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Resilient decision-making
MARK SCHOFIELD

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CONTENTS

OPERATIONS

TECHNOLOGY

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DEAR READER,

Welcome to this landmark 20th anniversary edition of the Capco Institute Journal of Financial Transformation.

Launched in 2001, the Journal has followed and supported the transformative journey of the financial services industry over the first 20 years of this millennium – years that have seen significant and progressive shifts in the global economy, ecosystem, consumer behavior and society as a whole.

True to its mission of advancing the field of applied finance, the Journal has featured papers from over 25 Nobel Laureates and over 500 senior financial executives, regulators and distinguished academics, providing insight and thought leadership around a wealth of topics affecting financial services organizations.

I am hugely proud to celebrate this 20th anniversary with the 53rd edition of this Journal, focused on 'Operational Resilience'.

There has never been a more relevant time to focus on the theme of resilience which has become an organizational and regulatory priority. No organization has been left untouched by the events of the past couple of years including the global pandemic. We have seen that operational resilience needs to consider issues far beyond traditional business continuity planning and disaster recovery.

Also, the increasing pace of digitalization, the complexity and interconnectedness of the financial services industry, and the sophistication of cybercrime have made operational disruption more likely and the potential consequences more severe.

The papers in this edition highlight the importance of this topic and include lessons from the military, as well as technology perspectives. As ever, you can expect the highest caliber of research and practical guidance from our distinguished contributors. I hope that these contributions will catalyze your own thinking around how to build the resilience needed to operate in these challenging and disruptive times.

Thank you to all our contributors, in this edition and over the past 20 years, and thank you, our readership, for your continued support!

Lance Levy, **Capco CEO**

RESILIENT DECISION-MAKING

MARK SCHOFIELD | Founder and Managing Director, MindAlpha

ABSTRACT

Accurate and effective decision-making sits at the heart of operational resilience. However, many organizations take it for granted and spend very little effort on trying to understand and improve it. History is littered with unexpected events and outcomes. What defines the winners and losers, when surprises occur, is the ability to process new information, make new judgments, and effectively adapt decisions. However, with an ever-increasing amount of information to process and ever more complexity and uncertainty in the world, the decision processes we have evolved are under siege. This article breaks down the decision-making process, explains how biases affect our judgments, and looks at how we can correct these. We describe how our decision-making processes change according to circumstances and discuss some of the cognitive factors that cause us to make suboptimal choices. Finally, we present a framework and tools that can help us make better decisions.

1. INTRODUCTION

The great paradox of decision-making is that when we try to improve our decision processes, the issues that we are trying to correct prevent us from doing so. The cognitive biases that lead to decision errors also affect decision processes.

We like to be right; it makes us feel good. More than that, we hate to be wrong! We find it extremely unsettling. To counter this, we have developed a bias that behavioral scientists refer to as "fundamental attribution error". This is where we put our successful decisions down to our own brilliance and attribute the failures to bad luck. In turn, this leads to what is known as the "outcome bias", where we judge the quality of a decision according to its outcome and do not look at the process. This is problematic because it is not always the case that good decision processes deliver good outcomes and bad decision processes lead to bad outcomes. Sometimes good processes deliver bad outcomes, and bad processes can deliver good outcomes. This may be a result of the situation changing or just down to luck. However, when we evaluate decisions on outcomes, rather than process, we may discard good processes that delivered bad outcomes and keep bad processes that delivered good outcomes. We do not learn from our mistakes, and that prevents us from improving our decision-making processes. It is no wonder that we repeatedly make the same mistakes.

Effective decision-making should be at the heart of any operational resilience strategy, and demands that we learn from our mistakes. If we do not, we cannot hope to make effective decisions when the situation is volatile or uncertain, or when we are under pressure. History is littered with unexpected events and unexpected outcomes to expected events; this will never change. What defines the winners and losers when surprises occur or expectations are not met, is the ability to quickly process new information, accurately make new judgments, and effectively make new decisions.

This article breaks down the decision-making process, explains how biases and errors creep into decision-making, and looks at how we can correct these. We will see how our decision-making processes change according to our circumstances and how some of the evolutionary tools we have developed to help us operate under pressure can lead us to poor judgments. We will look at some of the different cognitive and emotional preferences and biases that cause us to make suboptimal choices and present a framework and tools that can help us make better decisions.

