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Analysis by Team – A Tool for Mitigating Mistakes in Intelligence Analysis

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Purpose:

In this paper, we will examine various causes of error in intelligence analysis and then propose a solution to combat or mitigate them.

Design/Methods/Approach:

We reviewed the literature of relevant primary and secondary sources on mistakes in intelligence analysis and efforts to mitigate them. Additionally, we use the synthesis method to propose a solution.

Findings:

Analysis by team was recognized as a valuable tool in mitigating mistakes in intelligence analysis. Intelligence analysis is a cognitively intense activity, subjected to cognitive biases and analytical mistakes. Mistakes and biases can be further exacerbated by the pressures on intelligence analysts stemming from uncertainty, denial and deceptions, secrecy and the need for timeliness. Because of these limitations and challenges, individuals often struggle to recognize their own mistakes, but are still able to identify them in other people. As a solution to this, analysis by team is proposed. However, working in groups can lead to risks such as groupthink and polarization. For that reason, analytical groups have to be properly selected, structured and managed.

Research Limitations/Implications:

Besides the secret nature and, therefore, limited access to information, there is also limited empirical research on the efficacy of the methods and techniques used by intelligence analysts.

Practical Implications:

In the paper, we present a practical solution for mitigating mistakes by intelligence analysis, which can be used by professionals from other fields of national security as well as in the business environment.

Originality/Value:

This paper seeks to present the most viable tool to combat or mitigate mistakes in analytical or investigative work. Analytical findings and conclusions are meant for national security and law enforcement professionals and decision makers. More effective and rigorous analysis can therefore support better decision making.

Keywords: intelligence, intelligence analysis, analytical mistakes, cognitive biases

UDC: 351.746.1

Skupinska analiza – orodje za zmanjšanje napak v obveščevalni analitiki

Namen prispevka:

V prispevku bomo raziskovali različne vzroke napak v obveščevalni analitiki ter predstavili možne rešitve za zmanjšanje teh napak.

Metode:

Pregledali in analizirali smo primarne in sekundarne vire literature na področju napak v obveščevalni analitiki ter poskuse zmanjšanja teh napak. Za izdelavo predloga rešitev je bila uporabljena metoda sinteze.

Ugotovitve:

Analitične skupine so se pokazale kot ustrezno orodje za zmanjšanje napak v obveščevalni analitiki. Obveščevalna analitika je kognitivno intenzivna dejavnost, ki je podvržena kognitivnim pristranskostim in analitičnim napakam. Napake in pristranskosti dodatno krepijo tudi pritiski na obveščevalne analitike, ki izhajajo iz negotovosti, zanikanja in prevar, prikrivanja ter zahtev po pravočasnosti. Zaradi teh omejitev ter izzivov posamezniki pogosto niso zmožni prepoznati lastnih napak, še vedno pa so sposobni prepoznati napake drugih. Kot rešitev predlagamo uporabo analitičnih skupin. Ker je delo v skupinah lahko tudi problematično, na primer skupinsko razmišljanje ali polarizacija, morajo biti analitične skupine ustrezno izbrane, strukturirane ter vodene.

Omejitve:

Poleg tajne narave in s tem omejenega dostopa do informacij obstaja tudi omejeno število ustreznih empiričnih raziskav o učinkovitosti metod in tehnik obveščevalne analitike.

Praktična uporabnost:

V prispevku smo predstavili praktično rešitev za premagovanje ali zmanjšanje napak v obveščevalni analitiki, ki se lahko uporablja na drugih področjih nacionalne varnosti kot tudi v poslovnem svetu.

Izvirnost/pomembnost prispevka:

Prispevek poskuša predstaviti najučinkovitejše orodje za zmanjšanje napak na analitičnem ali preiskovalnem področju. Ugotovitve so namenjene strokovnjakom na področju nacionalne varnosti, organom pregona ter odločevalcem. Učinkovitejša in natančnejša analiza lahko namreč prispeva k boljšim odločitvam.

