Part One

No Place for Old Dogs: New Tricks Required

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LET'S GET REAL: WE ALL MAKE MISTAKES

At 11.38 a.m. on 28 January 1986, the NASA space shuttle *Challenger* took off from Kennedy Space Centre at Cape Canaveral, Florida. Seventy-three seconds later, as it broke up, the liquid hydrogen and oxygen that was by then streaming from its ruptured fuel tanks explosively caught fire and enveloped the rapidly disintegrating spacecraft. The deaths of its seven crew members – including Christa McAuliffe, who would have been the first teacher into space – in such a catastrophic and shockingly visible way may well be the reason why this disaster, despite it having no real impact on the lives of the vast majority of those observing it, became the third fastest spreading news story ever.

Following the accident, U.S. President Reagan rapidly set up a special commission (known as the Rogers Commission, after its chairman) to investigate it. The consensus of its members was that the disintegration of the vehicle began after the failure of a seal between two segments of the right solid rocket booster (SRB). Specifically, two rubber O-rings designed to prevent hot gases from leaking through the joint during the rocket motor's propellant burn failed due to cold temperatures on the morning of the launch. One of the commission's members, theoretical physicist Richard Feynman, even demonstrated during a televised hearing how the O-rings became less resilient and subject to failure at the temperatures that were experienced on the day by immersing a

sample of the material in a glass of iced water. There is no evidence that any other component of the space shuttle contributed to the failure.

I've found, from years of asking participants in my decision-making workshops, that most people's memory of that day aligns with the summary in the paragraphs above. Though relatively few are aware of the precise name of the actual component involved, they consistently remember only the seal failure. This root cause appears unambiguous. So why would the Rogers Commission have concluded, as they did, that the key factors contributing to the accident were NASA's organisational culture and decision-making processes, not the technical fault? We need to take a deeper look.

First Appearances are Often Deceptive

Full details of the events leading up to the Challenger disaster are a matter of public record,[1] so I won't recount them in detail here. Bear in mind as you read the string of glaring errors below that this was the same organisation that achieved the incredible feat of landing men on the moon and returning them home safely, and which resolutely refused to succumb to the enormous challenges it faced in getting the stricken Apollo 13 crew back home safely when that mission suffered an oxygen tank explosion over two hundred thousand miles from Earth.

Let's return to that ill-fated Tuesday morning in January 1986. Several key facts shed light on the finding of the Rogers Commission that decision-making errors were at the heart of the catastrophe:

- The O-rings had not been designed for use at the unusually cold conditions of the morning of the launch, which was approximately -2°C. They had never been tested below 10°C, and there was no test data to indicate that they

would be safe at those temperatures (which were around 14°C lower than the coldest previous launch).

- NASA managers had known for almost a decade, since 1977, that the design of the shuttle's SRB's joints contained a potentially catastrophic flaw. Engineers at the Marshall Space Flight Centre had written to the manufacturer on several occasions suggesting that the design was unacceptable, but the letters were not forwarded to Morton Thiokol, the contractor responsible for construction and maintenance of the SRBs.
- Engineers raised specific warnings about the dangers posed by the low temperatures right up to the morning of the launch, recommending a launch postponement; but their concerns did not reach senior decision makers. The night before the launch, Bob Ebeling, one of four engineers at Morton Thiokol who had tried to stop the launch, told his wife that Challenger would blow up.[2]
- In 1985, the problem with the joints was finally acknowledged to be so potentially catastrophic that work began on a redesign, yet even then there was no call for a suspension of shuttle flights. Launch constraints were issued and waived for six consecutive flights and Morton Thiokol persuaded NASA to declare the O-ring problem "closed".
- While the O-rings naturally attracted much attention, many other critical components on the aircraft had also never been tested at the low temperatures that existed on the morning of the flight. Quite simply, the space shuttle was not certified to operate in temperatures that low.
- It seems that one of the most important reasons why NASA staff opposed the delay may have been that the launch had already been delayed six times. Two of its managers have been quoted as saying, "I am appalled. I am appalled by your recommendation", and "My God, Thiokol, when do you want me to launch?"[3]