2. HOW WE MAKE DECISIONS

2.1 Dual process theory

To improve decision-making, we must begin with an understanding of how we make decisions. For many years,

decision theory was polarized. On one hand, economists argued the case for homo economicus, the rational decision-maker seeking to maximize individual utility. On the other hand, psychologists argued that decision processes were at the whim of affect and emotion. Herbert Simon developed a theory that sat neatly between the two. Simon argued that we try to make rational decisions, but that we are constrained in our attempts to do so by factors beyond our control. He suggested that to navigate this complexity, we have developed a toolbox of rules, tricks, and short cuts [Simon (1972)].

Daniel Kahneman and Amos Tversky developed the theory further. They proposed that our brains operate two separate decision processes [Kahneman (2011)]. System 1 sits in the limbic system, which governs our emotions. At its heart is the amygdala, which is responsible for self-preservation and for our fight, flight, or freeze response under threat. Decisions made in System 1 are intuitive, fast, and frugal on resources, but they are prone to error. They do not need to be extremely accurate, just good enough. System 2 sits in the prefontal cortex and is analytical. System 2 is accurate, but it is slower and consumes more resources than System 1. Because we are biologically wired to conserve resources the best we can, System 2 will pass decision-making tasks to System 1 whenever it can. This can be highly effective when making simple decisions about survival or for processing everyday tasks. But when things get complicated, it can lead us into trouble.

2.2 The two great enemies of effective decision-making

Two of the greatest challenges for effective decision-making are uncertainty and information overload. The effects of both are amplified in situations where we are under pressure and resilience is being tested.

2.2.1 DECISIONS UNDER UNCERTAINTY

There are three main conditions under which we make decisions: decisions under certainty, under risk, and under uncertainty. When the objective of a decision is known, the possible outcomes of the options are known, and the likelihood of those outcomes are also known, a decision is said to be taken under conditions of certainty. When we are not sure about the outcome of a decision, but we can assign a reasonable estimate of probability to it, the decision is said to be taken under conditions of risk. When we cannot estimate the probability of an outcome or are unable to see what all the possible outcomes are, we are making decisions under conditions of uncertainty.

Uncertainty makes decision-making challenging. That is not to say that we do not make bad decisions under the other conditions. As we shall see later, there are cognitive biases that can appear even under conditions of relative certainty, however uncertainty is the most problematic because it means that we have no reference framework to fall back on. We must approximate the information that we use as the inputs for our decisions before we can assimilate it and then use it in our decisions.

When we are faced with events that test resilience, uncertainty tends to be high. This is because the events that cause the greatest volatility are often not once-in-a-lifetime surprises, rather they are unexpected outcomes to expected events. They are outcomes that go against our preconceived expectations, and this makes it harder for us to adjust. The U.K.'s Brexit referendum was not a tail-risk even; it was a binary choice between "remain" or "leave" and the opinion polls had been extremely close. Similarly, the outcome of the 2016 U.S. Presidential election cannot be described as an outlier, it was a two-horse race and the polls had been extremely close. However, in both cases, people had made up their minds and created reference frameworks geared towards one outcome.

2.2.2 INFORMATION OVERLOAD

Information overload is another common cause of flawed decision-making that is amplified under pressure. It can be described as having more information than we are able to process in the time available to do so. Research has shown that the amount of information we use to make decisions follows an inverted-U shape [Chewning and Harrell (1990)]. Initially, as the amount of data available to us increases, we use more inputs in our decisions. But, beyond a certain point, the number of factors that we use in our decisions starts to decline. Once we become truly overloaded, we only use a very small percentage of the available information in our choices.

There is no doubt that the volume of information available has increased dramatically. In 2018, it was estimated that 90 percent of the world's data had been created in the preceding two years [Marr (2018)]. We are constantly in a mild state of information overload and, therefore, continually filtering the data that we use in our decision processes. When we are faced with an unexpected outcome, the situation is exacerbated because we are forced to react quickly, thus, the time available to process information and execute the decision is shortened.

Both uncertainty and information overload create feelings of unease, or dissonance, in our minds, and these trigger a

biological stress response. We immediately try to create some sort of order to ease this feeling. To do this, we have developed a series of short cuts, tricks, and rules of thumb that we call heuristics. Heuristics can be highly effective, but they may also leave us open to cognitive biases and bad decisions.

2.3 Heuristics

Herbert Simon introduced the concept of bounded rationality [Simon (1972)]. He argued that even if we are trying to make rational decisions, our ability to do so is constrained by factors such as the complexity of the problem, the cognitive capacity of the decision-maker, and the time available to make the decision. He proposed that when faced with these challenges we resort to short cuts and rules of thumb to make decisions easier. An example might be picking the first solution that satisfies a decision criterion, rather than analyzing data in detail to find an optimal solution. He called these "heuristics".