Ključne besede: obveščevalna dejavnost, obveščevalna analitika, analitične napake, kognitivne pristranskosti

UDK: 351.746.1

1 INTRODUCTION

As intelligence analysts engage in analysis, their work often succumbs to pitfalls common to all people, such as making mistakes in their judgement. Mistakes happen for various reasons, such as a lack of full information, logical fallacies or cognitive biases, confirmation bias being most known and common. No matter the cause, mistakes can influence the overall quality of analytical processes and final intelligence products. In this paper we will examine some causes of error in intelligence analysis and then propose solutions to combat or mitigate them. We reviewed the literature of relevant sources on this topic, and through the synthesis method come to propose using teams to mitigate and reduce mistakes in intelligence analysis.

Intelligence analysis is an essential part of the intelligence process. Also known as the intelligence cycle, it includes planning (or direction), collection, processing, analysis, and distribution. Its main function is identifying problems, collating open source or classified data and information, generating, and evaluating hypotheses, recognizing patterns, aggregating information, and presenting final intelligence products in the form of explanations, assessments, and foresight to policymakers (Straus et al., 2011). Office of the Director of National Intelligence [ODNI] (2015) set up five analytical standards for the U. S. intelligence analyst community to follow. According to these standards, intelligence analysis should be objective, independent of political consideration, timely, based on all available sources, and should implement and exhibit nine analytic tradecraft standards[1]. Of course, these are ideal standards, something for analysts to strive for, but often hard to achieve.

Intelligence analysis differs significantly in some respects from other information gathering and processing activities. Johnston (2005, p. 4) defined intelligence analysis as "*the application of individual and collective cognitive methods to weigh data and test hypotheses within a secret socio-cultural context*". This also means that intelligence analysis, besides cognitive properties, is also challenged by several limitations and pressures not always common in other analytical professions. Such issues stem from uncertainty, denial and deceptions, secrecy and most of all, time constrains. Taken together, these challenges can have a profound effect on the mistakes and, consequently, on the quality of an analyst's work. Although in this paper we will focus on intelligence analysis, the described cognitive limitations, analytical mistakes, and possible solutions to mitigate them can likely also be applied to criminal investigations[2] and national security investigations, such as counterintelligence and counterterrorism.

1 *The nine analytic tradecraft standards are: (1) description of the quality and credibility of underlying sources, data and methodologies; (2) expression and explanation of uncertainties associated with major analytic judgments; (3) distinguishing between underlying intelligence information and analysts' assumptions and judgements; (4) incorporating analysis of alternatives; (5) demonstrating customer relevance and addressing implications; (6) using clear and logical argumentation; (7) explaining changes to or consistency of analytic judgements and bringing significant differences in analytical judgement to the attention of consumers; (8) making accurate judgments and assessments; and (9) incorporating effective visual information where appropriate (ODNI, 2015).*

2 *Institutions should be vary of scientifically unjustified techniques, as already emphasized by Areh's (2013) critique of certain methods and tools in interrogation practices. The absence of scientific justification or even contradiction can result in biases and faulty outcomes.*

2 SOURCES OF ANALYTICAL MISTAKES

Some mistakes are unavoidable due to the complex and unknowable nature of some subjects, but some can be prevented or at least identified and their effect mitigated or reduced through proper processes. Mistakes can happen at all stages of intelligence cycle and they can lead to intelligence failures.[3] Some argue that intelligence failures are in fact analytical failures (Britten, 2018). As intelligence analysis is recognized as a cognitive decision-making process (Straus et al., 2011), it is inevitably affected by cognitive properties and limitations common to all thinking people, meaning they can make mistakes. Kahneman (2011) in his simplified version of human cognition writes about two types of thinking: "*System 1*" and "*System 2*". "*System 1*" represents our brain's unconscious, automatic and emotional responses, while "*System 2*" represents the slower, logical, and more intensive mode of thinking. Although he emphasizes that no system is perfect or fully rational, the main idea is that deliberate thinking of "*System 2*" requires more effort, resources, and time. Because intelligence analysis is being conducted in a fast paced and time constrained environment, it is harder for an individual analyst to stay in the "*System 2*" thinking mode.

