fallacy when we are over-optimistic about the time in which we can achieve things.

The two techniques discussed in this paper – (1) Counterfactual thinking and (2) Pro and PreMortems – can help us combat our in-built biases and help us to pursue our objectives in the best way we can.

This paper puts forward an explanation of both techniques, and then provides some suggestions about how to implement them.

Kaleidoscopic learning – looking back and learning with Counterfactual thinking

Counterfactual thinking is a way to question what has happened in the past by asking “What if?” A key principle is that we should not assume that what we know has happened in the past was pre-ordained or inevitable. We must think about alternative scenarios to how events *could have unfolded*, and whether at certain decision points along the way things might have taken a different turn.

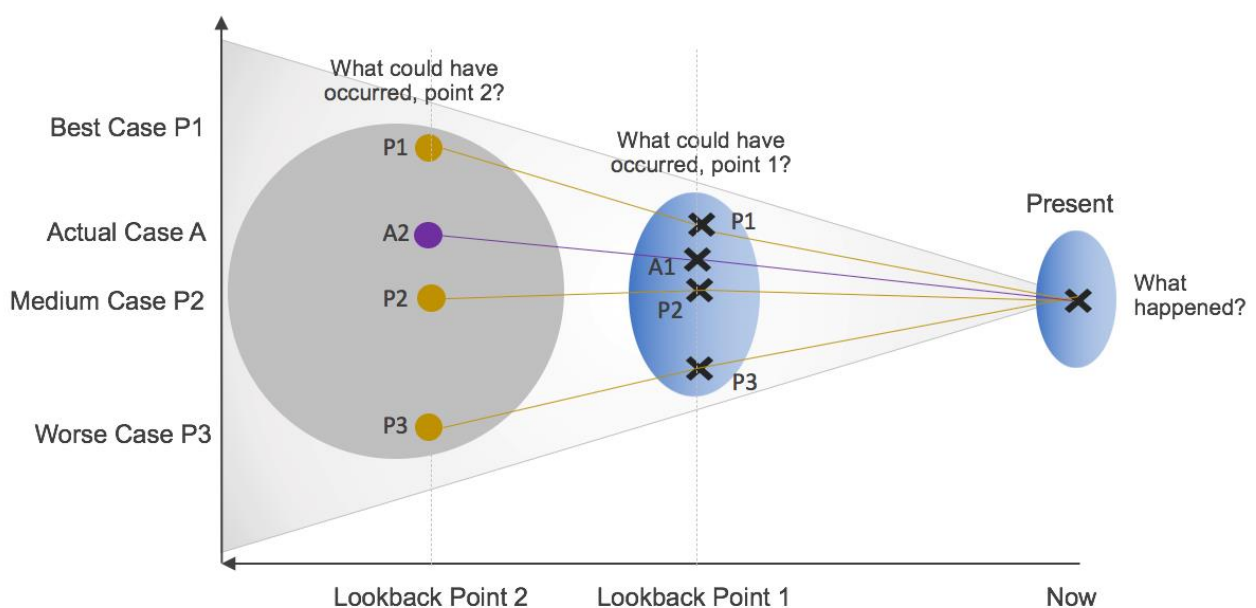


Image by self: An example of looking at different possible outcomes to past events

Practice Counterfactual thinking as a habit

Stitching Counterfactual thinking into a lessons learned exercise, such as an After Action Review or a Retrospective, can help us learn from the past in a rounded, unbiased and kaleidoscopic way. By twisting the lens to consider alternative scenarios and paths that could have occurred (for better or worse), we can also think about how effective and resilient our controls and management systems for handling different eventualities are. If they work well in one situation, will they work well in another? By thinking about the past with a “What if?” kaleidoscope we can improve our ability to understand risk, and perhaps also our state of resilience.

The Counterfactual mindset: ‘What if?’ ups and downs

After a negative event occurs, we tend to ask ourselves how it might have been avoided or prevented, or what additional risk management and resilience measures and actions could have reduced the impact. When a positive event or outcome occurs, we tend to look at what we did to make it happen and reinforce our belief in our ability to succeed. As [a paper on the work of Daniel Kahneman](#) describes, the world is far more random than we tend to think. The reality of anything that happens, good or bad, is that it could have turned out differently had the circumstances been different. Chance and fortune, good or bad, had a hand in the actual outcome.

When an event happens, our brains fabricate a convenient story about why it happened – often making it seem as if it was destined to be that way. Thinking about “how else an event could have occurred” is key to Counterfactual thinking.

