Chapter

SOCIO-TECHNICAL GAMBITS THAT DESTROY CYBER SECURITY & ORGANISATIONAL RESILIENCE

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ABSTRACT

This chapter summarises how an organisation (and key individuals within it) could be subject to smart targeting by cyber and other attacks - underpinned by re-conceptualising the ways in which decision-making by individuals and bureaucracies can be influenced or even directed. Beginning with a short summary of the author's practical experience, the chapter then presents the notion of the choice architecture, followed by a dissection of some of the ways in which malign influence can be generated by or over decision-makers – underpinned by the author's observation of such phenomena in the real world. The chapter concludes by arguing that organisations can and should accrue competitive advantage by recognising that their decision-making competences are vulnerable to the imaginative and determined adversary. The use of fast, frequent and cheap exercises to enhance scanning for threats placed (or placeable) within an organisation and to supplement the situational awareness, alertness and robust response of individuals and structures is recommended.

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Gambit
an act or remark that is calculated to gain an advantage, especially at the outset of a situation (Oxford English Dictionary, 2003)

INTRODUCTION

Writing from the perspective of a lecturer and consultant in a business school, it is natural that one of my over-riding concerns is with helping students and clients assure 'competitive advantage'. This chapter details how organisations (and perhaps nation states, or at least their strategic industries) can acquire competitive advantage against smart cyber attacks which leverage an understanding of (or luck with) the ways in which individuals make - and organisational culture shapes decisions.

In other words, the large company or civil service department can be the victim of an asymmetric attack enabled (or supplemented) by cyber means – whereby spending on hardware, software, business continuity, disaster recovery and awareness are made irrelevant. Here, the asymmetric adversary has the competitive advantage.[1] However, this is only reliable if targets remain unsighted to, and unprepared for, such attempts to breach the decision-making integrity of them and their organisation. The problem is that such attempts are almost never expected nor looked for.

An analogy that I enjoy working with is that of the Roman gladiator the *Retiarius* – who triumphs over more heavily armed and armoured opponents through the use of a net to ensnare and entangle, delivering the *coup-de-grace* with a dagger. The organisation, encumbered by policy, procedures, assumptions and expectations, acts like the invulnerable, heavily-armoured gladiator: weighed down by misplaced belief in ability as much as by shiny equipment. The pesky,

[1] In terms of asymmetry, I mean here not necessarily that the adversary is smaller – but maybe liberated from conventional thinking and policy restraint.

fleet-of-foot adversary is unimpressed by such clumping, expected and worthy protection, and indeed disregards it as anything other than avoidable or even helpful. This literal and virtual armour impedes the speed and range of movement, and once some advantage – such as the unbalancing of the opponent - has been achieved, the armour becomes more than unhelpful to the defender.

That is not to say that some points of an organisation should not be protected with the equivalent of the heavily-armoured, well-muscled gladiator. Rather, the author believes that cyber-security should not be regarded as *only* achieved and achievable through such obvious means as cost advantage, but instead emerge from attention to the ways in which organisational culture and individual perception can be harnessed to unlock competitive advantage accruing to the actor using innovative and creative approaches.

This chapter describes emerging, concept-driven thinking that should help organisations better understand, anticipate, probe for, protect against and respond to the exploitation of decision-makers at all levels in and through cyber systems.

STARTING POINTS

This chapter adapts - and extends on - the term 'choice architecture' (Sunstein, Thaler and Balz 2010) to describe the array of decisions around any individual who is open to influence, targeting or having decisions substituted with alternatives. In understanding what a choice architecture is, these authors state, we need to know that:

> Decision makers do not make choices in a vacuum. They make them in an environment where many features, noticed and unnoticed, can influence their decisions. The person who creates that environment is, in our terminology, a choice architect (Sunstein *et al.* 2010).

Sunstein *et al.* are not writing about cyber-security – so in our terms, in thinking about an adversary seeking to gain advantage through the use of cyber technology, the person (or persons) attempting to harness, degrade, subvert,

maintain or destroy a target's choice architecture is an *anti-architect*, akin to the engineer who understands how to 'un-construct' a building as much as build it.

The author has been inspired in designing this chapter by a career (from 1998) researching how individuals in and organisations themselves make decisions and – in particular – how either come to make certain decisions despite overwhelming evidence that those decisions are inappropriate or even cause consequences more damaging than those from the initiating accident or attack. The author has been privileged to help develop concept-driven tools and approaches to protect decision-makers and ensure the meeting of strategic objectives under challenging circumstances.

