

The innate effect of Bias

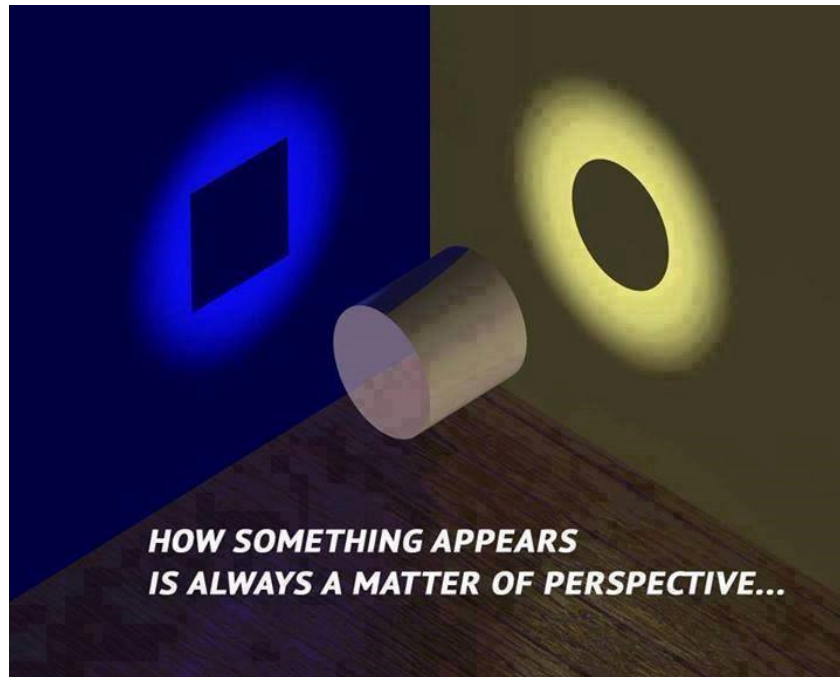
Overview

Research by behavioural economists has clearly demonstrated we are not rational; in fact we are naturally irrational. Deeply embedded biases affect every decision we make, there are conscious factors, learned from experience, subconscious cognitive biases and affective factors including our feelings and emotions at the time the decision is made. The challenge is to accept people as they are and then work rationally within our innate biases; this needs a rational approach to an irrational problem!

"Everything we hear is opinion, not fact; everything we see is perspective, not the truth."

Derived from: Marcus Aurelius.

Bias is an inevitable part of every communication, your biases and the other person's biases. The fact you see something differently does not mean you are looking at different things.



The neuroscience view

Understanding how the brain works is essential for effective communication¹ and understanding why people react to messages and make decisions² in the way they do.

The brain is continually bombarded with stimulation through sight, touch, hearing, taste and smell. To survive, it deals with most of this information unconsciously. The conscious mind has the capacity to deal with around seven items at one time (typically between 5 and 9), the rest of the information is processed unconsciously by using the stored 'maps' hardwired into the brain.

¹ For more on **communication theory** see: https://www.mosaicprojects.com.au/WhitePapers/WP1066_Communication_Theory.pdf

² For more on **decision making** see: https://www.mosaicprojects.com.au/WhitePapers/WP1053_Decision_Making.pdf

Every stimulus causes a pattern of synapse paths to form, in combination these patterns form your memory, and initially these connections are short lived. To save energy the brain deals with each new stimulation by trying to match it with previous patterns – this is the first and automatic response. Repeated connections form stronger paths and your long-term memory maps (eg, habits). These long-term memories are the ‘hard wiring’ in your mind and become the basis for how we interpret our world. Each individual’s life experiences have created unique pathways, which result in different approaches to learning, decision making and the interpretation of messages.

Perceptions (our reality) are driven by this hardwiring. Changing the old wiring is difficult, which makes breaking established habits or perceptions difficult. Creating new wiring is much easier and new habits become stronger with conscious repetition but it takes a long time to completely over-write a strong habit.