The particular working environment can further expose intelligence analysts to cognitive biases and lead them to make mistakes in their judgements and final analytical products. Heuer (1999) was one of the pioneers exploring psychological factors, including cognitive biases, affecting the quality and work of intelligence analysis. He found the human mind to be ill-equipped in dealing effectively with uncertainty, and that people (intelligence analysts) have mental models or mindsets that make them interpret the same information in different ways. Biases and fallacies therefore represent a significant challenge to intelligence analysis, which is not unknown to analysts themselves. In a short survey, Pherson and Boardman (2017) asked intelligence analysts to list the top cognitive biases and intuitive traps they believe they were most susceptible to when conducting their analysis. Analysts listed confirmation bias (67%) as number one, followed by anchoring effect (56%), desire for coherence and uncertainty reduction (56%), satisficing (56%), mental shotgun (44%), and vividness bias (44%).

Belton and Dhami (2020) reviewed the literature in this field and identified at least 21 key biases that could affect individual analyst's work, of which eight have been particularly meaningful for each stage of the analytical workflow. They divided the analytical workflow into six stages: (1) capture requirement (understand the context); (2) plan analytic response (alternative methods and prioritization); (3) obtain data (selecting and verifying data and sources); (4) process data (analytical tools and techniques); (5) nterpret outputs (assessments); and (6) communicate conclusions (presenting). The most common bias was confirmation bias, identified in all but two stages: planning analytical response and communicating conclusions. But what exactly are cognitive biases and where

3 *There remain debates if these are, in fact, intelligence failures or not, but most known from the U. S. perspective include: the attack on Pearl Harbor (1941); the Bay of Pigs Invasion (1961); the Tet offensive (1968); the Yom Kippur War (1967); the Iranian revolution (1978); the Soviet invasion of Afghanistan (1979); the collapse of the Soviet Union (1991); the Indian nuclear test (1998); the 9/11 attacks (2001); and the Iraq War (2003) (Friedman, 2012).*

do they come from, and most important of all, how can they be mitigated in intelligence analysis?

The term "*cognitive bias*" was introduced by Tversky and Kahneman (1974). They described cognitive bias as people's systematic but allegedly flawed patterns of thinking and irrational responses to decision-making problems. According to them, biases or systematic errors occur due to mental shortcuts or heuristics people use in uncertain situations. They recognize three types of heuristics: (1) representativeness, which causes us to miscalculate probability by paying more attention to similarity; (2) availability, where we rely on information that comes to mind quickly or is most available to us; and (3) anchoring, where we rely too heavily on the first piece of information we receive on a topic.

There has been a surge in identified biases since then. Buster Benson (2016) collected over 200 known biases[4], organizing them according to four main problems: (1) there is too much information; (2) there is not enough meaning; (3) there is not enough time and resources; and (4) there is not enough memory. Intelligence analysts would likely recognize these problems, but would add another problem, namely, there is not enough information, as some is hidden (secrets) and some is unattainable (mysteries) (Nye, 1994).

Galef (2021) suggested that what hinders people to see more clearly and think more rationally is their mindset. A prevailing mindset in people is what she called a "*soldier mindset*", suggesting that thinking is similar to defensive combat. In this mode of thinking, we focus on defending our preconceived views. We attack our opponent's points of view while we fortify and defend ours. Consequently, changing our minds feels like a defeat in a battle. The idea behind "*soldier mindset*" is derived from the "*motivated reasoning*", where our unconscious motivations shape the way we interpret information. Accordingly, people are often motivated to arrive at conclusions they wished to be true (Kunda, 1990). Motivated reasoning is interlinked with biases, most commonly with confirmation bias, which Nickerson (1998, p. 175) defined as "*the seeking or interpreting of evidence in ways that are partial to existing beliefs, expectations, or a hypothesis in hand*". Others (Mercier & Sperber, 2011) preferred and proposed the term "*myside bias*" to "*confirmation bias*". According to them, the term is a better explanation of people's behaviour, because people tend to confirm or deny evidence and hypotheses that go against them or "*their side*" in a debate, rather than blindly confirming beliefs or ideas that come to their mind. Furthermore, Oeberst and Imhoff (2023) argue that several known cognitive biases can actually be traced back to the combination of a fundamental prior beliefs[5] and people's tendency toward belief-consistent information processing (confirmation/myside bias).