This chapter also draws on previous and current consultancy commissions where the author has been asked to test existing cyber-security preparedness or where specific insight has been sought into how new concepts demonstrate the need for companies and governments to create protection for hitherto unguarded or unrecognised points. The fact that some of the exploits described in this chapter have not yet occurred is not because they are impossible or even unlikely, rather that we are lucky (or, that they may just not yet have been discovered or disclosed). These exploits should, however, be used as scenarios for whatever robust 'red teaming' or other techniques are used to assure Boards, customers and others of the real and reliable levels of defence from, and the existence of sustainable response to, smart(er) cyber-risks.

There are four major considerations that I address in the remainder of the chapter:

- Processes of situational awareness generation and commonsense maintenance
- Decision-making short-cuts & vulnerabilities (heuristics)
- Emotional drivers of behaviour & novel emotive targets
- Potential for introduction of 'waste' into our organisational systems

The philosophical position of this paper is generated from the anthropological skill of employing empathy to imagine how a determined, smart and unconstrained adversary might plan an unconventional cyber-attack on an

organisation. This approach is buttressed by a deep understanding of the frailties of individuals and organisations, gathered from operating as employee, consultant and researcher at the strategic, operational and tactical levels of commercial and public sector organisations in the UK and beyond. Being guided by an ethic of scientific integrity which discovers what clients 'need to know rather than what they want to hear', I have had unique access to and freedom to test the decision-making, enabling and disabling structures of a wide range of institutions.

If intelligently reconnoitred, planned and executed – a smart cyber-attack would involve the adversary identifying the ways in which individuals/ small groups / the organisation takes decisions. This insight may be abstractable from observing or learning about past events or gathered from active interventions. However acquired, this amounts to becoming familiar with the 'choice architecture' of a target or targets.

CHOICE ARCHITECTURE OF INDIVIDUALS OR ORGANISATIONS: THE SEARCH FOR DISCOVERABLE VULNERABILITIES

The ideas in this paper extend on widely understood behaviours – so that, for example, the con artist who builds relationships with those that he or she defrauds exploits a choice architecture in their 'mark' around trust, confidence, coercion, flattery. The effective bank robber understands the choice architecture around the use of violence and domination caused by shock and overwhelming threat of force. The counsellor, interrogator understands how the use of empathy and encouraging reflection and sharing can be beneficial.

The term 'choice architecture' (Sunstein, Thaler and Balz 2010) is thought-provoking, because it encourages one to see the range (or not) of decisions open to an individual / system from an empathetic point-of-view. From a humanistic, interpretive stance, it is vital to be able to understand why targets do the things they do *in their terms* (i.e. being culturally relative). These things may not be rational or commonsense in 'our' terms, but - seen in the context of the worldview

of another – they will be: and we can generate and use such insight. By collating a view of the choice architecture around an individual and their host organisation (and 'imagining across' any gaps in that view), we come to understand what an adversary might garner about the micro-culture of an individual or small group, how they might achieve effect, and how we might detect and prevent such attempts at information–gathering and intervention.

In his legendary 1980s work for the US Marine Corps, LtCol Channon – of *The Men Who Stare at Goats* fame - presents a diagram which can be used to capture this concept. The individual stands in the centre of an *array* of influences and rules (informal and otherwise) which social and other structures impose or suggest. Inspired by this diagram (which summarises what anthropologists have often only been able to express in reams of words), the author began to speculate about the operational potential of a novel way of considering the choice architecture / worldview of an individual that could bring together a number of strands to achieve real effect.

Taken together, as comprehensive a picture as possible could give a fine-grained understanding of how a person's worldviews are founded and sustained and what they are (or could be) susceptible to in terms of influencing choices or ways in which they might be placed in a position that leads to, say, their suspension from their current employment role.. Some of the influences could be *direct* (e.g. removing or supporting an existing element), others *indirect* (what do we have to re-engineer or introduce in order to make a new component attractive to the target?).

Policy-makers have begun to see that a more individual-centred approach to shaping decision-making can be helpful. **Behavioural science** – typically applied to health-related issues – is a case in point. In trying to overcome the difficult challenge of encouraging desirable changes to lifestyle amongst citizens in Western, post-industrial, liberal democratic states, it has been found that this outcome may be more likely as a product of 'nudge' and tweaks to the choice

architecture around consumers than the traditional tools of regulation and enforcement. So, for example, making exercise and lifestyle change achievable, cool and sexy (see http://www.thisgirlcan.co.uk/ - from Sport England and partners), rather than taxing fat and sugar, are thought more likely to achieve increased levels of physical activity and therefore improved physical and mental health, reduced use of hospital resources and so on.