2.3.1 Heuristics and biases in action

Tversky and Kahneman (1974) developed the concept further. They listed several observable heuristics and linked these to identifiable cognitive biases. An example would be the "anchoring" heuristic, whereby we estimate a value by iterating from a number that we already know. This can be very effective, but only if the starting reference number is accurate and relevant to the question in hand. Kahneman (2011) gives the example of an experiment in which participants were asked to estimate the height of the highest redwood tree in the world. Half the participants were asked if it was greater or less than 1,200 feet and then asked to guess the actual height, while the other half were asked to guess if it was greater or less than 180 feet, and then to guess the actual height. The first group, anchored to the idea of 1,200 feet, made an average guess of 844 feet while the second group guessed an average of 282 feet. This represents an effect size of 55 percent due to the different anchors, a figure that has been replicated in several contexts.

Another heuristic is "availability". Here, we estimate the frequency or likelihood of something by how readily it comes to mind. An example of this is shown by an experiment in which couples were asked to estimate the percentage of various household chores that they had carried out over the preceding weeks. Not surprisingly the percentage estimates of both partners combined added up to significantly more than 100 percent in every task. This is not because they had a negative view of their partners, but simply because the memory of having done something themselves was much more prominent in their minds than the memory of the other person doing it.

2.3.2 HEURISTICS AND ADAPTIVE LEARNING

Of course, heuristics can be good as well as bad. Another common heuristic is "representativeness", where we evaluate something based on how well it conforms to our preperception of what it should look like. For our primitive ancestors, making a quick judgment about how potentially dangerous an unfamiliar animal might be would have been a matter of life and death. In this sense, heuristics are an adaptive learning process, through which experienced practitioners in a field may develop more efficient processes through repeated practice, trial, and error. However, the outcome of these decisions is only as good as the accuracy of the preconception. When the context changes, the effectiveness of the representativeness heuristic is compromised.

2.3.3 Why bad decisions are not random

The evidence for heuristics influencing decision outcomes is compelling. The effect may be good or bad, depending on the context of the decision, but it cannot be ignored. Moreover, if we assume that decision-makers are generally attempting to make rational choices, we cannot conclude that incorrect decisions are random [Owen (1992)]. This is an important distinction. Decision-makers may use heuristics to simplify decisions under pressure, and the resulting decisions may be incorrect, but if these heuristics repeat themselves, they are not random and the flaws in our decision-making should be predictable.

2.4 Preferences and biases

The non-random nature of decision errors has enabled researchers to identify several types. A quick internet search will reveal hundreds, but for the purpose of this paper we will focus on the two that are most relevant to organizations and businesses, preferences and biases.

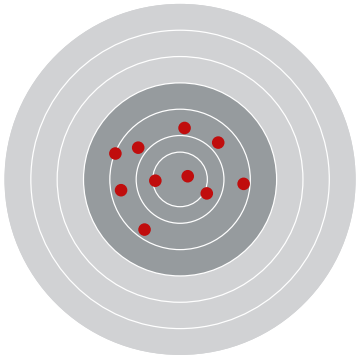
2.4.1 PREFERENCES

Preferences explain how we consistently make seemingly irrational decisions under certain conditions. There are three main types: risk preferences, time preferences, and social preferences.

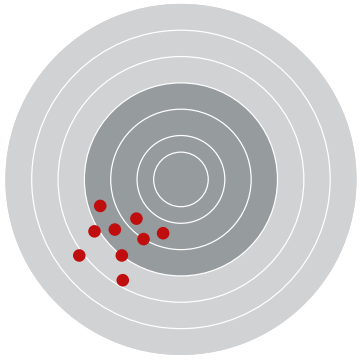
Risk preferences show that we make inconsistent decisions under varying risk conditions. Daniel Kahneman won his Nobel Prize for economics for his work in this field. His Prospect Theory [Kahneman and Tversky (1979)] showed that we systematically overestimate the cost of losses compared to the value of gains. Offered a 95 percent chance of winning £10,000 against a guaranteed offer of £9,000 most people

Figure 1: Biases

(a) Random error



(b) Systematic bias



Source: MindAlpha Ltd.

will settle for the certain but economically inferior choice of the £9,000. However, when framed in the context of loss; a 95 percent chance of losing £10,000 against a 100 percent certainty of losing £9,000 most people will prefer the gamble. Although this is also the economically worse outcome, emotionally it feels easier than surrendering to a certain loss. Experiments have shown these preferences to be consistent, with the same person often selecting the inferior economic outcome in both choices.

