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THESIS

SHADES OF GRAY: RELEASING THE COGNITIVE BINDS THAT BLIND US

by

Patrick D. Hensley

September 2016

Thesis Co-Advisors: Kathleen Kiernan
John Rollins

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13. ABSTRACT (maximum 200 words)

The United States Intelligence Community is tasked with providing the intelligence necessary to protect the homeland and U.S. interests abroad. Technology acts as a force multiplier for intelligence analysts, but that advantage also comes with substantial risk. The risk lies in our reliance on technology and processes, and the tradecraft of intelligence analysis and critical thinking appears to be losing relevance. During the intelligence analysis process, weak signals are often identified and then dismissed. In hindsight, these weak signals are realized as missed opportunities that could have allowed the Intelligence Community to mitigate the threat. This research examines cognitive bias from multiple perspectives and affirms that cognitive bias does influence intelligence analysis, and intelligence analysts need to understand the effects of cognitive bias. This research presents a recent case study and determines the negative influences of those biases had an impact on the decisions that were ultimately made in error. As a result of this research and analysis, several mitigation strategies are identified and included as recommendations to the Intelligence Community. These strategies present the United States with an opportunity to decrease the influences of cognitive bias on intelligence analysis, leading to a more effective and resilient Intelligence Community.

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SHADES OF GRAY: RELEASING THE COGNITIVE BINDS THAT BLIND US

Patrick D. Hensley
Captain, Daly City Police Department, Daly City, California
B.S., Notre Dame de Namur University, 2008

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September 2016**

Approved by: Kathleen Kiernan
Thesis Co-Advisor

John Rollins
Thesis Co-Advisor

Erik Dahl
Associate Chair of Instruction
Department of National Security Affairs

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ABSTRACT

The United States Intelligence Community is tasked with providing the intelligence necessary to protect the homeland and U.S. interests abroad. Technology acts as a force multiplier for intelligence analysts, but that advantage also comes with substantial risk. The risk lies in our reliance on technology and processes, and the tradecraft of intelligence analysis and critical thinking appears to be losing relevance. During the intelligence analysis process, weak signals are often identified and then dismissed. In hindsight, these weak signals are realized as missed opportunities that could have allowed the Intelligence Community to mitigate the threat. This research examines cognitive bias from multiple perspectives and affirms that cognitive bias does influence intelligence analysis, and intelligence analysts need to understand the effects of cognitive bias. This research presents a recent case study and determines the negative influences of those biases had an impact on the decisions that were ultimately made in error. As a result of this research and analysis, several mitigation strategies are identified and included as recommendations to the Intelligence Community. These strategies present the United States with an opportunity to decrease the influences of cognitive bias on intelligence analysis, leading to a more effective and resilient Intelligence Community.

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LIST OF ACRONYMS AND ABBREVIATIONS

9/11	September 11, 2001
AMAN	Israeli Directorate of Military Intelligence
BCIA	Basic Criminal Intelligence Analysis
BENS	Business Executives for National Security
BITAC	Basic Intelligence and Threat Analysis Course
CIA	Central Intelligence Agency
CKI	Collaborative Knowledge Interoperability
DHS	Department of Homeland Security
DNI	Director of National Intelligence
DOD	Department of Defense
DOJ	Department of Justice
DS	Department of State
FBI	Federal Bureau of Investigation
HUMINT	human intelligence
IALEIA	International Association of Law Enforcement Intelligence Analysts
IARPA	Intelligence Advanced Research Projects Activity
IC	United States Intelligence Community
IIC	Israeli Intelligence Community
IDF	Israeli Defense Force
ICArUS	Integrated Cognitive-neuroscience Architectures for Understanding Sensemaking
IMINT	imagery intelligence
ITRPA	Intelligence Reform and Terrorism Prevention Act of 2004
JIGSAW	Joint Intelligence Graphical Situation Awareness Web
LAMP	Lockwood Analytical Method for Prediction
MACBETH	Mitigating Analyst Cognitive Bias by Eliminating Task Heuristics
MASINT	Measurement and Signatures Intelligence
NCS	National Clandestine Service
NEJM	New England Journal of Medicine