With this broader awareness it is easy to recognise that the technical, and obvious, "cause" of the accident – the O-ring failure – was really just an outcome of the complex structural problems arising from the relationships between the parties involved. Now, I expect that the Commission's conclusion seems completely unsurprising:

> *Failures in communication … resulted in a decision to launch 51-L based on incomplete and sometimes misleading information, a conflict between engineering data and management judgments, and a NASA management structure that permitted the internal flight safety problems to bypass key Shuttle managers.*[4]

A report by the U.S. House Committee on Science and Technology went further. It agreed with the Rogers Commission on the technical causes of the accident, but was more specific about the contributing causes:

> *The Committee feels that the underlying problem which led to the Challenger accident was not poor communication or underlying procedures as implied by the Rogers Commission conclusion. Rather, the fundamental problem was poor technical decision-making over a period of several years by top NASA and contractor personnel, who failed to act decisively to solve the increasingly serious anomalies in the Solid Rocket Booster joints.*[5]

The Problem with Hindsight

In examining the events leading up to the Challenger accident, it would be completely understandable to have the urge to scratch your head and wonder how so many obviously intelligent people (we are talking about rocket science, after all) could have displayed such apparent ineptitude. How did NASA, an organisation that places such importance on safety, end up so flagrantly violating its own rules and appear to have so little regard for human life?

"Our comforting conviction that the world makes sense rests on a secure foundation: our almost unlimited ability to ignore our ignorance."

—Daniel Kahneman, Nobel Prize-winning Professor of Psychology and international best-selling author on judgment and decision making

When a decision has gone badly, the benefit of hindsight often makes the correct decision look as though it should have been blindingly obvious. But once you are aware of this bias, you'll see it everywhere – from the immediate aftermath of the horrendous terrorist atrocities in Paris in November 2015, where the press began questioning how intelligence services had failed to anticipate the attacks as soon as the "facts" leading up to them began to emerge, to football supporters who believe they have far greater expertise at picking the team than the manager, to the times when we second-guess our own decisions: "I should have known not to take that job", "I knew the housing market would collapse/go up", "I should have known that he was being unfaithful to me", "I knew that if I trusted her she'd hurt me", "I should have listened to my intuition", and on it goes …

This "hindsight bias" refers to the tendency for uncertain outcomes to seem more likely once we know the outcome that has occurred. Because of it, we are prone to view what has already happened as relatively inevitable and obvious, not realising how the information about the outcome has affected us.

One of the first psychologists to investigate hindsight bias was Baruch Fischoff who, together with Ruth Beyth, used President Richard Nixon's historically important 1972 diplomatic visits to China and Russia as the focus for a study. Before the visits took place, participants were asked to assign probabilities to 15 possible outcomes, such as whether the U.S. would establish a diplomatic mission in Peking or establish a joint space programme with

Russia. Two weeks to six months after the visits had taken place, the same people were asked to recall what their earlier predictions had been. The results were clear. The majority of participants inflated their estimates for the outcomes that had occurred while remembering having assigned lower probabilities to those that had not. This bias also became stronger as the time between the initial prediction and the recall task increased. Many other events that captured public attention have since been studied, with similar results.

The heart of the problem seems to be that once we adopt a new understanding of the world, we immediately find it difficult to reconstruct past beliefs with any accuracy. This inevitably causes us to underestimate our own level of surprise at past events and, on the flip side of the coin, explains why it is so easy to be surprised when others overlook the obvious, as NASA did in the run-up to the Challenger accident.

Hindsight, because it is always 20:20, ensures that we feel on safe ground when criticising others' irrationality or lack of foresight; moreover, it simultaneously reduces our ability to evaluate past decisions objectively (our own or those of others). It can have an extremely detrimental impact on both decision making and decision makers:

- Decisions that don't work out can often be punished, because the variety of factors that were outside the control of the decision maker are difficult to recognise after the event.
- If decision makers come to expect that their decisions will be scrutinised with hindsight, they are much more likely to seek risk-averse and bureaucratic solutions.
- Irresponsible risk seekers can be undeservedly rewarded when their decisions work out because it is hard to recognise their gamble, so they don't get punished for taking too much

risk. Meanwhile, anyone who doubted them may get branded as conventional, over-cautious, or plain weak.