Analysing what could have happened if the outcome of an event had been worse is called a ‘downward counterfactual’. In contrast, an ‘upward counterfactual’ considers a more positive outcome from what happened.

Psychologists of counterfactual thinking (Roese, 1997) observe that upward counterfactual thoughts are more common than downward thoughts, because of our innate tendency to be optimistic. Examples of upward counterfactual analysis thinking include:

- If only I had looked at this matter in more detail or earlier, I would have been able to do something about it.
- If only we had reviewed this situation earlier, we could have avoided this event or prevented it from occurring.
- If only we had thought of this possible outcome, we would have taken steps to protect ourselves from it.
- If we had seen this opportunity earlier, we could have taken it.

It is all too easy to fail to look at things that have gone badly with a downward counterfactual mindset because of our innate nature to be optimistic and to try to find silver linings.

We have an inherent outcome bias in reviewing events (and near-misses). As Kahneman (2011) points out, decisions tend to be judged according to the outcome that occurred. We need to look at the 'downward' possibilities as well as the 'upward' ones. Examples of downward counterfactual thinking include:

- How could this bad and unwanted event have been worse, and how much worse?
- What if it had occurred at the same time as another event? Could we have seen a "perfect storm"?
- What if it had taken place at a different time, for example when more activities were underway / more people there / other things were taking place?

Kaleidoscopic learning – looking forward with Pro and PreMortems

The Pro and PreMortem technique (is a simple and highly effective way for teams to use "*prospective hindsight*" to imagine targets and objectives are either achieved with outstanding results (the ProMortem), or badly missed with serious consequences (the PreMortem). A Pro / PreMortem can be thought of as the other side of the coin to Counterfactual thinking. With it, we project ourselves into a future that *has already happened*, and envisage plausible scenarios about "how it came to be so". The cognitive scientist, Dr Gary Klein, has conducted extensive research into how we see insights and has written about Pro and PreMortems in his books and papers. His research has demonstrated that [prospective hindsight improves our ability to achieve successful outcomes](#).

With a ProMortem, we see an extremely good outcome – with objectives achieved, perhaps far better than planned. With a PreMortem, we envisage a very bad outcome – an abject, total failure. A key point to the technique is, rather than ask "What if things *were to go well?*", or "What if things *were to not go well?*" we look into the future to see a project or initiative that either *has gone very well* – or it *hasn't gone well at all*.





Images by self: Examples of looking forwards to future outcomes

Conducting Pro and PreMortems can help keep our cognitive biases in check, in a similar way that Counterfactual thinking does when we learn in a rounded way from the past. We often see similar biases at play when we look forward into the future as we do when we look backwards. Two such biases that we can keep “in check” with this technique are (1) *optimism bias*, where we are too hopeful towards achieving an outcome and (2) *outcome bias*, where we become fixated on achieving a specific outcome and become blind to the possibility of others.

When we hold a Pro and / or PreMortem we don’t try to predict all the possible future causes for a terrific or a terrible outcome. We seek to understand signals (strong and weak) that could appear on the horizon to alert us to opportunities and threats that may lead towards a path of super success or forlorn failure.

The PreMortem mindset and the Mars Curiosity Rover landing

Many examples of prospective hindsight exist, whilst perhaps not having been explicitly called a Pro or PreMortem. A great example from space exploration is the ingenious, novel, daring and successful landing technique that led to the successful touchdown of the Mars Curiosity Rover on The Red Planet in 2012. This example is literally “out of this world”, yet it holds useful lessons for Earth-bound activities.

When NASA decided to increase its efforts to study Mars about 20 years ago, it decided to construct a one-tonne nuclear-powered mobile laboratory housing a range of instruments designed to answer one question: did Mars ever possess conditions that could support life? More than 7,000 scientists and engineers played their part in overcoming the challenges to designing, building and operating the Curiosity Rover. One of the biggest challenges the team had to overcome was how to land it safely on the surface of Mars, and the team came up with the Sky Crane. That they succeeded was in part because they were constantly thinking about how things might go wrong – they demonstrated PreMortem thinking.