NIC	National Intelligence Council
NIE	national intelligence estimate
NIT	National Intelligence University
NSA	National Security Agency
ODNI	Office of the Director of National Intelligence
ONR	Office of Naval Research
OSINT	open source intelligence
POTUS	President of the United States
RECOBIA	reduction of cognitive biases in intelligence analysis
RPG	rocket propelled grenade
SAT	structured analytic technique
SHABAK	Israeli Security Agency
SIGINT	signals intelligence
SINTELLA	Simulation of Intelligence Analysis
SME	subject matter expert
TMF	temporary mission facility
TOR	terms of reference
TPED	tasking, processing, exploitation, dissemination
WMD	weapons of mass destruction
WWII	World War II

EXECUTIVE SUMMARY

The intelligence cycle has remained unchanged since its inception following the end of World War II. The threats faced by the United States Intelligence Community today are very different from the threats of the past. Unlike those in the intelligence environment during the Cold War, the threats of today often come from terrorist organizations with allegiance to no single nation, state, or specific location. These dynamic threats require enhanced intelligence analysis that takes into account for the limitations of human cognitive performance.

Intelligence analysis often reveals weak signals that can be difficult to discern. In hindsight, these weak signals are often identified as missed opportunities, which had they been recognized during the intelligence analysis process, could have provided the Intelligence Community with opportunities to mitigate the threat. This researcher's hypothesis is that cognitive biases are mental roadblocks that prevent the identification of weak signals during the intelligence analysis process. This thesis presents research on human cognitive performance and decision making, defines the intelligence cycle, and explores the relationship between these topics.

One of the challenges of this research was the very nature of intelligence activities. The infrequent failures of intelligence analysis are often debated in publicly available information sources and later scrutinized by Senate subcommittees. Those very few intelligence failures are offset by the many successes that, based on the nature of intelligence and the classification of documents are difficult to document. The United States Intelligence Community is considered one of the most effective in the world, although sharing those intelligence successes with the public does not occur very often due to the sensitivity of its activities.

There is a significant amount of literature exploring cognitive bias, including books, journal articles, academic papers, and media articles. Those sources include literature from government organizations, the psychological and social sciences,

academia, and the private sector. Many of these sources provide examples of the negative effects of cognitive bias and note the need to account for those influences.

Until recently, the Intelligence Community had very little literature related to cognitive bias and the effects on intelligence analysis. Following the tragic events of September 11, 2001, there are now many sources available that reference the need to account for the influences of cognitive bias in any effective intelligence analysis strategy. Some of the most respected and recognized names in the Intelligence Community agree that the influences of cognitive bias on intelligence analysis are significant, and these subject matter experts have contributed to this research.

This thesis analyzes the recent terror attack in Benghazi against United States assets on September 11, 2012. The fatal mistakes can easily be correlated to a failure to recognize the effects of cognitive bias on intelligence analysis. Because of the many challenges in the Middle East, this thesis also includes a comparative study of the Israeli Intelligence Community. The use of a devil's advocate office by the Israeli Intelligence Community is explored as a potential strategy that could be used by the United States Intelligence Community.

This research explores and identifies potential mitigation strategies could be employed by the Intelligence Community to address the effects of cognitive bias on the intelligence cycle. Some of these mitigation strategies have been available to the Intelligence Community for some time, and others are considered emerging strategies under development today. Those potential mitigation strategies are grouped under the headings of psychological, analytical, and technological strategies. Furthermore, they include providing intelligence analysts with critical thinking skills/analytic tradecraft to recognize cognitive bias, the value of alternative analysis/external analysis, the use of structured analytical techniques, the employment of teams of analysts as opposed to analysts working alone, and the use of emerging software programs.

This thesis posits that the intelligence cycle is influenced by cognitive bias. The research also supports the fact that humans do not have the ability to self-identify when those cognitive biases are influencing intelligence analysis and decision making. This is a

significant concern for the Intelligence Community, which is tasked with providing the intelligence required to protect this country; however, the Intelligence Community has not formally recognized the fact that cognitive bias has an effect on intelligence analysis. This research discovered no evidence to support any encouraging changes in an attempt to mitigate those effects in the intelligence analysis process. In addition, the Intelligence Community continues to provide very little cognitive bias training to new intelligence analysts. Additionally, this researcher found no evidence of any recurring training for analysts regarding the effects of cognitive bias. This is a significant issue and should be of great concern to the Intelligence Community.

As a result of this research, recommendations include training intelligence analysts to recognize cognitive bias and develop strategies to address the effects, improving analyst critical thinking skills and analytic tradecraft, exploring the analyst team concept, determining if a structured analytic technique would improve the intelligence cycle, encouraging analysts to document all assumptions during intelligence analysis, and requiring analysts to include alternative assessments depending on the variables identified during the intelligence analysis process.