- Perhaps most importantly, hindsight severely reduces our ability to learn from past decisions. We'll look at why this is so important in the next couple of chapters.

We are all susceptible to hindsight bias, but it can be very difficult to recognise what is happening.

Running on Instinct

Psychologists use the term *heuristics* to describe the unconscious mental shortcuts that we take to arrive at judgments or solve problems. To date, dozens of them have been identified; hindsight bias being just one example. When we are faced with difficult questions, high complexity or ambiguity, or a need for high speed, heuristics can help us to find answers or solutions that would otherwise be beyond conscious reach. However, because they evolved to enable us to cope with an evolutionary past when we were living on the plains, hunting and gathering, the biases they introduce are often imperfect and may lead to terrible mistakes.

Mental shortcuts can even lead to inappropriate biases in life or death situations, as demonstrated by a study by Amos Tversky which looked at how the way that data is presented can affect doctors' choices. All of the participants received the same data on the effectiveness of two interventions for lung cancer: surgery and radiation treatment. It indicated that radiation offered a much better chance of survival in the short term, but a lower life expectancy over the next few years.

For half of the participants the data was presented in relation to survival rates, whilst for the others it was provided in terms of

death rates; for example, the statistics for the surgical treatment of 100 patients were as follows:

Time Period	Survival Rate	Death Rate
Immediately	90	10
After 1 Year	68	32
After 5 Years	34	66

Clearly, from a mathematical/logical point of view, the two columns of data are exactly the same, yet 82% of the doctors presented with the survival data recommended surgery versus only 56% of those who were given the opposite perspective. Studies like this demonstrate the enormous influence that heuristics can have on our decision making; in particular, how difficult it is for us to divorce decisions from their emotional components.

Heuristics can be considered to be much like instincts. Animal instincts are easy to recognise; indeed, we assume that this is how animals do pretty much everything. As human beings, however, we generally prefer to think of ourselves as rational. We like to hang on to the evidence of our conscious experience, which suggests that our experience of the world is "accurate" and that we form beliefs and opinions based on the facts of the situation. Social psychologist Lee Ross called this conviction "naïve realism" – the conviction that we have the ability to experience events as they are. It enables us to justify any opinion as reasonable, because if it wasn't we wouldn't hold it! Sounds great, doesn't it? And it is completely wrong. The logic of this kind of thinking does not bear scrutiny, but that's okay because it's an easy choice not to investigate …

Throughout this book I'll be encouraging you to take up this challenge: to investigate the activity of your mind and to make

a habit of doing so. It is a vital element in making substantial improvements to your own decision-making capabilities. Let's start right now.

As you ponder the following questions, I'd like you to consider the idea that conscious awareness only provides access to the tip of the iceberg of what goes on in our mind, and that we have instinctive capabilities that go much deeper:

- When you see a breed of dog that you've never seen before, would you know that you are looking at a dog? If so, how? Check whether your descriptions could also apply to, for example, a cat or any other animal.
- When you see a caricature of someone you know well, would you recognise them? What gives you this capability?
- Would you be able to tell the difference between, say, a Scottish and an Irish accent (or any other two accents)? Just try for a moment to put a conscious description to the differences.
- If you walk into a room where two people have just been arguing, would you tend to be able to sense the tension in the room? When this happens, is it an instant feeling, or something that you have to think about? How can you tell?
- If you are like most people, you probably have little ability to describe the rules of grammar. So how is it that you, like almost everyone else, can probably use a wide range of these rules effectively most of the time in both speech and writing?

In each of these cases, and many others like them, the subtle distinctions that shape our awareness can be seen to occur automatically and virtually effortlessly. Almost any adult would readily recognise, for example, "dog" from "not-dog", even though any

verbal explanation of how such a feat can be achieved would be highly incomplete.

The capacity to handle situations like those above stems from the enormous power of the unconscious mind, which can process rich and detailed information far beyond the limits of the conscious. Because of this unconscious capacity, we have the ability to solve many problems for which the conscious mind is completely unequipped. Even your capacity to read this text is enabled by your subconscious doing the hard work; hence, no thinking is required.