Awareness about this kind of cognitive phenomena is not new. The Greek writer Thucydides (431 B.C.E./2008, p. 282) wrote in 5th century B.C.: "…and their judgment was based more upon blind wishing than upon any sound prediction; for it is a habit of mankind to entrust to careless hope what they long for, and to use sovereign reason to thrust aside what they do not desire". Later in the

4 *Gigerenzer (2018) on the other hand challenged the prevailing cognitive bias hype and suggested a "bias bias", which he described as the tendency to spot biases even when there are none.*

5 *According to Oeberst & Imhoff (2023) the fundamental prior beliefs are: (1) My experience is a reasonable reference; (2) I make correct assessments of the world; (3) I am good; (4) My group is a reasonable reference; (5) My group is good; and (6) People's attributes (not context) shape outcomes.*

17th century A.D. Francis Bacon (1620, p. 23), often called the father of scientific empiricism, also noticed people's tendency to seek evidence to support their judgments and dismiss contrary evidence: "The human understanding, when any proposition has been once laid down (either from general admission and belief, or from the pleasure it affords), forces everything else to add fresh support and confirmation; and although most cogent and abundant instances may exist to the contrary, yet either does not observe or despises them, or gets rid of and rejects them by some distinction, with violent and injurious prejudice, rather than sacrifice the authority of its first conclusions." This begs the questions: why do we do this, and where does this tendency come from?

Mercier and Sperber (2011) argue that mankind's ability to reason was not selected by natural selection for people to be good at finding out the truth about the world, but to use reasoning to effectively argue and win arguments with other people. The main point is to persuade. Reason helped our ancestors to live and thrive in a socially complex environment. A person needed to be skilled in persuasion and to use arguments to convince others in making choices. If he or she was successful, their reputation and wellbeing followed suit. On the other hand, reasoning helped individuals to be wary of other people's arguments, recognizing faulty reasoning and effectively countering arguments. Mercier and Sperber (2011) called this "*argumentative theory of reason*". Similarly, Haidt (2012) explains that people are primarily motivated by their intuitions or preconceived notions, while rational thought comes after beliefs are already established. People are very good in finding rational justifications and evidence for their position, but are often blind to see even the most obvious contrary evidence or arguments. This led to the development of the "*Moral foundations theory*" (Graham et al., 2013), which intends to explain the origins of and differences in human moral reasoning based on innate moral foundations[6]. Cusimano and Lombrozo (2021) discovered that individuals often endorse and feel justified in believing morally desirable propositions, even when they perceive a lack of evidence for them. These *"morally desirable biases"* lead people to adhere to illogical tendencies or even take pride in them, particularly when the evidence supports ideas they find morally objectionable.

Since we employ strategic reasoning to justify our preferences, it exposes us to confirmation bias. This tendency is particularly noticeable in political and moral discussions, further amplifying our biases and mistakes in reasoning. The analysis of diverse viewpoints and hypotheses constitutes a significant aspect of an intelligence analyst's work, rendering them susceptible to the aforementioned effects. Intelligence analysts, by virtue of being human, are not exempt from the cognitive properties and constraints inherent in the human mind.

3 EFFORTS TO MITIGATE MISTAKES

To mitigate mistakes and biases in intelligence analysis, some authors propose training in critical thinking, using logic and applying more scientifically derived

6 *Although Graham et al. (2013) are willing to accept modifications and changes, they currently recognize six moral foundations on which people differ and therefore reason: care/harm; fairness/cheating; loyalty/betrayal; authority/subversion; sanctity/degradation; liberty/oppression.*

methodology, especially hypothesis testing (Harris & Spiker 2012; Moore et al., 2020; Whitesmith, 2022). Harris and Spiker (2012) propose implementing critical thinking skills into four intelligence analysis functions: (1) assess and integrate information; (2) organize information into premises; (3) develop hypotheses; and (4) test hypotheses. Moore et al. (2020) advocates *"sensemaking"* in intelligence, which is a deliberate, ongoing effort to understand a situation and its causes. It closely resembles abductive thinking, that is, inferring the best possible explanation for a data set. Whitesmith (2022) proposes applying epistemology, specifically the *"justified true belief"* theory as an aspirational standard among intelligence analysts, with the aim being to promote the ability of intelligence analysis to produce more truth than falsehood. To better mitigate mistakes and biases in intelligence analysis, some argue that intelligence analysts should apply more methodological approach[7], using structural analytical techniques or SATs (Heuer & Pherson, 2014), while others argue that *"intuition based intelligence sense-making offers a way to comprehend those complex transnational threats whose speed, uncertainty, and interactivity defy traditional analytic approaches"* (Treverton & Fishbein, 2004, p. 3). This issue is commonly known as the *"science verses intuition"* debate in the intelligence community (Marrin, 2012).