This paper is an initial exploration of how stronger versions of these ideas can be applied to challenging real world contexts – with the objective being to defend socio-technical systems against the realities of micro-cultural decision-making to reinforce, retire, degrade or replace existing choices for targets, using new but effective means to understand and act. This paper uses the term *micro-cultures* to describe the environment around and sustained by an individual or small-group. The dynamics and processes of such mini-organisations can be impacted in effective ways – as it is such groupings that are likely to be the predominant forms of adversary that we face having to deal with over the coming decades. It is assumed that the group / individual culture here is of much greater significance than the larger culture from which one or more members of the group may hail from.

SITUATIONAL AWARENESS, SENSE- AND DECISION-MAKING

The situational awareness and world view held by an individual is produced from the choice architecture that a person builds. Although some of these elements may be inescapable, others will be particular to the individual / small group. If an individual has adopted a particular political perspective, for example, then this often influences their ideas of what counts as trusted sources of information – largely that which rewards them with positive reinforcement.

Endsley, highlighting the aviation roots of the term situational awareness (SA), defines it as "the pilot's internal model of the world around him at any point in time" (1988). This model is synthesised from what instruments report, what can

be seen outside, what radar and other sensors show as well as sensory input meshed with the prior experience of the pilot. Individuals synthesise across their sources and choices and interpret or impose meaning on them to produce their worldview. Through using empathy, imagination, inference from psychological and other research, we can generate a usable representation of the target's choice architecture and the routes to it to achieve hard outcomes.

As an anthropologist, the author is passionate about the value of looking at how individuals and groups make sense of their world. Anthropologists are nothing if they forget their cultural relativity: what appears to look exotic, irrational to 'us' does not to those who believe or pursue activities or hold beliefs that we do not. Although a clumsy word, 'ethnomethodology' is our word to describe variation in commonsense. A vital element of a micro-culture's Situational Awareness (SA), commonsense varies across space and time. It can become extremely localised as a strong source of identity and underpinning of otherwise inexplicable behaviour: more can be done to capture and work with it.

HEURISTICS: VULNERABILITIES AT THE HEART OF DECISION-MAKING

Given that the decisions that humans make are based on an understanding of reality driven by information, the speed, pace and quality of decision-making is affected by the processes that individuals or groups have for synthesising their situational awareness. In an effort to make decision-making as efficient as possible, humans have evolved *heuristics* as a way of attempting to use pattern-matching to save having to think up new explanations for events and solutions to them. If a situation is perceived to be like one previously encountered, we tend to try and fit a sense-making and intervention solution to it that we have previously applied. This reaches a dangerous extreme when we allow ourselves or others to adjust how we *perceive* a problem in order to *fit* a solution that we know we have. In other words, in our desire to make sense and to succeed, humans can be tempted to believe that the world is what it ought to be rather than what it is.

Heuristics have been defined as "a strategy that ignores part of the information, with the goal of making decisions more quickly, frugally, and/or accurately than more complex methods" (Gigerenzer and Gaissmaier 2011: 454). Of course, such shortcuts for speed, efficiency and accuracy have to be used very carefully – incorrect identification of the circumstances can lead to the use of approaches that are sub-optimal. MacGillivray summarises three key heuristic processes that are relevant in explaining how humans tend to make psychological life as efficient as possible:

> *Credibility heuristic* – If the *conveyor* of the warning message passes a threshold of perceived credibility, then treat the message as being a signal from the target; if not, treat the message as being noise from a distractor
>
> *Precedent heuristic* – Search for precedent(s) for unfolding event (i.e. historic analogue(s)), and if identified, then treat current events in the same fashion as they were.
>
> *Facts-trump-speculation heuristic* – When faced with conflicting lines of evidence relating to a phenomenon, order them according to a predefined (but possibly implicit) hierarchy of evidence (cue validities), and treat the highest ranked line of evidence as true (MacGillivray 2014: 1720).

Heuristics have also been defined as "automatic, stereotyped behaviour" (Cialdini 2001: 7) – in the sense that ways of making decisions in a particular micro-culture can be done in pretty much thought-free ways. Heuristics help us function in a complicated world – we have to make assumptions in order to cope with the competing demands on our cognitive capacity. As Cialdini puts it:

> Without these features we would stand frozen – cataloguing, appraising, and calibrating – as the time for action sped by and away. From all indications, we will be relying on these stereotypes to an even greater extent in the future. As the stimuli saturating our lives continue to grow more intricate and variable, we will have to depend increasingly on our shortcuts to handle them all (Cialdini 2001: 7).