Time preferences show that we often make inconsistent decisions over different time periods. We overestimate or overvalue events in the present, relative to those in the future. For example, people offered the choice of £100 today or £120 in six months' time will often select the more certain £100 today, even though the future payment implies an annualized rate of return of about 40 percent and is, therefore, economically more attractive. Offered the same payoffs in the future, £100 in one years' time against £120 in eighteen months' time, the same person will reverse their decision and opt for the economically superior £120.

Social preferences describe decisions that are influenced by the people around us or by our perceptions of social norms. Our decisions are influenced by people who are perceived to have legitimacy or expertise in a particular field, or simply to fit into a group. The preference to fit into a group is beautifully demonstrated by the Asch conformity experiments [Asch (1956)], in which a hapless student takes part in a visual perception test. Little does he know that all the other participants are actors, planted in the group and primed to give the wrong answer. The group is asked to pick the longest line out of a selection drawn on a piece of paper. In the first round, our victim correctly selects the longest line, despite the rest of the group picking an answer that is obviously wrong. However, in the second round he switches his choice to fit in with the group, even though it is quite clearly wrong.

This is the essence of groupthink. The desire to maintain the identity of a group, through the removal of conflict, leads to a narrowing of frames of reference, a reluctance to challenge existing opinions, uniformity of choice, and resistance to change, even in the face of contrary information.

2.4.2 BIASES

Cognitive biases are systematic divergences from decisions implied by rational choice theory. Biases should not be confused with random errors. If we think about shots at a target, random error would be represented as shots scattered all around the target [box (a) in Figure 1], while bias would be represented as clustered shots displaying a common skew from the center [box (b) in Figure 1].

Biases can be resolved in two ways. By shifting the aim back towards the center of the target or alternatively by moving the target. Moving the target is a common feature of biased decision-making; when we move the target, we can no longer see the error. In decision-making, it is imperative that we establish where the target should be before we adjust the decision process.

2.4.3 COMMON BIASES IN DECISION-MAKING

There are many documented cognitive biases that affect decision-making. Here are just a few:

- **Overconfidence** is one of the most pervasive biases in decision-making. We overestimate our ability to evaluate options and assign probabilities to outcomes, which makes us likely to discount quite plausible outcomes that do not fit our preconceived ideas. There are simple but effective tests that can demonstrate overconfidence and it is often the case that the most experienced decision-makers in a group display the highest levels of overconfidence.
- **Confirmation bias** is probably one of the most harmful biases in decision-making. This is where we actively seek out information to confirm our existing beliefs. We may have an underlying preference for a particular course of action, and we justify it by finding evidence that supports it.
- **Base-rate neglect** is another common decision error. Here, we ignore the implications of base-rates in sampling. A famous example of this was given by Kahnemann (2011) and is known as the Linda Problem. "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 anti-nuclear demonstrations." Participants in the experiment were asked which was more probable: 1) Linda is a bank teller or 2) Linda is a bank teller and is active in the feminist movement. Most respondents picked option 2, even though for 2 to be true, it is a necessary condition that 1) should also be true. It is impossible for 2 to be greater than 1.
- **Priming and anchoring biases** are also commonplace. Our decisions are often skewed by an external and sometimes irrelevant prime or anchor.

Many of the biases in behavioral decision literature are variations on a theme, but it is vital to understand how they may impact your business. Organizations wishing to identify where cognitive biases may be affecting their decision processes should consult a recognized decision expert, who will be able to help them understand where de-biasing is needed. The effort is worthwhile. Sunstein and Hastie (2015) found that organizations that improved decision processes also improved their return on investment (RoI) by up to 7 percent.

3. MAKING BETTER DECISIONS

3.1 Setting up the decision

So, how do we go about making better decisions? The answer is encapsulated in the old maxim, the 7 Ps: Proper Planning and Preparation Prevent Persistently Poor Performance. A framework for identifying biases is as valuable for making everyday decisions under relative certainty as it is for making decisions under conditions of volatility and uncertainty. A rigorous and robust decision process should be at the very core of operational resilience.

3.1.1 RETHINKING DECISION-MAKING

Effective decision-making needs to get away from the traditional linear model of "analysis, selection, and measurement". Resilient decision-making is a constantly evolving cyclical process with five stages: framing, information gathering, analysis, selection, and learning. The learning stage is a vital piece of the process that differentiates the decision cycle from linear decision-making. Learning generates new information that feeds back into the start of the new cycle.