Heuer and Pherson (2014) list over fifty-five SATs to be used by analysts, and arrange them in groups according to how they help an analyst overcome their cognitive limitations: decomposition and visualization; indicators/signposts/scenarios; challenging mindsets; hypothesis generation and testing; and group process techniques. While others (Artner et al., 2016) group them according to their purpose: diagnostic; contrarian; and imaginative. Dhami et al. (2016) identifies 75 SATs and groups them in thirteen primary functions[8]. They find that most SATs ultimately rely on the analyst and their subjective skills and inputs. Also, none of the SATs guarantee accurate or unbiased analytical judgement. The latter was recognized also by Jones (2017), meaning that there is likely no analytical technique that could be completely bias-free.

CIA's Directorate for Analysis (2009) published and presented twelve core analytical techniques their analysts use: key assumptions check; quality of information check; indicators or signposts of change; analysis of competing hypotheses (ACH); devil's advocacy; team a/team b; high-impact/low-probability analysis; "What if?" analysis; brainstorming; outside-in thinking; red team analysis; and alternative futures analysis. Of these twelve SATs, Chang et al. (2018) identifies status quo bias (preference to keep the current state of affairs) and confirmation bias as the two most common biases these SATs are supposed to mitigate.

In a systematic review, Coulthart (2017) examines the efficacy of the twelve core SATs from the perspective of rigor and accuracy. Devil's advocacy has the

7 *There is a strong tendency to develop software and apply other technological solutions, such as artificial intelligence, to overcome cognitive biases. Although such technology is useful in all stages of intelligence process it can nevertheless still be subject to human errors or biases. Technologies as such do not make analysts immune to cognitive biases and may in certain circumstances even facilitate it (Zanasi & Ruini, 2018).*

8 *These primary functions are: (1) generating ideas/scenarios/questions/hypotheses/options; (2) clarifying; (3) determining usefulness of data; (4) critiquing; (5) reducing disagreement or reaching consensus; (6) identifying/monitoring patterns/trends over time; (7) identifying/understanding (non-causal) relations; (8) identifying/understanding cause-effect relations; (9) hypothesis testing; (10) forecasting/prediction; (11) deciding/choosing; (12) constructing message; and (13) presenting message (Dhami et al., 2016).*

most credible evidence-base and highest efficacy. The ACH was found to be effective and have a highly credible evidence-base, but with less research studies. Brainstorming had mixed effectiveness and a moderately credible evidence-base. Alternative futures analysis was found to be effective in nearly every study, but its evidence-base had low credibility. Red team analysis also appears to be highly effective, but again, with low credibility evidence. Team A/Team B had a single study of low credibility. The other six core SATs had no evaluative research. Chang et al. (2018, p. 346) warn that although there were preliminary results showing some evidence that ACH, Devil's advocacy and brainstorming can be effective under certain conditions, they suggest that "*SATs as a whole warrant greater sceptical examination*". Chang et al. (2018) also claim that SATs fail to address the bipolar nature of biases, as efforts to reduce bias can lead to its opposite bias rising. SATs are also subjected to noise neglect, meaning that noise in the conclusions in different stages of analysis can infiltrate subsequent stages, leading to faulty final judgments.