Heuristic processes are developed to try and impose synthesised cognitive stability and predictability on the world (i.e. commonsense). Decision-makers in

the West, for example, believe that they should not make any major decision without as perfect a quantity and quality of information as possible. This is their commonsense, bounded by heuristic constraints of their own making. Of course, by the time this point has been reached, most opportunities to exercise freedom of manoeuvre or shape the consequence of events have eroded. And yet 'secondary elaborations' will often absolve them of any responsibility for a poor outcome.

Other versions of these 'psychological traps' include acknowledging and valuing only evidence that confirms (rather than contradicts) a preferred view of reality; the continuing of a course of action because of the level of investment already sunk, and so on (see below). In addition, the draw of these traps is enhanced under conditions which prevail in crises: incomplete and inconsistent information, cognitive and physical stress effects, the challenge of multiple demands, new situations and knowledge, scrutiny from peers, the media and so on.

In striving to grow the cyber-resilience of organisations, exercises should provoke stressful or other conditions to encourage the fall-back to inappropriate heuristics and enable the recognition and correction of unhelpful behaviours. These heuristic traps could be encouraged, generated and baited – to shape situational awareness and manage choice architecture. Often, these heuristic tendencies and traps are organisational and individual ***Defaults***: under specific circumstances, individual 'a' tends to make a snap decision, then commit to it, explain it by recourse to 'x', 'y' and 'z' (and so on). Diagnosed in a safe environment (e.g. a simple table-top exercise or an FDREx, see Hills 2015 for an outline of how these can be done cheaply and repeatedly), appropriate treatments can be developed to allow individuals to see the traps that they have been drawn to.

Although damaging enough in isolation – the flaws in generating situational awareness can mesh with one another. Hammond, Keeney & Raiffa give the example of a situation where:

> [a] dramatic first impression might anchor our thinking, and then we might selectively seek out confirming evidence to justify our initial inclination. We make a hasty decision, and that decision establishes a new status quo. As our sunk costs mount, we become trapped, unable to find a propitious time to seek out a new and possibly better course. The psychological miscues cascade, making it harder and harder to choose wisely (Hammond, Keeney & Raiffa 2006).

In reviewing events, even if a decision-maker's actions and assumptions have proven to be faulty, dominant personal and institutional cultures mean that they tend to then deploy 'secondary elaborations' to explain why there are other aspects that should bear the blame. A failure that is outwith the decision-maker's control will be said to have undermined the ability of that individual to function as they would have wished. This protects the individual and their surrounding system from being seen to have failed – the wider confidence in the stability and predictability of the ways in which things are done must be protected.

There are normally few opportunities for challenge built into individual and organisational heuristics. These are very simple rules designed to avoid the need to evolve new solutions to problems or require new intellectual effort to make sense of a situation. We look for patterns that confirm that a new event is the same as (or similar to) a prior one. Information which does threaten these patterns is very likely to be dismissed – unless an organisation or individual has implemented challenge into its operating procedures..

We need to know when we should question or retire a heuristic to enable sensible decision-making, *or* know how to make a context over-complicated for an opponent, such that they are very likely to use inappropriate heuristics. Take the example of the growth of self-proclaimed experts who drive and shape consumer and other behaviour. As Cialdini puts it, citing others, "we frequently ignore […] arguments and allow ourselves to be convinced just by the expert's status as 'expert.' This tendency […] can be referred to as controlled responding (Chaiken & Trope, 1999)". Sometimes this tendency is harmless or helpful, but if

presumed experts are actually unqualified and / or unreliable – this can be deadly dangerous to decision-making. Again, in the operational context we may wish to maintain the influence of such advisors to an adversary.

Certain occupations and individuals have developed formal means of avoiding such heuristic traps and we can all learn and develop analogues of these. For example, pilots are trained to know that an object which appears fuzzy may actually be closer than it is perceived. As Tversky and Kahneman put it: "distances are often overestimated when visibility is poor because the contours of objects are blurred. On the other hand, distances are often underestimated when visibility is good because the objects are seen sharply" (Tversky and Kahneman 1974: 1124). Exercises and post-event analysis should train the capability of individuals and teams (in and before crises) to avoid tempting and automatic heuristic traps. Of course, in the real world, a smart adversary would seek to ensure that heuristic traps are maintained until a time of their choosing.