Every decision process should end with a four step debrief: 1) What did we do that we would do again? 2) What did we do that we would not do again? 3) What did we not do that we would do next time? 4) What did we not do that we are glad we did not do? This learning should form the basis of the preparation stage for future decisions. Every decision process should start with a simple question: what have we learnt from previous decisions that may be relevant for this decision?

3.1.2 Framing the question

The next steps are to define the decision type and to frame the question accordingly. A common cognitive error, when faced with a tough decision problem, is to substitute the difficult question with a similar but easier one. An example of this might be the complex question that we face when hiring: "is this candidate likely to be effective in the role we are interviewing for"? A simpler, substitute question might be "does this candidate interview well"? or even "do I like this candidate".

Worse, we may conflate question substitution with other biases. For example, we start with a bit of overconfidence, and add the availability heuristic: "what comes to mind when I think of a successful person in this company"? "Me, of course!" and we then add question substitution to the mix, so we answer the question "how good is the candidate"? with a simpler question, "how similar is the candidate to me"? This is a common cause of diversity issues, probably more prevalent than any deep-rooted negatively connotated bias.

Table 1: Decision type analysis

	ONE-OFF	SEQUENTIAL
DIRECTIVE	Simple action	Complex action or strategy
ANALYTICAL	Simple answer	Complex answer or framework

Source: MindAlpha Ltd.

We need a simple framework for understanding the decision we are making and framing the question correctly. A useful tool is to map the decision problem onto a matrix constructed from two questions: 1) is the decision a one-off or part of a sequence of decisions? and 2) is the decision directive, requiring a clear choice, or analytical, leading to discovery or gathering of information?

A one-off directive decision requires a simple action as a result: "Do we do a or b?" A sequential directive problem will need a more complex outcome or strategy. For example, "If outcome X occurs, do we do a or b and if outcome Y occurs, do we do c or d?" A one-off analytical question requires a simple informational response such as, "what is the cost of option a?", while a sequential analytical problem invites a framework to help make sense of the data: "can we create a table that shows the relative costs and benefits of the four possible options?"

The question that is posed to the decision-maker(s) must be phrased in a way that elicits the type of response that is required. Ask the wrong question and the wrong answer is virtually guaranteed.

3.1.3 INFORMATION GATHERING

The next step is to gather the required information. In crisis decision-making this may have to happen quickly, but wherever possible it is important to take time to ensure that all the relevant information is gathered. Human cognition is based on reductive processes that help us process large quantities of data quickly. If we start with a biased subset of the available information, the resulting decision will obviously be biased.

A golden rule of effective decision-making is "never start with a hypothesis". If we begin with a fixed idea of the outcome, confirmation bias tends to follow very quickly. We end up seeking out information that supports the hypothesis and ignore everything else. Wherever possible, we must gather the data first and then examine it to see what possible hypotheses emerge.

A useful framework for information gathering is to break the process down into three distinct areas: 1) the immediate decision problem, which entails anything that has a direct impact on the decision itself; 2) the transactional environment, which includes all the actors who can influence or are likely to be influenced by the decision; and 3) the broader macro environment, which is all the external factors that could influence the behavior of the actors in the transactional environment.

3.2 Making the decision

With a correctly framed question and effective information gathering, we can begin to look at the decision itself.

3.2.1 JUDGMENTS

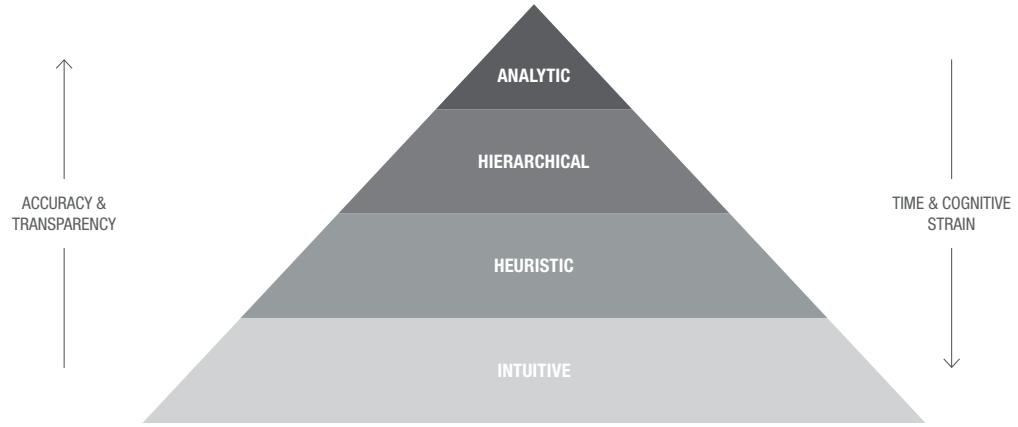
In decision theory, we define a decision as "the irrevocable allocation of resources, in the sense that it would take additional resources to change that allocation" [Matheson and Howard (1968)]. Judgments are the criteria that we use to determine that resource allocation.