One of the most common SATs proposed to mitigate the effect of confirmation bias is the analysis of competing hypotheses (ACH). ACH is an analytical technique developed by Richard Heuer (1999) whereby an analyst should identify a set of hypotheses, systematically evaluate data that is consistent and inconsistent with each hypothesis, and reject the hypotheses that contain too much inconsistent data. Dhami et al. (2019) claim that little evidence exists of how SATs are applied or whether they are effective. They tested the ACH and its effectiveness in reducing confirmation bias, but found mixed evidence for this. However, they did observe that ACH may increase errors in judgment. Whitesmith (2020) also criticized the use of ACH. She argues that the theoretical basis of the ACH method is flawed and that there is no empirical basis for its use to mitigate cognitive biases. Additionally, De Melo (2021) observes that despite its pervasiveness, ACH does not perform well in experimental tests. According to him the technique is not effective in mitigating biases or improving analysts' reasoning.

Whitesmith (2020) argue that cognitive biases are not learned behaviours and cannot be easily detected. They often occur without our awareness, on a subconscious level. In an interview with Frueh (2022) Kahneman also accepts that overcoming biases on an individual level is much too difficult, with not a lot of evidence to suggest otherwise. He suggests that he has more confidence in the ability of institutions to improve their thinking than in the ability of individuals. He also acknowledges the use of heuristics or mental shortcuts is not completely useless. Others scholars like Gigerenzer and Gaissmaier (2011) already claim that under uncertainty, heuristics can be proven to work better than the supposedly more structured or methodical thinking.

Additionally, some biases might not be biases at all. Biases have been found by researchers in laboratory experiments, however as Klein (2017) discovered, people are often quite good in making decisions in real world situations. He doubted that all mistakes can be neatly identified and attributed to faulty reasoning. For example, Zhong (2022) argues that when information is costly, the optimal strategy involves seeking confirmation of what you already believe to be true. The confirmation bias is therefore the solution to the problem of how

to efficiently allocate resources between different news sources, according to our preconceived beliefs. This led Page (2022) to claim that many apparent biases are actually good solutions to practical problems people face, meaning these biases are in fact adaptive solutions to real life situations.

Nevertheless, Galef (2021) proposes a solution in overcoming biases and mistakes, namely to change and nurture one's mindset. She proposes people embrace what she calls a "*scout mindset*". Apart from "*soldier mindset*", which sees the world through a combat mode, scout mindset bears a resemblance to the process of making a map. The mindset switch goes from trying to win to being as accurate as possible. New information, even if conflicting, is helpful in establishing a better and more accurate map of the world. The idea is to use motivated reasoning, but instead of winning an argument, the motivation should be truth itself. She recommends guidelines on how to become a better scout, such as: realizing that truth isn't in conflict with one's other goals; learning tools that make it easier to see clearly; and appreciate the emotional reward of the "*scout mindset*". She also recommends cultivating these habits, as avoiding or overcoming motivated reasoning is challenging (Haidt, 2012; Mercier & Sperber, 2011). Afterall, there is no guarantee that an individual intelligence analyst cannot fall back into the "*soldier mindset*".

4 MITIGATING MISTAKES USING ANALYTICAL TEAMS

That individuals more often recognize faults in others, but rarely in themselves, has been common knowledge since ancient times, as Aesop's story about two bags illustrates: *"Every man carries two bags about with him, one in front and one behind, and both are packed full of faults. The bag in front contains his neighbours' faults, the one behind his own. Hence it is that men do not see their own faults, but never fail to see those of others"* (Aesop's fables, ca. 2500–2750 B.C.E/1912, p. 60.). People's tendency to see faults in others but not in oneself was also observed in the Bible: "*And why beholdest thou the mote that is in thy brother's eye, but considerest not the beam that is in thine own eye?"* (King James Bible, 1769/2017, Matthew 7: 3). Such ancient references underscore the fact that knowledge about this phenomenon is well incorporate in our cultural awareness. This raises the issue, if as individuals we are unable to recognize our own biases or mistakes but can easily find them in others, can we take advantage of this phenomena? Could working in groups be a better strategy to mitigate biases and mistakes?