It took a long brainstorming session of scientists and engineers at the Jet Propulsion Laboratory (JPL) in September 2003 to come up with the Sky Crane solution: to winch the rover down on a rope. According to the plan proposed by Adam Steltzner, leader of the probe's Entry Descent and Landing (EDL) team, a platform of rocket thrusters would hover above the Martian surface before lowering the Curiosity Rover to the surface by cable. The system would in theory be accurate, manoeuvrable and capable of dropping the Curiosity Rover precisely where scientists wanted it to be. Yet the idea was unique, untested and contained a long list of potential ways it could go wrong, any one of which could doom the mission to failure.

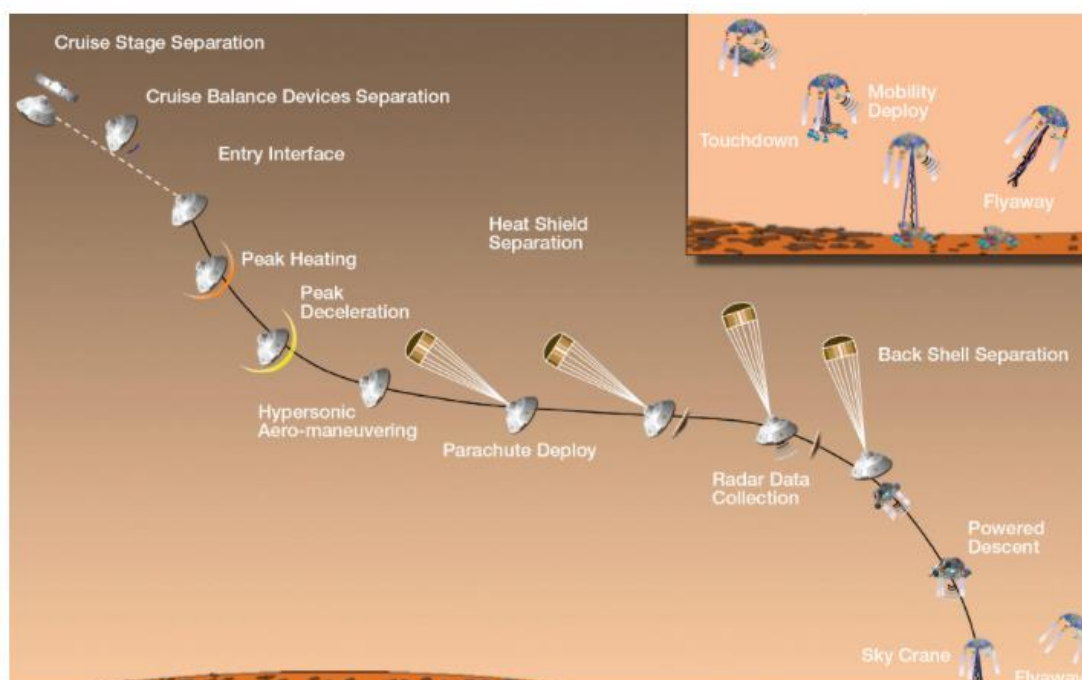


Image credit: [NASA](http://NASA.gov). Curiosity's EDL team released a timeline for mission milestones surrounding the landing of the Mars rover

Steltzner went through the plan in detail at NASA's HQ in Washington. Whilst NASA officials understood the risk of failure, the Sky Crane approach was approved and on November 26th 2011, the Curiosity Rover blasted into space, reaching its target on August 5th 2012.

"I had spent so much time thinking about the ways in which it couldn't work, or wouldn't work, that the idea of feeling that it would work, of relaxing and trusting that it would work, felt like a dereliction of duty to me," Steltzner recalls in [an interview with The Guardian in July 2013](#). *"I was rationally confident but emotionally terrified."*

Curiosity touched down exactly to plan, to cheers and exhilaration in the control room. It has since been trundling around the surface of Mars, collecting samples and data and providing us with unique insights into the Red Planet.

An excellent NASA video about the Curiosity rover landing is available on their website, [here](#).

Kaleidoscopic learning – how to apply Counterfactual thinking and Pro/PreMortems

The following suggestions for applying Counterfactual thinking and Pro/PreMortems can be used in a face-to-face setting or in a virtual environment. Both methods – two sides of a coin – are about “twisting the kaleidoscope” and overcoming our natural biases and our tendency to narrow our views too much.

For both techniques to work, everyone involved needs to feel they are in a psychologically safe environment in which everyone is free to voice their views, thoughts and opinions about risks and possibilities in an open and respectful way.

Apply Counterfactual thinking: how bad can it get...?

One way to help people think through what could have happened with Counterfactual thinking is by turning a situation into a game.