No matter how good the preparation phase, if the judgments we make are incorrect we cannot hope to make effective decisions. Two common sources of judgment error are failure to correctly estimate probabilities, which results from overconfidence and from availability or representativeness heuristics and, secondly, selective information or confirmation biases, where we only seek out and use information that supports a preconceived belief or hypothesis.

Useful methods for improving accuracy in the estimation of probabilities include using estimates from independent experts or even panels of independent non-expert researchers. This approach has been used effectively by the forecasting expert Philip Tetlock in the "Good Judgment Project" [Tetlock (2017)], which will be discussed below. In group decisions, we can also use iterative methods, such as the Delphi technique, in which a group of participants makes a set of estimates that are then discussed by the group and then re-estimated through a series of iterations.

A common source of confirmation bias is using decision criteria that could apply to several different alternatives in support of a preferred option. To avoid this, an important step is to test for "diagnosticity". This simply means establishing whether each of the criteria adds value to the judgment independently. Any factor that could potentially support all the possible choices in a decision set should be discarded, even if it seems important.

Figure 2: The pyramid of decision approaches



Source: MindAlpha Ltd.

3.2.2 SELECTION

With the judgment criteria established, we can begin to evaluate and eliminate options until we arrive at the decision. The way we do this will depend on the context of the decision, most importantly the time available for the decision, and the importance of the outcome. Schoemaker and Russo (1994) identify four tiers in their "Pyramid of decision approaches". At the bottom of the pyramid are intuitive decisions and it progresses through rule-based or heuristic systems, hierarchical importance weighting processes, and finally complex value analysis at the top to the pyramid. With each tier there is a trade-off between increasing accuracy and a greater resource requirement in terms of time and cognitive effort. The way we structure these approaches is known as the "choice architecture".

The choice architecture is a set of steps that help us select one option from a set. Table 2 shows four possible methods that we can use that correspond to the pyramid tiers.

The simplest method is satisficing (SAT). Here, we would simply select the first option that satisfies all the judgments, irrespective of whether other options perform better. In our example, Option 1 is good enough.

The second method is called lexicographic (LEX). In this method, we would decide on the most important criteria and pick the option that performs best on that. In the table it is Option 2. Moving up in terms of accuracy, but requiring greater effort, we can try elimination by aspect (EBA). Here, we systematically go through the judgment criteria ranked in order of importance, eliminating any option that does not meet a certain performance requirement. In our example, EBA leads us to Option 3. Finally, we have the additive method (ADD). This is the most onerous but the most accurate. In the ADD method, we would score each option across the judgment criteria and then sum the scores to give a value ranking.

We can even take this one step further, giving the judgment criteria weightings according to their importance. This is known as the additive plus or ADD+ method.

Table 2: Choice architecture

JUDGMENT	OPTION 1	OPTION 2	OPTION 3	OPTION 4
#1	+	++	+	0
#2	0	–	+	++
#3	+	–	++	++
#4	0	–	– –	++
#5	0	–	0	0
	SAT	LEX	EBA	ADD

Source: MindAlpha Ltd.

4. COMPLEX DECISION

So far, we have concentrated mainly on individual decision-making processes, but very few decisions are taken in isolation. The science and theory of how we make decisions, and how we should make them, applies to all forms of decision-making, but there are further considerations we need to make when dealing with groups or linked decisions.

It is, therefore, worthwhile taking a quick look at the intricacies of group decision dynamics, sequential or linked decisions, and other more complex decision challenges, such as forecasting and scenario analysis.

4.1 The madness of crowds or the wisdom of crowds

Aristotle supposedly said that the whole is greater than the sum of its parts, although he is misquoted. What he said was that the whole is something besides just the sum of its parts. It has an identity of its own and it creates value from that identity.

Cognitive diversity is one of the most powerful decision-making resources there is, if used effectively. When we combine all the knowledge and experience within a team, we do not suddenly have more facts, but when we look at that knowledge from different perspectives and introduce different ways of doing things, we create alternatives. Alternatives give us a better reference framework for making judgments.