Marrin (2012) suggests that to overcome the *"science versus intuition"* debate among intelligence analysts, it is beneficial to combine them in mixed analytical teams. In this way, the approaches of people who are more intuitive and imaginative can collaborate and grow thorough the complementary skills of analysts who are more scientifically or systematically driven. The notion of integrating different kinds of knowledge and perspectives is based on the recognition that doing so creates value greater than the sum of its parts. Treverton and Fishbein (2004, p. 6) also suggest that working in collaborative teams is an effective way to *"promote sustained awareness of possible flaws in one's thinking [that] requires a continuous dialogue among individuals with different perspectives"*. As Mercier and Sperber

(2011) already explained, people are more capable in finding mistakes and faults in other people's arguments than recognizing their own. A solution is therefore in establishing groups of analysts that can "peer review" each other's argumentative points and evidence. Similarly, Wang and Jeon (2020) discovered that people are more likely to see biases in others than in themselves. That is, people show bias in bias recognition. They also argue that bias can be mitigated when people are being educated about the fact that we all are susceptible to it.

Advocating for intelligence analysts working in groups is not completely new. Authors have recognized the advantages of teams of analysts working together (Straus et al., 2011; Tetlock & Gardner, 2015). However, they also acknowledge risks associated with working in groups. Tetlock and Gardner (2015) identify groupthink and polarization as the main risks. Groupthink is defined as "*a mode of thinking that people engage in when they are deeply involved in a cohesive in-group, when the members' strivings for unanimity override their motivation to realistically appraise alternative courses of action*" (Janis, 1982, p. 9). While group polarization occurs when people engaged in a debate become more extreme in their views than they were before the group began discussing the topic (Brauer et al., 2006). Straus et al. (2011) discuss the risk of different types of process loss and interdependencies in intelligence analysis. Besides polarization and groupthink (or pressures toward uniformity), they worry also about process losses such as productivity losses in brainstorming (listening and waiting for one's turn to talk can block the production of new ideas), the common knowledge effect (unshared or unique information is often not discussed in the group), overconfidence, which can be worsened in groups, and confirmation bias.

To avoid these risks Straus et al. (2011) propose focusing on group structure (diverse opinions and expertise, but not too big), task procedures (writing ideas down or brainwriting, simultaneous instead of sequential presentation of ideas, use of SATs), facilitation (leaders encouraging open discussion, new ideas and dissent) and training (in effective collaboration strategies). To build a positive group dynamic Tetlock and Gardner (2015) also recommend teams be intellectually diverse (including also domain experts, depending on the issue), they should foster a culture of sharing ideas, creating psychological safety, so team members can freely and respectfully discuss each other's ideas and flaws. Horowitz et al. (2019) also find that teams outperformed individuals in geopolitical analytical tasks, emphasizing the impact of good teamwork. They found evidence that more cooperative teams outperformed less cooperative teams. Important elements in team success were information-sharing, cultivating reasoning to hedge against biases and ensuring opinions of all team members are heard and respected.

Although there is no consensus among researchers on the optimal size of a group, there are indications that smaller groups tend to offer more benefits for group decision-making processes (Osmani, 2020). Tetlock and Gardner (2015) suggest in building successful analytical teams to put more effort into selecting the right people. Teams should include analysts that possess certain individual characteristics. They should be cautious, humble, and nondeterministic. Their thinking style should be actively open-minded, intellectually curious, self-critical, numerate, pragmatic, analytical, valuing of different views, probabilistic, open to

change (according to new facts), and akin to intuitive psychologists. Their work ethic tends to include a growth mindset and grit. Basically, what we are looking at when picking team members is what Galef (2021) would describe as people with a "*scout mindset*". That is, people whose reasoning is accuracy motivated, who value truth and who hold their identity lightly. Holding one's 'identity lightly' refers to when one's beliefs become entwined with their identity, becoming an obstacle to truth-seeking.

Coulthart (2017) suggests improving intelligence analysis in groups by relying on principles. The first principle is to allow analyst to come up with ideas and hypotheses on their own, and then share them with the group, because he found that face-to-face collaboration consistently reduced creativity and development of ideas. The second principle empathizes the significance of evidence weighting and updating belief accordingly and not just seeking negative evidence. The third and final principle suggests that conflict-inducing techniques can be effective, however they should be implemented carefully.

Although the efficacy of SATs is open to debate, there is still common conviction that a structural approach has some benefits, mainly in its transparency. Kahneman in his interview with Frueh (2022, p. 26) suggests that some structure is still better in solving problems than relying only on intuition. He also emphasizes the distinction between the final decision and the process of creating those decisions, underlining the importance of diversity in the latter. That is, the importance of independent and diverse points of views and sources of knowledge. In short, "*good decisions are made on the basis of diverse information*".