Accessing More of Our Potential

While heuristics are natural and automatic, awareness of them raises the questions:

- Could we learn to deliberately tap into this enormous unconscious capability in a more deliberate manner?
- Would doing so make a meaningful difference to our decision making?

The answer to the second of these questions is an emphatic "yes", which leaves us to address the critical question of how to achieve it. Doing so will require that you deliberately access a different type of learning to the one which has most likely dominated your professional development to date; one that trains the unconscious to do the heavy mental lifting.

When I was doing my officer training with the Royal Air Force, one of the other members of my team was an expert in aircraft recognition. Derek could somehow identify precise aircraft types from the tiny, fuzzy blobs in the photographs, and he was almost always right. But he couldn't explain how he knew!

Because enemy bombings could be significantly reduced by quickly and accurately identifying approaching aircraft, the same capability was highly valued in Britain during World War II. Several aircraft enthusiasts were found to be very good at this task, and efforts were soon started to enlist others. The problem was that, because there weren't many of them around, the only option was to train novices, but no matter how hard the "spotters" tried to explain their strategies, no one learnt to mimic their success. Like Derek, although the experts knew what they were looking at, they didn't know how they knew and therefore couldn't teach others what to do in the normal way. The information necessary to do so was not accessible to their conscious minds.

The solution was deceptively simple: trial and error combined with high quality feedback. The novices made guesses, and each time an expert would let them know whether they were correct. With each repetition, the novices' unconscous minds learnt just a little more until, eventually, they achieved mastery.[6]

It turns out that trial and error, with feedback, is the process by which we must learn to become proficient at any complex undertaking. We learnt to walk this way (with gravity and the floor as the feedback mechanism), to ride our bike (getting feedback from the corrective pressure of the hand on the back of the saddle, our stabilisers and, hopefully not too often, the ground), to read, play a musical instrument, touch type, or hit a tennis ball. Even activities such as running a meeting effectively or delivering a presentation require that the majority of the competencies involved are taken care of unconsciously. This is because the limited conscious mind is soon overwhelmed by the full burden of the various elements involved in even seemingly routine tasks.

In Chapter 8, I'll demonstrate that this type of learning is also vital if we are to make a non-linear improvement in our decision-making capabilities.

Great Power, but No Warning Bells

So we've seen that both heuristics and learned skills are essential to our capability to function effectively, particularly to achieve mastery. Each can come to feel effortless and natural, despite the complexity of the mental computations involved.

Because of the ease with which intuitive answers or solutions come to us, we feel confident of them, irrespective of their source. But when things that are hard seem easy, it is because a huge amount of brain capacity has been allocated to them, which results in an important paradox: *the times when we have access to our greatest mental capabilities are also the times when our ability to recognise any errors that occur is at its lowest.* This is because:

We have no direct access to the mental processes of the unconscious mind, and …
both heuristics and learned intuitive responses are the preserve of the unconscious, so …
the more quickly we can do something, the more difficult it will be to recognise any errors that arise.

This feature of mental activity presents one of the most challenging obstacles to better decision making. Overcoming it will require that you learn to:

- consciously recognise the sorts of situations in which you are most likely to make cognitive errors
- slow yourself down enough to get yourself into an empowering mindset so that you can access the mental resources needed for effective decision making
- respond instead of reacting so that you can examine alternative perspectives and, hopefully, create new alternatives.

The bad news is that the times when you are going to need this capability the most will be those when it will be the most difficult for you to interrupt the way you normally do things. No mental "warning bell" will ring when you are running on automatic and on the brink of a serious error. This means that your progress is almost certain to be limited until you improve your ability to notice your own reactivity.

The good news is that it is quite possible to reduce reactivity and increase responsiveness – and if you do so you can be virtually assured that your decision making will improve. I'll explain in detail how to do this later in the book. Alongside that, if we can enhance awareness, so that you can observe events with what might be described as a higher level of "truth", perhaps we can even unlock the possibility of a non-linear change in your capability.