James Surowiecki investigated this in his book, "The wisdom of crowds" [Surowiecki (2004)]. In it, he talks about a study of the television program, "Who wants to be a millionaire?". Surowiecki found that when contestants used their "phone a friend" lifeline, they got it right no more than 50 percent of the time, but when they asked the audience, they got it right almost 90 percent of the time.

Tetlock (2017) took this a step further. He used teams of ordinary people to forecast political, economic, and social events and was able to outperform experts from these areas as well as specialist intelligence analysts.

So, it seems straightforward. If we bring together a broad set of experience and knowledge, we should make better decisions. However, very often, we fail. There are two common reasons for this. The first is groupthink and the second is rational herd behavior.

4.1.1 GROUPTHINK

Groupthink occurs when there is a desire to maintain the identity of a group through consensus and lack of conflict. Views that challenge the consensus are rejected and this leads to some common behavioral biases.

The first is shared "information bias". Experiments have shown that members of a group, given a combination of shared information and unique information, spend 90 percent of their time discussing the shared information. Groups mainly consider and make decisions using information that everyone holds. This often leads to incorrect decisions that could have been avoided using items of the unique information held by one member of the group. Yet, people do not speak up for fear of being ostracized.

The second is "confirmation bias", where the group actively seeks out information that supports its existing views. Information that could change a decision never comes to light.

The third is "uncertainty avoidance". We have a natural desire to seek closure and it is often easier to cut analytical corners, just to get the job done, rather than risk unearthing something new that could cause confusion and delay a decision.

Then there is "overconfidence in others". When the views of a few people dominate and there is no input from dissenting group members, existing views seem to carry more weight and bad decisions go unchallenged.

4.1.2 HERD BEHAVIOR

Herd behavior is similar to groupthink, in that it involves a group following the lead of one or a few individuals. However, sometimes these decisions may be rational, even if they are eventually proved to be wrong. This is particularly the case when information is limited.

Nobel laureate Abhijit Banerjee demonstrated this in his "Simple model of herd behavior", with an example in which 100 people are asked to select between two restaurants, A and B [Banerjee (1992)]. There is a 51 percent prior probability that A is better than B, however, each person also has a further piece of information and the total of these pieces of information favors B in the ratio of 99:1. If the first person to choose has the piece of information favoring A, they will clearly select A, based on the 51 percent prior probability and their own information. The second person to choose now has a dilemma. They have information favoring B but see that the first person has chosen A. These two pieces of information cancel each other out and they are left with the 51 percent prior probability favoring A. Thus, it is rational for them to select A, even though they hold information favoring B. From then on, each new chooser sees the 51 percent prior and the subsequent selections favoring A. It is rational for everyone to select A, despite 99 of them having information favoring B.

Both groupthink and herd behavior have something in common, which is that decisions get made without all the available information. This is incredibly damaging for effective decision-making.

4.1.3 MAKING BETTER GROUP DECISIONS

What can we do to overcome this? The first step is to ensure that the correct conditions for groups to be effective exist. Surowiecki (2004) identifies five of these: 1) The group must contain diversity of information, 2) people's opinions must be formed independently of those around them, 3) participants must have access to decentralized pools of specialist knowledge, 4) there must be an effective mechanism for aggregation of information and turning it into a collective judgment, and 5) there must be trust among the participants, to the extent that everyone's input is equally regarded.

In short, groups must be diverse and inclusive. To achieve this, everyone must be given an opportunity to speak, and feel safe to do so without fear of being ridiculed. Groups should encourage dissenting views by actively encouraging people to challenge the consensus, even mandating someone specifically to do this in the form of a devil's advocate. Finally, groups should reward people for original ideas and information, even if it is eventually proved to be wrong.

4.2 Spillovers and spillunders

Linked decisions are not just those that involve more than one person, they also include decisions that are directly connected to another decision. Behaviors that result from one decision and influence a subsequent choice are known as spillovers [Dolan and Galizzi (2015)]. A spillover that leads to a follow-on action or decision that is in the same direction is called a promoting behavior. If the subsequent action is in the opposite direction, it is either a permissioning or a purging behavior.

For example, we might go to the gym and then, encouraged by our healthy start to the day, decide to keep up the good work and have a healthy lunch. This is a positive promoting behavior. Alternatively, we might skip our gym session and then decide that our new health kick has gone out of the window for today, and, therefore, eat an unhealthy lunch. This is negative promotion.