THE POWER OF BELIEF, EMOTIONS AND ATTENTION

When committed to an idea, being able to retain objectivity and self-reflexivity such that one adapts or drops that belief when circumstances change is of vital importance. Generally, however, what happens is that individuals and groups perpetuate belief in something even when it is patently no longer tenable. This is a further example of how beliefs change perception and even drive physical and psychological reality. This power difficult to exaggerate. Take an anthropological description of the effects of belief in the efficacy of a curse, for example:

> Cannon showed that fear, like rage, is associated with a particularly intense activity of the sympathetic nervous system. This activity is ordinarily useful, involving organic modifications which enable the individual to adapt himself to a new situation. But if the individual cannot avail himself of any instinctive or acquired response to an extraordinary situation (or to one which he conceives of as such), the activity of the sympathetic nervous system becomes intensified and disorganized; it may, sometimes within a few hours, lead to a decrease

> in the volume of blood and a concomitant drop in blood pressure, which result in irreparable damage to the circulatory organs. The rejection of food and drink, frequent among patients in the throes of intense anxiety, precipitates this process; dehydration acts as a stimulus to the sympathetic nervous system, and the decrease in blood volume is accentuated by the growing permeability of the capillary vessels. These hypotheses were confirmed by the study of several cases of trauma resulting from bombings, battle shock, and even surgical operations; death results, yet the autopsy reveals no lesions.
>
> There is, therefore, no reason to doubt the efficacy of certain magical practices. But at the same time we see that the efficacy of magic implies a belief in magic. The latter has three complementary aspects: first, the sorcerer's belief in the effectiveness of his techniques; second, the patient's or victim's belief in the sorcerer's power; and, finally, the faith and expectations of the group" (Levi-Strauss 1963: 168)

Imprisoned in a choice architecture that provides no alternative explanation other than that the curse will have the sorcerer's desired effect, the victim produces their own physical impact from purely psychological drivers of fear. Devastated by a perceived reality – victims have no choice but to die.

A publication commissioned by the UK Cabinet Office explores how more benign use of ideas can help policy-makers and regulators be more effective in changing how people make decisions. One section deals with emotion:

> Affect (the act of experiencing emotion) is a powerful force in decision-making. Emotional responses to words, images and events can be rapid and automatic, so that people can experience a behavioural reaction before they realise what they are reacting to. Moods, rather than deliberate decisions, can therefore influence judgments, meaning they end up [making decisions that are] contrary to logic and self-interest. People in good moods make unrealistically optimistic judgments, whilst those in bad moods make unrealistically pessimistic judgments (Mindspace 2010: 25).

However, it should also be possible to make use of the fact that *judgments can equally influence moods*. Individuals can be expected to make the judgments that deliver a feeling of satisfaction. These decisions may not actually be of the best quality either. Whilst humans like to think of themselves as neutral, rational and

scientific in their Observation, Orientation, Decision-making and Action (OODA, after Boyd), this is often very far from the reality of how decisions are made. The psychological traps outlined above, for example, tend to be perceived as inescapable and generate massive commitment, not least because group and individual thinking is suffused with emotion. Individuals in organisations tend to lack courage and fear the consequences of challenging dominant views (whether in the cockpit of an airliner, the boardroom of a company or the leadership of an insurgent group).

Removed from the situation (de-immersed) or with the benefit of hindsight, individuals may see that they made the wrong decisions despite the presence (possibly overwhelmingly so) of alternative options and contradictory information. But under stress and with their emotions in full play – they made decisions which were sub-optimal. Sticking with Sunk Costs, desperation for Confirming Evidence and the temptation of easy approaches to a badly framed problem are all the output of an emotionally-anchored commitment. Individuals and groups receive positive reinforcement (i.e. feel good or righteous or sensible) from being in the grasp of these traps because, at the cognitive level, *they need reality to be what they hope it is rather than what it actually is*.

The molecule dopamine is relevant here. This neuromodulator - and the areas of the brain in which it is produced - are "involved in normal brain functions such as working memory, reinforcement learning, and attention" (Fellous and Suri 2002: 1). Typically, dopamine is released in response to a situation associated with enjoyment: providing the reinforcement that allows us to learn via the reward of praise. It is also involved in the cycle of addiction – being released (after a possibly complex series of processes in the brain) after the physiological addiction is met or as part of psychological addiction. The feelings of pleasure or satiation may be generated by endorphins themselves triggered by dopamine:

> In other words, the dopamine in the reward pathway may make you crave drugs or alcohol or sex or a symphony, and it may also reinforce habitual drug use, sex, or symphony listening, but it is not responsible

> for the pleasure you get from these activities. The pleasure which we get from these things seems to involve neurotransmitters called endorphins and to involve hedonic hot spots (Hamsnetwork, undated)

If dependence is acquired – to any potentially addictive activity, substance or default way of handling a decision – then an individual becomes motivated to seek the reward of sating cravings. There is no reason why in decision-making, individuals may have become dependent on the pleasure generated by sticking with what they know, with pursuing sunk costs and meeting the expectations of simplistically framed issues.