Multiple Levels of "Truth"

Picking up on that last sentence, you might be wondering how "truth" can vary. Our case study of the Challenger shuttle disaster and the subsequent discussion about how mental biases occur illustrates this point:

- Level 1: the disintegration of the spacecraft began following the failure of the O-rings in one of the joints of the right SRB. This is the most superficial explanation of how the accident happened – true, but also highly incomplete.
- Level 2: the O-rings would not have had the opportunity to fail had NASA's safety procedures been effective. The reason no solution was found was to do with the culture of the organisations involved, which resulted in years of poor

decision making. Since fixing this problem would have resolved the first as well, logically this must represent a higher-order conclusion.

- Level 3: a large number of intelligent and highly professional people made a string of incredibly poor decisions over an extended period of time. No doubt, the environment they were working in was extremely complicated, but it was also well understood by the experts involved. Nevertheless, as we saw above with the doctors choosing between life-saving treatments, emotions tend to trigger our human psychological biases and traps, this being the most fundamental explanation for the failures leading up to the disaster.

These three different explanations can be true at the same time because they hinge on perception. Thus, this example demonstrates the fundamental impact our minds can have when we are making decisions. It is quite obvious that solving the second-level problem would be of higher utility than solving the first because, having done so, Level 1 would take care of itself. Likewise, solving the Level 3 problem would be of more value than either of the other two, because by overcoming the psychological biases we would remove the root cause behind Levels 1 and 2.

Efforts to solve problems at too low a level, without getting to the primary factors involved, will tend to have limited results as, unfortunately, NASA highlighted through their lack of success in solving their problems post-Challenger. In the aftermath of the Columbia shuttle disaster in 2003, the investigation board that was set up to look into this accident concluded that "the causes of the institutional failure responsible for Challenger have not been fixed", and that "flawed decision-making" had resulted in this second accident as well.[7] Although NASA did make changes after Challenger, it appears that they were neither deep nor enduring enough.

The value in learning to perceive or think differently stems from the fact that this is the only way to solve new problems and thereby advance in life. We need a shift in awareness that brings potential new solutions into our consciousness. This is what I believe Einstein was referring to when he said: "We cannot solve a problem from the level of consciousness that created it." Perhaps NASA simply started at the wrong level.

In this chapter we've only scratched the surface of the many insights offered by the Challenger accident. Because of its depth, it has become a widely used case study into all manner of organisational issues, such as engineering safety, group decision-making, the ethics of whistle-blowing, and effective communications. However, important though the decision-making errors it highlights may be, the lessons that it provides fall far short of solving many of the most difficult challenges that are endemic in business today. There is another class of problem that has been gaining in importance since the end of the industrial age. During the last few decades we have been experiencing the emergence of a fundamentally different operating environment – one that dramatically increases the demands on decision makers. It is this shift, and its implications, that we must look at next.

Decision-Making Principle #1
We can access much more of our potential by learning to harness, in a deliberate way, the power of our unconscious mind.

Notes

1. For the full account on Wikipedia: https://en.m.wikipedia.org/wiki/Space_Shuttle_Challenger_disaster#Liftoff_and_initial_ascent.

2. This information did not emerge until 30 years after the event: www.npr.org/sections/thetwo-way/2016/01/28/464744781/30-years-after-disaster-challenger-engineer-still-blames-himself.
3. Howard Berkes, "Remembering Roger Boisjoly: He tried to stop Shuttle Challenger launch", 6 February 2012, www.npr.org/sections/thetwo-way/2012/02/06/146490064/remembering-roger-boisjoly-he-tried-to-stop-shuttle-challenger-launch.
4. Rogers Commission (6 June 1986), Report of the Presidential Commission on the Space Shuttle Challenger Accident, Chapter V: The Contributing Cause of The Accident.
5. U.S. House Committee on Science and Technology (29 October 1986), "Investigation of the Challenger Accident; Report of the Committee on Science and Technology, House of Representatives."
6. M. D. Allan, "Learning perceptual skills: The Sargeant system of recognition training" (1958) *Occupational Psychology*, 32: 245–252.
7. Columbia Accident Investigation Board (2003). Report of Columbia Accident Investigation Board, Vol. I, ch. 8, p. 195.