The Office of the Director of National Intelligence recently released the 2016 national counterintelligence strategy, which recommends the Intelligence Community focus efforts on anticipating, identifying, and warning of emerging threats. In addition, one of the recommendations is the development of relevant educational programs and opportunities to assist with the identification of those threats.[1] The topic of this thesis is consistent with our most recent national counterintelligence strategy and provides an opportunity to contribute to our nation's security. This thesis presents the Intelligence Community with recommendations to strengthen our nation's intelligence analysis effectiveness to provide for more resilient intelligence analysis to better protect this nation and our interests abroad.

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[1] U.S. National Counterintelligence and Security Center, *National Counterintelligence Strategy of the United States of America 2016* (Washington, DC: Office of the Director of National Intelligence, 2016), http://www.dni.gov/files/documents/ncsc/National%20CI%20Strategy%202016_Unclassified_Final.pdf, 8.

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I. INTRODUCTION

Know thy self, know thy enemy. A thousand battles, a thousand victories.

—Sun Tzu

A. DISCUSSION

Intelligence activities have always been an integral responsibility of nations and states tasked with protecting their people. In the earliest days of war, commanders would send soldiers to vantage points, usually high ground, to provide intelligence related to the movements of enemy forces. At that time, the only intelligence that could be relied upon was the view of the enemy, and those who controlled the high ground often had the advantage.

Fast forward to the war on terrorism. Not only can we not see the movements of those who wish to do us harm, but in many cases, they do not align themselves with a particular nation, state, or specific location. Contemporary terrorist organizations are often comprised of the most religiously radicalized members, and in many cases, believe they have a responsibility to conduct "holy war" against their perceived enemies. Despite disagreement on the true definition of jihad,[1] that Islamic word is used as a rallying cry for those who wish to do us harm.

Resilient intelligence processes and activities now require much more than positional high ground. Technology has the ability to provide the Intelligence Community with situational high ground, but that advantage comes with substantial risk. The risk lies in our reliance on technology and processes, while the tradecraft of intelligence analysis and critical thinking appears to be losing relevance. For the Intelligence Community to protect our homeland and our interests abroad, intelligence analysts need to understand how cognitive biases influence analysis.

[1] Islamic Supreme Council of America, "Jihad: A Misunderstood Concept from Islam—What Jihad Is, and Is Not," accessed April 15, 2016, http://islamicsupremecouncil.org/understanding-islam/legal-rulings/5-jihad-a-misunderstood-concept-from-islam.html?start=9.

The term "cognitive bias," first introduced by Amos Tversky and Daniel Kahneman in the 1970s, was used to describe a person's systematic but flawed patterns of response to both judgment and decision problems.[2] Research on the effects of cognitive bias on the decision-making process has increased steadily since then and has gained significant influence in the psychological literature. This is an important consideration when thinking about intelligence analysis. There is a significant amount of literature exploring cognitive bias, including books, journal articles, academic papers, and media articles. The sources for this literature review include works from the Intelligence Community (IC), other government organizations, the psychological and social sciences, academia, and the private sector. Many of these sources provide examples of the negative effects of cognitive bias and discuss the need to account for those influences.

Intelligence analysis often reveals the presence of weak signals that can be difficult to detect. In hindsight, these weak signals are often identified as missed opportunities, which had they been recognized during the intelligence analysis process, could have provided the IC with opportunities to mitigate the threat. This researcher's hypothesis is that cognitive biases are mental roadblocks preventing the identification of weak signals during the intelligence analysis process. A secondary research question is what mitigation strategies could be employed by the IC to recognize cognitive biases in order to better protect our homeland?

B. PROBLEM STATEMENT

The IC comprises 17 agencies within the Executive Branch, many of which work to collect and analyze the intelligence necessary to support our national security activities.[3] Most of the IC defines the intelligence cycle as the process governing how

[2] Amos Tversky and Daniel Kahneman, "Judgment under Uncertainty: Heuristics and Biases," Stanford University, 1974, http://statweb.stanford.edu/~cgates/PERSI/Courses/Phil166-266/TverskyK-HeuristicsBiases.pdf, 1124.