In other words – the psychological traps and defaults to an inappropriate commonsense described earlier – can be usefully seen as forms of addictive and dependent behaviour. If we swop out substances (e.g. alcohol) for powerful ideas and patterns of behaviour (e.g. Defaults) – just as alcohol impacts on a range of different neurotransmitters producing a range of neurological effects, so too could powerful ideas (commonsense) and patterns of behaviour (heuristics) generate dependence and be defended from challenge. Reality is mis-perceived, from the level of chemicals in the brain.

Negating an emotional reward, providing an alternative and better emotional reward or depressing mood to make decisions more (or less) rewarding are all speculative approaches that could be planned and deployed. The author has published conceptual research which explores whether recruitment to problematic behaviours (suicide bombing and unethical employee actions) could usefully be seen as the result of ‘infection’ by powerful bundles of memes (ideas) which change the emotional reward pathways, values and standards, sources of trusted information and so on for individuals and small groups (see Hills 2012 and 2014).

Making use of how emotions intersect with the choice architecture of an individual is potentially valuable in the operational context. The power of information that leverages emotion has been demonstrated in the commercial domain:

> including a picture of an attractive, smiling female increased demand for [a] financial product by the same amount as a 25% decrease in the loan's interest rate.
>
> [In Ghana, an] intervention campaign focused on provoking disgust rather than promoting soap use [in order to sell soap]. […] This led to a 13% increase in the use of soap after [visiting] the toilet and [a] 41% increase in reported soap use before eating (Mindspace 2010: 26).

These are encouraging signs, but clearly the need is to build on this evidence to produce approaches and outputs that deliver meaningful effects in more challenging real-world environments, including being able to introduce new thoughts and actions into target micro-cultures. This objective is made even more potentially beneficial given that emotion is strongly linked with attention.

DIVERTING OR FOCUSING ATTENTION WITH EMOTION

In a crisis management or commercial environment, "[u]nderstanding and managing attention is now the single most important determinant of business success" (Davenport and Beck, cited in RSA 2011: 26). Training individuals to maintain attention in appropriate directions is a challenge to businesses and public sector organisations – in operational scenarios, the ability to understand and manage others' attention *away from* or toward the most important decisions and directions could be extremely useful. Skimming through the clinical literature, it is clear that there are a number of ways in which emotion affects the attentiveness of decision-makers:

> In rats in vivo, stimulation of the ventral tegmental area or local application of dopamine decreases the spontaneous firing of the prefrontal cortex (Thierry et al., 1994), striatum and nucleus accumbens (Nicola et al., 2000), suggesting that dopamine may be able to control the levels of noise, and hence signal-to-noise ratios (Fellous and Suri 2002: 2).

In other words, levels of the neuromodulator dopamine affect how and whether noise is interpreted. In the decision-making context, then, this could be another way in which contradictory information ('noise') is ignored, not even acknowledged by those, for example, stuck fast on the psychological trap of

seeking only confirming evidence. Repeated exposure to the emotional payback of what's come to be seen as the commonsense, no-alternative-approach-exists has so shaped the reward pathway in the decision-maker's brain that facts or truth that need to be heard are ignored as 'noise': their content isn't even recognised as relevant to the issue at hand. A comprehensive means of achieving and maintaining this outcome in an operational context could be useful.

The clinicians mentioned above, exploring the way in which disorders such as Attention Deficit Hyperactivity Disorder (ADHD) play out in the brain, have concluded that those with ADHD do not lack the ability to be attentive: it's just that their attentiveness is directed in a *different way*:

> There's a highway of nerves connecting the dopamine reward pathway to the prefrontal cortex, a crucial fold of tissue that controls the spotlight of attention. This makes perfect sense: A sensation or idea that triggers more dopamine release – it's deemed worthy of more ***neural currency*** – is more likely to get noticed, and enter the crowded theater of consciousness. In other words, the prefrontal cortex is now paying attention. ***The chemical has told us what we should notice*** (Lehrer 2010, emphases added).