This means every message received by a person is fitted to and filtered through their previously stored experiences. Even if several people receive exactly the same message, everyone will experience the meaning of the message differently and react differently. A simple question (the message) asking how much a typical meal costs will generate vastly different answers depending on the individuals typical dining experience ranging from \$15 for a suburban takeaway to \$150 for a city restaurant. Both answers are correct!

Bias is insidious; awareness of a perceptual or cognitive bias does not by itself produce a more accurate perception of reality! Kahneman and Tversky found in their work on decision-making under uncertainty, (which won Kahneman the 2002 Nobel Prize in economics) that:

- Errors of judgment are often systematic and predictable rather than random (the effect of bias);
- Many errors of judgment are shared by experts and laypeople alike (everyone is biased); and
- The errors remain compelling even when one is fully aware of their nature.

Dealing with the effects of bias needs more than just awareness! But being aware helps.

Innate cognitive bias

The evolution of the human race has left us with a series of cognitive biases that are innate – factors that we are born with and which can easily generate irrational behaviours in the modern business world. Some of the more important are discussed below³.

Two biases that cut in when you have an issue that has already cost money and needs more funds committed to prevent potential future losses are *loss aversion* and *Hyperbolic discounting*.

Loss aversion means that most people are far more concerned about losing \$100 than they are happy about gaining \$100 rationally we should have no difference in reaction \$100 is \$100; but people will try much harder to avoid a loss than to make a similar sized gain. Given the choice of receiving a profit of \$9,000 now or accepting a risk that has a 90% chance of increasing the profit to \$10,000 dollars, but a 10% chance of receiving nothing; most people will take the \$9,000. Most people are *risk averse*⁴ as is demonstrated by the proverb ‘a bird in the hand is worth two in the bush’. However, if the choice is to take a sure loss of \$9,000 or accepting a risk that has a 90% chance of increasing the loss to \$10,000 dollars, but a 10% chance of losing nothing; most people will take the 90% chance of losing \$10,000; most people are also *loss averse*⁵. In

³ Others are discussed in **Are your stakeholders biased** see: https://www.mosaicprojects.com.au/Mag_Articles/SA1034_Are_your_stakeholders_biased.pdf

⁴ For more on **risk assessment** see: https://www.mosaicprojects.com.au/WhitePapers/WP1015_Risk_Assessment.pdf

⁵ For more on **loss aversion** (sunk costs) see: https://www.mosaicprojects.com.au/Mag_Articles/P022_Sunk_Costs.pdf



probability theory both options are the same the 'Expected Value' of the 90% option is the probability x the amount at stake = $0.9 \times \$10,000 = \$9,000^6$.

These aversions are compounded by the context of the decision and the way the information is framed. Positive probability statements (highlighting benefits) are favoured over negative statement focusing on loss even if the two propositions have the same 'expected value'.

Hyperbolic discounting (or near-term bias) is the preference short term gratification over long term benefits. Most people over-emphasise the value of short-term rewards over more substantial long-term benefits.

Put these two traits together and our natural instinct is a strong bias towards not losing more money this month even if the short-term gain is far outweighed by the longer-term losses caused by the short-term focus.

Another bias that affect problem solving are first our strong preference for our own creations over other people's creations; reinforced by what behavioural economists call the 'IKEA Effect', the more labour we expend on a project, the more we love the result regardless of its quality. If someone has worked hard on the solution to a problem (or the creation of an estimate) they are innately programmed to love their solution!

The extent to which a particular bias affects you depends in part on your innate preferences, but to a remarkably large extent, it is also based on the behaviour of others around you. We have a strong impulse to conform, and this '*behavioural contagion*' affects both our behaviours and our attitudes to risks and loss.



The effect of bias can become acute if they form part of a person's strongly held core beliefs. When 'believers' are presented with evidence that works against their belief they simply cannot accept validity of the evidence. And, because it is important for the person to protect their core belief they will rationalise, ignore, or even deny anything that doesn't fit with that belief. This process creates a feeling that is extremely uncomfortable called *cognitive dissonance*; and people that are uncomfortable and defensive are unlikely to be open to change.