[3] Office of the Director of National Intelligence, "Intelligence Community," accessed January 9, 2015, http://www.dni.gov/index.php.

intelligence should be collected, integrated, evaluated, analyzed, and disseminated.[4] The intelligence cycle presents opportunities at every step for the negative effects of cognitive bias to influence the analysis.

Intelligence analysis often results in the presence of weak signals that can be difficult to distinguish. In hindsight, these weak signals are often identified as missed opportunities, which had they been recognized during the analytical exploitation process, could have provided the IC with opportunities to mitigate the threat. This researcher's hypothesis is that cognitive biases prevent the identification of weak signals during the intelligence analysis process.

Until recently, there was very little literature related to cognitive bias and the effects on intelligence analysis. A great deal of literature after September 11, 2001 (9/11) references the need to account for the influences of cognitive bias in any effective intelligence model. Many experts agree the influences of cognitive bias are significant, and these subject matter experts, including Richards Heuer, Mark Lowenthal, Dr. Erik Dahl, and Dr. James Wirtz, have contributed to the available literature. There is no open source evidence of any mitigation strategies currently employed by the IC to address this issue. In addition, it appears the amount of time spent training new intelligence analysts about the effects of cognitive bias has remained unchanged; it is still very little.

The complexity of today's fight against terrorism demands the best efforts in this dynamic threat environment with resilient intelligence programs providing analysts with the tools and training required to be effective and successful. This thesis provides the IC with cognitive bias mitigation strategies and recommendations that, if followed, will result in significant improvements to the intelligence analysis process. For agencies in the IC, see Figure 1.

[4] Department of Justice, Office of Justice Programs, *Fusion Center Guidelines: Developing and Sharing Information and Intelligence in a New Era* (Washington, DC: Department of Justice, 2006), https://it.ojp.gov/documents/fusion_center_guidelines_law_enforcement.pdf.

Figure 1. Director of National Intelligence, 17-Element Intelligence Community[5]

The following agencies make up the IC:

- Air Force Intelligence
- Army Intelligence
- Central Intelligence Agency
- Coast Guard Intelligence
- Defense Intelligence Agency
- Department of Energy
- Department of Homeland Security
- Department of State
- Department of the Treasury

[5] Source: Office of the Director of National Intelligence, Public Affairs Office, "IC Science and Technology: Opportunities for Small Business Engagement," 2014, http://www.slideshare.net/GTSCoalition/odni-dr-honey-small-business, slide 5.

- Drug Enforcement Administration
- Federal Bureau of Investigation
- Marine Corps Intelligence
- National Geospatial-Intelligence Agency
- National Reconnaissance Office
- National Security Agency
- Navy Intelligence

C. RESEARCH QUESTIONS

The primary research question is *what is the effect of cognitive bias on the intelligence cycle*. To answer this question, this thesis studies cognitive bias and decision making, the intelligence cycle, and the effects of the relationship between these topics. This research also explores case studies in which the intelligence failures can be correlated to the IC failing to recognize the effects of cognitive bias.

A secondary research question is *what mitigation strategies could be employed by the IC to address the effects of cognitive bias on the intelligence cycle*. This question is answered through this research by exploring mitigation strategies that have been available to the IC for some time as well as cutting-edge strategies under development today.

D. SIGNIFICANCE TO THE FIELD

Following the events of 9/11, there was a reorganization of the IC and a significant increase of resources made available to the IC agencies. Despite the changes, the IC continues to struggle with the identification of weak signals. The intelligence analysis model used by the IC is the intelligence cycle, and the current model does not account for the limitations of human cognitive performance. Although there have been intelligence analysis improvements, such as advancements to information sharing capabilities and better leveraging of technologies, there are opportunities for improvement. This thesis provides an introduction to the issue, background information,

and relevant research from a variety of sources coupled with recommendations moving forward.

E. LIMITATIONS

One of the many challenges of this research was the difficulty of accessing information regarding the IC. This research was forced to rely on open source information to connect the dots to support the hypothesis. However, this research does not include current strategies employed by the IC to address this issue due to the unavailability or non-existence of any literature documenting those strategies. In addition, it appears the amount of time spent training new intelligence analysts about the effects of cognitive bias has remained unchanged; it is still very little.