With the reversing patterns, we might go to the gym and then decide that we have "earned" an unhealthy lunch, we call this permissioning. Or, we might start the day with an unhealthy breakfast and then decide that we had better go to the gym to burn off a few calories, this is called purging behavior.

In financial markets, and indeed other areas of risk-taking, decision spillovers are common and often very costly, particularly negative promotion, in which an adverse outcome leads to further risk-taking, to try and get out of a bad situation.

More recently, behavioral scientists have identified new patterns, called spillunders [Krpan et al. (2019)]. This is where the perception of a future action precipitates a preemptive action or decision. Thus, our intention to go to the gym in the afternoon may lead us to have an unhealthy lunch that we intend to burn off later. However, the self-confidence that we have in our future actions has repeatedly been shown to be excessively high.

4.3 Making sense of turbulent times – scenario planning

Scenario planning is a topic that merits an article on its own, but a brief synopsis is important in any discussion of decision-making. Unprecedented advances in globalization and technology mean that we live in a society that is networked unlike ever before. Our political systems, our economies, our social and environmental milieus are intricately interwoven. Tiny changes in one area can have huge repercussions in other areas. Identifying and interpreting these relationships is vital for operational resilience, but this cannot be done under pressure when we are trying to explain an unexpected event.

Scenarios differ from everyday decisions in that they exist in a non-specific time frame, they do not have probabilistic outcomes, and they may never actually play out. However, scenarios are a vital part of the process of resilient decision-making for two reasons. First, the process we use to construct scenarios can be effectively deployed across most decision challenges and is effective in helping to debias judgments. Second, when an unexpected outcome does present itself, scenarios provide us with a reference framework for better decision-making. Many of the decision heuristics we use are based on forms of pattern recognition. When the patterns change, our reference framework will be wrong, and mistakes follow. Pre-prepared scenarios provide us with a set of alternative patterns against which we can make future decisions under pressure.

4.3.1 THE OXFORD SCENARIO PLANNING APPROACH (OSPA)

The VUCA concept (volatility, uncertainty, complexity, ambiguity) used by the U.S. military has had a resurgence in popularity in the last couple of years, but we prefer the TUNA concept (turbulent, uncertain, novel, ambiguous), developed by Rafael Ramirez and Angela Wilkinson at Oxford University's Said Business School [Ramírez and Wilkinson (2016)].

The difference is nuanced, but it is hugely important; novelty replaces complexity in the Oxford model. Advances in technology, particularly in areas like artificial intelligence and machine learning, mean that dealing with complex problems should not unduly concern us. However, new patterns and new relationships emerging can be hugely disruptive. It is these that tend to cause the biggest problems for decision-makers.

Most organizations will claim to engage in some form of scenario planning, but often the traditional approaches fall short. They tend to fit one of two models. They are either variations on the existing base-case, often anchored by a fixed set of judgments and thereby producing outcomes that look very much like the current business plan, or as Professor Ramirez says: "For many executives ... scenario planning considers imaginary counterfactuals in the tail of their economic modelling." These are attempts at "blue-sky" thinking. They are futile attempts to predict the unpredictable.

The Oxford scenario planning approach does not try to predict the unpredictable. It helps organizations reframe known information to create sets of plausible future states that would be transformative or disruptive for the organization or its operating environment. The goal of scenario planning is to be prepared for unexpected outcomes to expected events.

5. CONCLUSION

Decision-making is a science, not an art. While it may please us to think of ourselves as instinctively good judges and decision-makers, and it is easy for us to explain away our decision errors as the result of a changing environment or just plain bad luck, often the mistakes we make, and repeat, are the result of common, observable, and predictable biases.

Our decision-making processes have developed over the millennia. We have fast and frugal intuitive processes that allow us to assess important information rapidly when we are under pressure and we have deeper analytical processes that allow us to solve larger and more complex problems. However, the threats that we meet today have changed from the days of sabre-toothed tigers and unfriendly rival tribes. Today it is complexity, novelty, uncertainty, and information overload that cause us to become stressed. These threats are exactly when we need to be more analytical and accurate in processing information and making decisions, but we are preprogrammed to be reductive in our approach and to lean on tricks like pattern recognition to process the information quickly.

Understanding how we make decisions, having a knowledge of preferences in human behavior that are repeated time and time again, and being familiar with the biases that skew our judgments can make us much more effective at making decisions under pressure.

If we can overlay this with carefully constructed frameworks that help us process the right amount and type of information, to debias our judgments of the options presented to us, and to select the correct option without emotion creeping in, we will consistently make fewer errors and achieve better results.

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