Cognitive dissonance⁷ is one reason why some otherwise intelligent people can believe the world is only 10,000 years old (based on deeply held religious convictions) and ignore all of the evidence from geology, palaeontology and biology. You cannot change this type of belief system simply by offering logical argument and facts because your facts will simply be denied any credibility by the person (a classic example is the denial of climate change where the deniers claim all of the world's governments, scientist and the UN are

⁶ For more on **probability theory** see: https://mosaicprojects.com.au/WhitePapers/WP1037_Probability.pdf

⁷ **Cognitive dissonance** is the discomfort we feel when we're trying to hold onto two competing ideas or theories.

in a grand conspiracy therefore all of the ‘facts’ presented to validate climate change are obviously falsified) – the denial does not have to stand up to external scrutiny as long as it works for the person. Changing a person’s belief system requires a lot of effort over an extended period to build a replacement belief structure.

These are just a few of the biases and behavioural traits built into all of us; most people are innately optimistic, over-value their personal skills and capabilities and over-value the advice of distant experts compared to the advice from someone they know well (for more see Annex 1 at the end of this White Paper).

The challenge is firstly to resist these biases in your own thinking (which is only possible at the conscious level of thought) and then to shift everyone’s thinking far enough into the future to allow a benefits focused solution to be jointly developed. If someone is reacting unconsciously, you need to gently bring their reaction into their conscious thinking to allow a different option to be developed.

Learned bias and naive realism

The innate cognitive biases briefly outlined above are overlaid with learned behaviours ‘hard wired’ into our brains. These learned behaviours manifest as perceptions and the stereotyping of groups of people: *‘The PMO staff are all focused on generating masses of useless data’* - firstly there are no positive stereotypes, second, if a new PMO manager is trying to make a difference, she will have to break the mould created by the stereotyping before anyone will listen to her insights.

Learned biases relate to the perception of risk, expectations and most aspects of estimating. Most ‘normal people’ would find the idea of jumping out of a perfectly good, working aeroplane unacceptable, or at least very risky. Parachutists think it is fun!

Naive realism is the belief that we see reality as it really is⁸ – objectively and without bias; and that those who don't see things ‘our way’ are either uninformed, or biased. The three “tenets” of naive realism are:

1. That I see entities and events as they are in objective reality, and that my social attitudes, beliefs, preferences, priorities, and the like follow from a relatively dispassionate, unbiased and essentially “unmediated” comprehension of the information or evidence at hand.
2. That other rational social perceivers generally will share my reactions, behaviours, and opinions— provided they have had access to the same information that gave rise to my views, and provided that they too have processed that information in a reasonably thoughtful and open-minded fashion.
3. That the failure of a given individual or group to share my views arises from one of three possible sources:
 - a. the individual or group in question may have been exposed to a different sample of information than I was (in which case, provided that the other party is reasonable and open minded, the sharing or pooling of information should lead us to reach an agreement);
 - b. the individual or group in question may be lazy, irrational, or otherwise unable or unwilling to proceed in a normative fashion from objective evidence to reasonable conclusions; or
 - c. the individual or group in question may be biased (either in interpreting the evidence, or in proceeding from evidence to conclusions) by ideology, self-interest, or some other distorting personal influence.

The reality is my version of the ‘truth’ and your version of the ‘truth’ is as unreliable and biased as everybody else’s⁹.

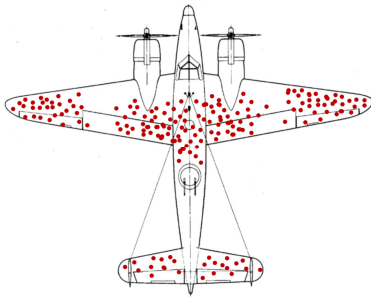
⁸ From [https://en.wikipedia.org/wiki/Na%C3%AFve_realism_\(psychology\)](https://en.wikipedia.org/wiki/Na%C3%AFve_realism_(psychology))

⁹ Philosophy suggests “In morals and philosophy only an approximation to the truth can be obtained” and the best approximation requires comparing and merging several versions of ‘the truth’ – as many as possible.