5 CONCLUSION

Intelligence analysis is a cognitively intense activity, subjected to cognitive properties and limitations, such as cognitive biases. Analytical mistakes and cognitive biases can be further exacerbated by the pressures on intelligence analysts stemming from uncertainty, denial and deceptions, secrecy, and the need for timeliness. One of the most recognized biases that influences intelligence analysis is the confirmation bias, also known as myside bias. According to this bias, analysts seek confirming evidence and information for their preconceived notions, disregarding contrary evidence. This mindset of thinking is a result of motivated reasoning.

There have been attempts to mitigate the effect of mistakes in intelligence analysis, most noteworthy is the propagation and use of SATs. The science does not fully support the claims of SAT proponents, but their usefulness has not been completely discarded by some. Others encourage a mindset change, from a motivated reasoning ("*solder mindset*") to accuracy driven reasoning ("*scout mindset*"), to a more rational and objective thinker. This can be very difficult to achieve in an individual, as according to the Argumentative theory, people didn't evolve to seek truth but to argue, to support their own claims and find fault in other people's arguments and judgements. This means that analysts would be advised to work in well-managed teams. In this way, they can discover each other's mistakes and faults and consequently create better intelligence products.

While some mistakes and biases are hard to mitigate by a single individual, we can take advantage of an individual's innate motivation to find faults in other people's arguments and put individuals in a collaborative group environment. There are however risks to such settings, such as groupthink, common knowledge effect, confirmation bias, overconfidence, and polarization. Therefore, a team would have to be properly selected, structured and managed.

A team should be comprised of intelligent and curious individuals who are also trained in recognizing biases and faulty reasoning (likely more in others), who value truth and hold their identity lightly. The latter helps prevent polarization as people's identity should not depend on their opinions. In short, they should possess a "*scout mindset*". Some individuals should be domain experts (depending on the topic), but intellectual diversity is vital, as new or contrarian insights and information often come from outside specific fields. Additionally, diversity can also enhance the cognitive stimulation of team members. However, even diverse teams may evolve into uniformity, risking groupthink. Therefore, keeping a rotation in their argumentative positions or periodically bringing in new members may be advantageous. Finally, the size of the group is not predetermined or set at a specific number, but smaller groups seem to be most valuable.

With managing such teams, sharing of information and constructive (respectful) criticism by all team members should be encouraged. Several analytical lines can be simultaneously produced, written down, discussed and if possible, tested by the team. Encouraging, developing and discussing original ideas can hinder team member's tendency to fall back on conventional ideas. Using structural techniques can be helpful especially in the transparency of the process, but due to their limited nature and the risk of ignoring unknown, surprising factors, they should not be completely relied on. Also, individual training in intelligence analysis, proper mindset, critical thinking and learning about mistakes and limitations should be encouraged and nurtured.

However, creating teams is not a panacea and it will not solve all analytical problems. Creating and using teams of analysts is also inherently resource intensive and may reduce overall analytical capacity if that capacity is focused on relatively few issues (compared to individuals focusing on multiple discrete issues). Nonetheless, there is evidence to suggest that creating good teams can be an important foundation for the improvement of intelligence analysis. Additionally, choosing the "right" analysts and group can sometimes take time and require some tinkering as there are no certainties in assessing an individual person's characteristics and accurately predicting his or her conduct in a group setting. Furthermore, uncertainty, denial and deception, secrecy and time constrains will likely remain unresolved challenges to intelligence analysis in the future. Considering these factors, and recognizing that intelligence analysis is also fallible, fostering intellectual humility should be a fundamental aspect of the entire intelligence analysis process. This principle is equally applicable in the development of technological solutions for intelligence analysis, especially collaborative platforms, where ideas can be presented and rigorously challenged, particularly in anticipation of the likely integration of artificial intelligence. Lastly, the proper application and use of teams is not limited to intelligence analysis

and can likely be as effectively used in mitigating mistakes in other aspects of analysis or investigations, such as business, law enforcement, security and counterintelligence.

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