This Counterfactual “parlour game” has been [put forward by Gordon Woo](#).

The game umpire gathers players around a table. A negative event that has already happened is described. Sequentially, players are asked to come up with ways in which the loss / damage / outcome from the event could have been incrementally worse – e.g. by approx. 10% each time.

The first player therefore has to come up with a counterfactual where the loss was 10% worse. The second player then has to explain how the loss might have been a further 10% worse. The third player has to construct a counterfactual where the loss was a further 10% worse, and so on.

This procedure is repeated and usually gets progressively challenging until nobody can think of a further downward counterfactual. We then discuss examples of routes and chance that could have led to such a situation.

Such an exercise, of deliberately thinking about how things might have been much worse, helps us to remember that the role of chance and randomness in an eventual outcome is ever-present.

Whenever we hold a lessons learned “retrospective” review of a project or an activity, whilst looking at “the root cause(s)” of events, use Counterfactual thinking to look at ways of how the event could have taken a different path, with a different outcome. This will equip you with valuable insights into the strength of your risk and control framework and capability, and it will help you to assess your resilience.

Apply the Pro and PreMortem – climb into the future...

Pro and PreMortems lend themselves to a variety of situations. They can be held at the start of a project or initiative, and they can be held at key points along the journey also.

Aim to get a Pro or PreMortem done in two hours or less. It should only take longer than this if you have a particularly complex situation to review.

Set it up as a focused and high-energy session (whether face-to-face or virtual). To inject energy, help people “see the future”, being careful with any mock-up materials you create for this effect. For example, you could provide mock-up images of their initiative making newspaper headlines for the wrong reasons, or hand them a mock-up of a post project review report which is extremely damning or show them a mock-up video (clearly labelled as a mock-up) with your CEO ruing the imagined disaster that has unfurled.

A 7-point suggested method of holding both a PreMortem is as follows (for a ProMortem, flip points 2 and 3 around to be positive):

1. Get the team ready – put them into the situation.
2. Generate reasons for abject failure – in a quick-fire and free-form way. It may help to gather people’s thoughts on a “wall of failure” (using Post-it notes or an electronic whiteboard equivalent). All suggestions are taken on board, not dismissed as “it will never happen.”
3. Generate plausible causes for the reasons for failure – what “did we do” that made the situation turn out this way? Are you uncovering potential weak signals as well as strong ones? You may find it useful to connect things together with a decision tree or similar technique.
4. Consolidate the reasons and plausible causes and discuss “trigger points” – how can you detect things, and how can you prepare?
5. Revisit your plan and your objectives – does / should anything about it change as a result of this session?

Visualising Pro/PreMortem pathways with What if? decision trees...

One way to visualise Pro/PreMortem causes and outcomes (which can also be applied to Counterfactual thinking) is to use What if? thinking to create decision trees that show possible paths to outcomes. Through decision trees, we are not assuming that we can predict exact future pathways, rather, we are keeping our biases in check about what could happen as we work towards achieving an objective. We are also trying to look for “weak signals”.

With careful thinking we can uncover an erroneous or limited assumption that has until now we have been blind to. The path to seeing such insights depends on us recognising then changing a flawed assumption. To discover insights we must resist the temptation to explain hints or signals as irrelevant or inconsequential. Instead, we must be curious, alert and ready to investigate weak signals when they appear.

Practise Pro and PreMortems as a habit

The next time you are involved in a new initiative or project, ask the team you work with whether they know about Pro and PreMortems, and suggest that you hold one early on. Then apply it mid-way through, perhaps at key milestones.

Conclusion – kaleidoscopic learning from the past, and towards the future

The two techniques discussed in this paper about kaleidoscopic learning – (1) Counterfactual thinking and (2) Pro and PreMortems – are “two sides of a coin” to help us overcome our biases and blindness to possibilities by learning from the past and considering the future. Used effectively, we can turn hindsight into foresight and keep our minds open to possible outcomes for our initiatives and projects.

When we ingrain an open-minded “look-back and look-ahead” process into our habits as part of understanding risk, and we couple it with a good decision-making process, we can improve our situational awareness, we can be more alert to signals, and we can make better decisions as we strive to achieve our objectives.

So get your kaleidoscope ready, give it a twist and look at what has happened, and what could happen, in an open-minded way.

About the author

[Gareth Byatt](#) is an Independent Risk Consultant and owner of [Risk Insight Consulting](#). He has 20 years experience in international risk and project management, and resilience.