F. THESIS OUTLINE AND UPCOMING CHAPTERS

Chapter II covers the literature review and provides sources of information, including the IC, other government organizations, the psychological and social sciences, the private sector, and academia. Chapter III presents the historical perspective of cognitive psychology to provide an understanding of cognitive bias, psychological significance of cognitive bias, the relevance of cognitive bias awareness, and relevant research on how humans process information. Chapter IV discusses the intelligence cycle as a system, explores how cognitive bias creeps into the intelligence analysis process, presents the national intelligence estimate process, and provides an example of cognitive bias involving the IC via the study of a recent tragedy (Benghazi). Chapter V discusses potential mitigation strategies, and lastly Chapter VI ends with findings, recommendations, and conclusions.

II. LITERATURE REVIEW

> All our understanding begins with the senses, proceeds then to the understanding, and ends with reason. There is nothing higher than reason.
>
> —Immanuel Kant

A. INTRODUCTION

Research on the effects of cognitive bias on the decision-making process has increased steadily since the term was first coined in the 1970s and has gained significant influence in the psychological literature. There is a significant amount of literature, including books, journal articles, academic papers, and media articles, exploring cognitive bias. The sources for this literature review include works by the IC, other government organizations, the psychological and social sciences, academia, and the private sector. Only a few of these sources provide examples of the negative effects of cognitive bias and the need to account for those influences.

Until recently, the IC published little literature or remained relatively silent on the implications of cognitive bias and the effects on intelligence analysis. This thesis identifies and examines the post-9/11 recognition of the influence of cognitive bias in the overall intelligence cycle from collection requirements through dissemination. This research does not, however, include current strategies employed by the IC to address this issue or implications due to the unavailability of any public literature documenting IC internal strategies.

B. DEFINING THE INTELLIGENCE CYCLE

The intelligence model currently used by the IC is called the "intelligence cycle." A review of the literature indicates the intelligence cycle had its beginnings as a result of

the National Security Act of 1947.[6] Following World War II and because of the missed weak signals prior to the bombing of Pearl Harbor, the United States (U.S.) realized a more formal intelligence framework was needed and that model would need to allow for separation between "signals and noise."[7]

Following 9/11, the Intelligence Reform and Terrorism Prevention Act of 2004 (IRTPA) was passed to reform the IC and intelligence-related activities of the U.S. government.[8] This law recognizes the intelligence cycle as fundamental to the intelligence analysis process and dictates open source intelligence be included in the process. The act also reorganized the IC and established the Office of the Director of National Intelligence (ODNI). The IRTPA legislation remains in effect today and is recognized as the most fundamental change to the IC since 1947.[9]

In 2002, Congress passed the Homeland Security Act, and this created the Department of Homeland Security (DHS).[10] The purpose for this legislation is to prevent terrorist attacks in the United States, reduce our vulnerabilities, strengthen our infrastructure against attacks, and provide a process for recovery following a terrorist attack. It also provides the secretary of DHS the authority for conducting investigations following a terrorist attack on U.S. soil and the responsibility to prevent those attacks from ever occurring.

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[6] Office of the Director of National Intelligence, "National Security Agency Act of 1947," accessed June 24, 2015, http://www.dni.gov/index.php/about/organization/ic-legal-reference-book-2012/ref-book-1947-national-security-act.

[7] Central Intelligence Agency, "Intelligence Throughout History: The Impact of Pearl Harbor," last updated April 30, 2013, https://www.cia.gov/news-information/featured-story-archive/2010-featured-story-archive/pearl-harbor.html.

[8] Intelligence Reform and Terrorism Prevention Act of 2004, Pub. L. No. 108-458 (2004), http://www.nctc.gov/docs/irtpa.pdf.

[9] Michael Jacobson, "The Intelligence Reform and Terrorism Prevention Act: Addressing Controversies, Expanding Powers," Policy No. 929, Washington Institute, December 17, 2004, http://www.washingtoninstitute.org/policy-analysis/view/the-intelligence-reform-and-terrorism-prevention-act-addressing-controversi.

[10] Homeland Security Act of 2002, Pub. L. No. 107-296 (2002), http://www.dhs.gov/sites/default/files/publications/hr_5005_enr.pdf.