Survivorship bias / survival bias and selection bias

Selection bias introduced by choosing individuals, groups or data for analysis in selective way that prevents proper randomization being achieved, thereby ensuring that the sample obtained is not representative of the population intended to be analysed¹⁰. Survivorship bias is an error of logic made by concentrating on the people or things that made it past some selection process and overlooking those that did not. For example, prioritising improvements in a ‘free service’ based on complaints received from users excludes problems that cause customers to simply stop using your service and to go elsewhere. This later group of problems are far more significant but cannot be included if your data collection is only focused on people who take the trouble to complain.



This image shows the damaged portions of returning planes during WW2. Initially this was thought to show where extra protection was needed. Statistician Abraham Wald took survivorship bias into account and concluded the damage shows locations where the plane can take a hit and still return home safely. Those hit in other places such as the engines, cockpit, and waist area, did not survive. Therefore, paradoxically he concluded, the areas needing more protection were the areas that were not damaged on surviving aircraft.

Affective factors

A person’s current state of emotion can easily overpower rational thinking. If a person is tired, or emotionally stressed for any reason, these negative emotions will affect all of the decisions made regardless of the current decision’s relationship to the cause of the emotion. Similarly, if a person has just won an important sporting event (important to them, not to you or the world at large), the feeling of being successful and capable of winning will impact decisions and encourage more risky decisions.

In addition to their current emotions, we all store emotion charged memories. These emotions are automatically triggered in situations perceived to be similar to the stored memory.

Conclusion

Everyone knows they are not biased (or are far less biased than most)¹¹:

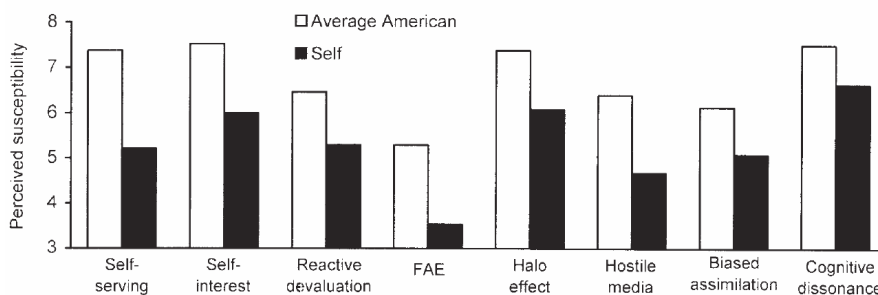


Figure 1. Perceptions of one’s own versus others’ susceptibility to eight different biases in human judgment and inference. FAE = fundamental attribution error. Adapted from “The Bias Blind Spot: Perceptions of Bias in Self Versus Others,” by E. Pronin, D. Y. Lin, and L. Ross, 2002, *Personality and Social Psychology Bulletin*, 28(3), p. 372. Copyright 2002 by The Society for Personality and Social Psychology. Adapted with permission of Sage Publications.

¹⁰ For different **types of random sampling** see page 3 at: https://mosaicprojects.com.au/Mag_Articles/P006_Predicting_the_Future.pdf

¹¹ Source of chart: <http://www.psych.cornell.edu/>



The irrational impact of bias and emotions is unavoidable. Every one of us is affected by our make up all of the time. What is important when considering project estimates, designing a communication or reacting to a message is to try to step back from the immediate reaction/assessment and as far as is possible take into account the likely affect of the factors discussed in this White Paper.

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Annex 1: Decision-making and behavioral biases

Source: https://en.wikipedia.org/wiki/List_of_cognitive_biases (the Wikipedia list links through to more substantive references) with additions:

A few of the biases listed in this Wikipedia entry include:

- **Ambiguity effect** – the tendency to avoid options for which missing information makes the probability seem *unknown*.
- **Anchoring effect** – the common human tendency to rely too heavily, or "anchor," on one trait or piece of information when making decisions¹². The anchoring effect works like this: rather than making a decision based on pure value for investment (time, money, and the like), we factor in a comparative value - that is, how much value an option offers when compared to another option even if the other option (or the first option we've seen) has little relevance to the decision being made.
- **Availability cascade** – a self-reinforcing process in which a collective belief gains more and more plausibility through its increasing repetition in public discourse (or "repeat something long enough and it will become true").
- **Bandwagon effect** – the tendency to do (or believe) things because many other people do (or believe) the same. Related to groupthink and herd behavior.
- **Bias blind spot** – the tendency to see oneself as less biased than other people.
- **Clustering illusion** – the tendency to see patterns where actually none exist.