For decision-makers, then, they are attentive (possibly in obsessive detail) to things that they have decided (because they feel rewarded by doing this) are priorities and seek specific signals from noise. In responding to a crisis, leaders often become involved in distracting 'busy work' or tedious detail: offering a running-commentary on broadcast TV news or personally drafting a mundane press release. Attention is mis-directed, but not necessarily as a result of entirely deliberate thought. Scarce energy of the individual and their team(s) is focused on something that will provide short-term reward (dopamine feedback, sense of achievement, 'buzz') – even though this may ultimately be rewarding extremely undesirable or unadaptive behaviour. Heuristics and defaults are difficult to resist because, at the molecular level, decision-maker brains are being directed to invest attention in ways which guarantee dopamine feedback. Commitment is social and chemical.

Supporting those observations is a significant amount of psychological literature that describes the effects of emotional arousal on perception: in general, attention becomes fixated on micro details (or cues), making all else peripheral. Easterbrook's cue utilization theory, for example, holds that once at a high degree of arousal, attention will be focused to sensitivity to a narrow range of cues.

Martin, Schrock, Leaf and Rohr introduced the notion that organisations have states of morale or "emotion cultures that consist of languages, rituals, and meaning systems, including rules about the feelings workers should, and should not, feel and display" (2008: 46). Organisational psychologists have developed the idea of *emotional labour* to describe the effort that employees, for example, have to invest to meet the requirements of the company. Organisations, their security, cyber and other functions should be cognisant of the effects on resilience and crisis management of the emotional health of their workforces. It is a cliché to state that 'culture' is at the heart of all that a company or other institution does – but that does not meant that it isn't true, nor that the emotional state of groups and individuals isn't incredibly important. The worn-down, susceptible individual could be targeted or created by an adversary (or just exploited by those who can find those in such a condition). Just as security is everyone's business, so too security depends on the psychological resilience of individuals.

OTHER INFLUENCES ON DECISIONS

The literature on decision-making is vast and most of it invulnerable to conversion to practical use. However, there are some lines of investigation that could be helpful. For example, the recognition that a good many decisions made by consumers and others are actually reached irrespective of details that are objectively associated with the issue. This has been described as a situation where, in relation to climate change beliefs for example, "individuals are sensitive to normatively irrelevant features of the judgment context, including transient temperature abnormalities [such as a warm summer or cold winter)" (Zaval and

Cornwell 2014). In other words, a cold winter makes maintaining or converting to a belief in global warming more difficult.

By understanding the choice architecture around an individual, we should be able to understand or generate some certainty about means of influencing a decision by making use of non-directly related informational or emotional content. The idea might be to stimulate a heuristic decision by highlighting / making more attractive those features of the issue which are "normatively irrelevant" – also known as 'attribute substitution' (Kahneman & Frederick, 2002). Countering established ideas or narratives in a commonsense worldview may require finding **irrelevant but influential** ways of framing and out-competing those ideas or narratives.[2]

Lakoff, a political campaign consultant in the US, notes that there can be said to be two levels of frams: surface and deep (Lakoff 2006). Surface frames key into and depend on the existence of deep frames. Therefore, when economists speak of a stock exchange as being like a steam engine, politicians of a war on drugs – deep frames are linked with the use of imagery and analogy, metaphor and the like. As Lakoff puts it:

> Surface frames are associated with phrases like "war on terror" that both activate and depend critically on deep frames. These are the most basic frames that constitute a moral worldview or a political philosophy. Deep frames define one's overall "common sense." (*Ibid.:* 10).

From an influence standpoint, Lakoff reaches the conclusion that "Simply negating the other side's frames only reinforces them" (*Ibid.*: 14). Therefore, if we wish to encourage others to alter their opinion, this cannot be done simply, or only, by falsifying their beliefs: no matter how much fact and emotion that is deployed, effect is unlikely to be achieved. As he puts it:

[2] Readers may wish to reflect on recent political developments for evidence of the effectiveness of this.

> If you believed in rationalism, you would believe that the facts will set you free, that you just need to give people hard information, independent of any framing, and they will reason their way to the right conclusion.
>
> We know this is false, that if the facts don't fit the frames people have, they will keep the frames (which are, after all, physically in their brains) and ignore, forget, or explain away the facts.
>
> The facts must be framed in a way to make sense in order to be accepted as a basis for further reasoning. […] Frame or lose (Lakoff 2006: 15).

There are many examples where attempting to simply negate (refute or rebut) a narrative or belief leads to counter-productive consequences. Discussing the American citizens who have convinced themselves that President Obama is actually a practising Muslin, Nyhan *et al.* note that:

> One possible explanation for the general failure of corrections is that their semantic construction makes "unlearning" false information more difficult. Corrections often take the form of a negation (e.g., "Tom is not a criminal"). However, psychologists have shown that negations can actually strengthen associations between the subject and the concept being negated (Mayo et al. 2004, Wegner et al. 1981) and thereby reinforce the original claim. As such, it might be more effective to affirm the truth without reinforcing the false claim (e.g., "Tom is a law-abiding citizen") (Nyhan *et al.* 2013: 1).