¹² For more on **anchoring bias** see: https://www.mosaicprojects.com.au/Mag_Articles/SA1034_Are_your_stakeholders_biased.pdf

- **Confirmation bias** – the tendency to search for or interpret information in a way that confirms one's preconceptions¹³.
- **Conjunction fallacy** – the tendency to assume that specific conditions are more probable than general ones.
- **Distinction bias** – the tendency to view two options as more dissimilar when evaluating them simultaneously than when evaluating them separately.
- The **Dunning–Kruger effect** – a cognitive bias wherein unskilled individuals suffer from illusory superiority, mistakenly rating their ability much higher than it actually is owing to the inability of the unskilled to recognise their ineptitude. In extreme cases the problem isn't just that they are misinformed; it's that they are completely unaware that they are misinformed. And if one is under the illusion that they have sufficient or even superior knowledge, then they have no reason to defer to anyone else's judgment. (As a corollary:of highly skilled individuals to underestimate their relative competence, erroneously assuming that tasks which are easy for them are also easy for others - see also *Expert bias 1* below).
- **Endowment effect** – the fact that people often demand much more to give up an object than they would be willing to pay to acquire it.
- **Experimenter's or Expectation bias** – the tendency for experimenters to believe, certify, and publish data that agree with their expectations for the outcome of an experiment, and to disbelieve, discard, or downgrade the corresponding weightings for data that appear to conflict with those expectations.
- **Expert bias 1** - the inability for a person who has mastered a skill to understand how useful that skill can be to a lay person and/or they find it extremely difficult to think about problems from the perspective of lesser-informed people and provide information in a way 'useful' to people with less expertise (eg, by using expert jargon).
- **Expert bias 2** – the tendency of less expert people to place too much reliance on the advice of experts.
- **False consensus effect** – the tendency for people to overestimate the degree to which others agree with them.
- **Focusing effect** – the tendency to place too much importance on one aspect of an event; causes error in accurately predicting the utility of a future outcome.
- **Framing effect** – drawing different conclusions from the same information, depending on how that information is presented.
- The **Galileo Gambit**. Used by those who are biased against well-established scientific principles as follows: *Because Galileo was mocked and criticized for his views by a majority, but later shown to be right, current minority views that are mocked and criticized must also be right.* The obvious flaw in the Galileo Gambit is that being criticized for one's views does not correlate with being right: *"The fact that some geniuses were laughed at does not imply that all who are laughed at are geniuses. They laughed at Columbus, they laughed at Fulton, they laughed at the Wright Brothers. But they also laughed at Bozo the Clown."* (Broca's Brain, 1979)
- **Gambler's fallacy** – the tendency to think that future probabilities are altered by past events, when in reality they are unchanged. Results from an erroneous conceptualization of the Law of large numbers. For example, "I've flipped heads with this coin five times consecutively, so the chance of tails coming out on the sixth flip is much greater than heads."
- **Hindsight bias** – filtering memory of past events through present knowledge, so that those events look more predictable than they actually were; also known as the "I-knew-it-all-along effect."
- **Hyperbolic discounting** – the tendency for people to have a stronger preference for more immediate payoffs relative to later payoffs, where the tendency increases the closer to the present both payoffs are.
- **Illusion of control** – the tendency to overestimate one's degree of influence over other external events.