In the operational context, these might be simple but helpful tips to avoid unnecessarily embedding or foregrounding an adversary's beliefs, narratives or perceptions.

INTRODUCING WASTES INTO A TARGET SYSTEM

The 'lean' approach to production has been used widely in Western industrial contexts. Increasingly, its use has been extended into non-production functions (e.g. Human Resources). The core idea around lean is that all forms of waste are minimised. The concept has been credited with the triumph of the Japanese car industry and optimised global supply-chains. The eight key forms of waste are: Defects, Rework / correction, Inspection, Waiting, Unnecessary inventory, Transport / conveyance, Over-processing, Misuse of talent.

With a little imagination, the idea of lean can be reversed, in order to plan ways that an adversary might seek to impose costs to our target system. For example, if a target becomes concerned that information it receives is unreliable or that key resources may be compromised with covert devices – extra effort and disruption is caused as they either check the information / materiel or make alternative arrangements.

Note that – from the author's experience – even the most well-run of organisations unwittingly generate versions of the eight wastes when they attempt to manage any situation involving risk, crisis or uncertainty. Promoting such a situation in a target by disrupting certainties or generating cognitive challenge (e.g. a series of normal and novel challenges to deal with) could impede the processing of the core work of that system. Those charged with developing cyber (or any) resilience, security and crisis management arrangements should embed the possibility of such actions into their planning and testing.

A WORST CASE SCENARIO: *SHASHOUJIAN*

The PLA's notion of the 'Assassin's Mace' is that of producing a completely surprising and overwhelming effect on a target that makes continuation of their courses of action impossible. In this paper's terms, then, this would require undetected and subtle intervention in choice architecture – followed by a devastating reveal or exploitation.

Bruzdzinski captures the sense:

> the defeat of an adversary by a single fatal strike or "death blow" is the intended outcome of a *shashoujian* strike. Ideally, such a strike is executed with foreknowledge. It comes deceptively and swiftly, and without any perceptible indication or warning to alert the enemy. If employed perfectly, a *shashoujian* strike kills the adversary instantly, without the victim ever seeing it coming. The grim result is final and irreversible. […] Effective *shashoujian* strikes on the key nodes of a superior adversary can cause paralysis and initiate the disintegration of a superior force (Bruzdzinski 2004: 345).

The areas that have been detailed in this chapter comprises the 'key nodes' of how an adversary might model a taret. Aligning effective exploitation against these makes use of heuristic and other vulnerabilities. Having ensnared individuals within the organisation in advance could enable the delivery of such an 'assassin's mace' at a time of the attacker's choosing: perhaps during the CEO's annual speech to shareholders or another market sensitive moment. A plausible scenario, for example, might involve the medium-term development of compromised individuals within an organisation or its supply-chain. Without naming names, it is very evident that recruiting such individuals is much easier than one would hope. For example, in the UK we have seen a Government Minister resign after they have been persuaded to share intimate pictures with an individual with a plausible profile of a political party worker – who has been in contact only via Twitter and over a very short period of time. Although this exploitation was for the purposes of journalistic inquiry, the motive could of course be for very different intent and deployed to considerably more injurious effect. Consider, for example, the Minister or senior member of the hierarchy of a strategic business or privately-operated part of the critical national infrastructure who is compromised, his personal and professional circle is accessed and compromised and against which some or many of these are then subject to blackmail or other hard influence. These are, perhaps, traditional forms of tradecraft for hostile intelligence services – but now the means are available to so many other forces and almost no one is prepared for their use. Truly, clever, human-centric, cyber-enabled attack has the potential of being crafted into a highly effective assassin's mace.

CONCLUSION

This chapter could be criticised for being negative. It is not intended as such. Peppered through it are hints and suggestions for how insights could be incorporated into the security reviewing and exercising of organisations large and small, private and public, at threat and apparently beyond threat. The subtext is

intended to be that organisations can and should accrue competitive advantage by recognising that their decision-making competences are vulnerable to the imaginative and determined adversary. The use of fast, frequent and cheap exercises to enhance scanning for threats placed (or placeable) within an organisation and to supplement the situational awareness, alertness and robust response of individuals and structures is recommended. In addition, as some private sector organisations do already, the testing of key individuals against a suite of 'red team' attempts to compromise them should be considered.

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