¹³ For more on **confirmation bias** see:
https://www.mosaicprojects.com.au/Mag_Articles/SA1034_Are_your_stakeholders_biased.pdf



- **Illusory superiority** – overestimating one's desirable qualities, and underestimating undesirable qualities, relative to other people. (Also known as "better-than-average effect," or "superiority bias").
- **Loss aversion** – 'the disutility of giving up an object is greater than the utility associated with acquiring it'. (also known as **Sunk cost effects**¹⁴ and **Endowment effect**).
- **Memory bias** - we believe our memories more than facts. Our memories are highly fallible and plastic. And yet, we tend to subconsciously favor them over objective facts¹⁵.
- **Narrative fallacy** – the tendency to look at sequences of unrelated facts and assume there are connections to allow us to craft some kind of an explanation about them; and then use this 'story' as a basis for understanding similar situations. This process ignores/hides the innate uncertainty associated with the occurrence of unrelated events.
- **Negativity bias** – the tendency to pay more attention and give more weight to negative than positive experiences or other kinds of information.
- **Neglect of probability** – the tendency to completely disregard probability when making a decision under uncertainty.
- **Omission bias** – the tendency to judge harmful actions as worse, or less moral, than equally harmful omissions (inactions).
- **Optimism bias** – the tendency to be over-optimistic about the outcome of planned actions. This affects the estimating processes in all projects (time, cost, risk, etc) and continues into the work of the project (sustained false-optimism bias). This bias tends to drive behaviours that suppress negative information (eg, trend reports) on the false assumption things will improve.
- **Outcome bias** – the tendency to judge a decision by its eventual outcome instead of based on the quality of the decision at the time it was made.
- **Planning fallacy** – the tendency to underestimate task-completion times.
- **Post-purchase rationalization** – the tendency to persuade oneself through pseudo-rational argument that a purchase was a good value (also called the *Buyer's Stockholm syndrome*). This stems from the principle of commitment, our psychological desire to stay consistent and avoid a state of cognitive dissonance, therefore we rationalize our actions afterwards.
- **Pseudo-certainty effect** – the tendency to make risk-averse choices if the expected outcome is positive, but make risk-seeking choices to avoid negative outcomes.
- **Selective perception** – the tendency for expectations to affect perception.
- **Semmelweis reflex** – the tendency to reject new evidence that contradicts an established paradigm.
- **Status quo bias** – the tendency to like things to stay relatively the same (see also loss aversion, endowment effect, and system justification).
- **Stereotyping** – we all pay more attention to stereotypes than we think we do¹⁶.

¹⁴ For more on **Sunk Costs** see: https://www.mosaicprojects.com.au/Mag_Articles/P022_Sunk_Costs.pdf

¹⁵ One example of **memory bias** – when asked whether this page includes more words that end in "ing" or more words with "n" as the second-last letter most people opt for the answer that there are more "ing" words. Logically it is impossible for there to be more "ing" words than words with "n" as their penultimate letter. But words ending in "ing" are easier to recall than words like *hand*, *end*, or *and*, which have "n" as their second-last letter.

¹⁶ The human mind is so wedded to **stereotypes** and so distracted by vivid descriptions that it will seize upon them, even when they defy logic. In 1983, Kahneman and Tversky tested how illogical human thinking is by describing the following imaginary person: *Linda is 31 years old, single, outspoken, and very bright. She majored in philosophy. As a student, she was deeply concerned with issues of discrimination and social justice and also participated in antinuclear demonstrations.*

The researchers asked people to read this description, and then asked them to answer this question: *Which alternative is more probable?*

1. *Linda is a bank teller.*

2. *Linda is a bank teller and is active in the feminist movement.*

Roughly 85% of people chose option #2 as the answer, BUT, if answer #2 is true, #1 is also true. This means that in probability, #2 cannot be the answer to the question. Few of us realize this, because we're so overcome by the more



- **Threat aversion** – everyone has a fear response when faced with stimuli that may be perceived as threatening for very practical reasons. However, the response is not uniform; the brains of self-identified conservatives generate more activity overall in response to a threat suggesting they have a stronger ‘fear reaction’ than ‘liberals’. The degree of threat is also affected by knowledge (things you know and understand or feel you have control over are less threatening) and the sense of immediacy (hyperbolic discounting – *see main paper*).
- **Wishful thinking** – the formation of beliefs and the making of decisions according to what is pleasing to imagine instead of by appeal to evidence or rationality.
- **Zero-risk bias** – preference for reducing a small risk to zero over a greater reduction in a larger risk.

detailed description of #2. Plus, the stereotypes implicit in the statement are so deeply ingrained in our minds that we subconsciously apply them to others.