Different departments define the intelligence cycle a little differently. For example, the Department of Justice (DOJ) and DHS both refer to the intelligence cycle as intelligence that should be collected, integrated, evaluated, analyzed, and disseminated.[11] The Central Intelligence Agency (CIA) also utilizes an intelligence cycle and defines it as the planning/direction, collection, processing, analysis/production, and dissemination of intelligence.[12] Additionally, the Federal Bureau of Investigation (FBI) provides a definition and an explanation for each step in the intelligence cycle similar to most of the IC. Those steps include the requirements, planning/direction, collection, processing/exploitation, analysis/production, and dissemination.[13] The FBI defines analysis as the conversion of raw information into intelligence.[14]

The intelligence cycle presents opportunities at every step for the negative effects of cognitive bias to influence the analysis. Figure 2 is relatively a relatively consistent flow diagram used by all of the IC. What is lacking in this model is a structure that forces the intelligence analyst to account for assumptions, biases, and/or make analysis adjustments should any new information be discovered during the intelligence analysis process.

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[11] Office of Justice Programs, *Fusion Center Guidelines*.

[12] Central Intelligence Agency, "The Intelligence Cycle," accessed July 3, 2015, https://www.cia.gov/kids-page/6-12th-grade/who-we-are-what-we-do/the-intelligence-cycle.html.

[13] Federal Bureau of Investigation, "Intelligence Cycle," accessed July 3, 2015, https://www.fbi.gov/about-us/intelligence/intelligence-cycle.

[14] Department of Justice, Federal Bureau of Investigation, "Intelligence Defined," accessed July 3, 2015, https://www.fbi.gov/about-us/intelligence/defined.

Figure 2. Federal Bureau of Investigation—Intelligence Cycle[15]

C. DEFINING THE INTELLIGENCE CYCLE ANALYSIS PROCESS

The intelligence cycle specifies the steps in the process, and the intelligence analysis process is how each of those steps is used by intelligence analysts working toward an intelligence product. The reliability and significance of the information is evaluated, put into context, and used to produce an intelligence product. Raw intelligence is analyzed and finished intelligence reports result in providing background and an assessment about the significance of the find. One of the most important functions of intelligence analysis is reducing the uncertainty present in all sources of information by seeking an edge over adversaries; effective intelligence analysis provides those opportunities. In this thesis, the intelligence analysis process is described using the intelligence cycle model for proper context.

Intelligence analysis can be tactical, operational, or strategic. Strategic intelligence is of great value to policy makers because it provides the information required to make decisions affecting U.S. national security now and well into the future. Strategic intelligence requires access to sources of information from many different

[15] From: Federal Bureau of Investigation, "Intelligence Cycle," accessed July 3, 2015, https://www.fbi.gov/about-us/intelligence/intelligence-cycle.

disciplines, including the military, politics, and economics, and considers the relationships between societies and technological developments.[16] Strategic intelligence analysis is a long-term, dynamic process.

Tactical and operational intelligence maintains a focus on current or dynamic events. This type of intelligence can be used to measure current objectives, operations, or programs, and it does not attempt to specifically achieve any long-term projections.[17] A majority of the intelligence analysis activities support operational intelligence with the objective of providing decision makers with timely, accurate, and relevant information.[18]

The first step in the process is the requirements or the information needed by the decision makers. The U.S. national requirements are established by the director of national intelligence (DNI) following direction provided by the president of the United States (POTUS) and national security advisors.[19] These requirements serve to protect the U.S. from national security threats and are the basis for national security policy. This is the first step in the process and sets the direction for the rest of the analysis process. The specific information required, how that information will be collected, and determining how soon it is needed are all important factors at this early stage of the process. A prepared collection plan may include seeking intelligence partners to assist with the analysis. The consumer dictates the requirements and answers any clarification questions the intelligence analyst may have. Once the intelligence analyst understands the requirements and has a plan, the next step is collection.

Collection is referred to as the gathering of raw information and data according to the national security requirements and sharing that information with other analysis elements. Moreover, collection guidelines may be established to in order to provide optimal use of the intelligence resources to meet the consumer requirements. Specific

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16 Federation of American Scientists, "Operations Security-Intelligence Threat Handbook," Section 2, 1996, accessed March 11, 2016, http://fas.org/irp/nsa/ioss/threat96/part02.htm.

17 Ibid.

18 Office of Naval Intelligence, "Nimitz Operational Intelligence Center," accessed May 23, 2016, http://www.oni.navy.mil/This-is-ONI/Who-We-Are/Nimitz.

19 Federal Bureau of Investigation, "Intelligence Cycle."

requests may be disseminated to other collection sources to avoid duplication of efforts. Providing opportunities for redundancy can assist with verification that the intelligence and data collected is accurate and can either prove or disprove an intelligence assessment.[20] Collection activities occur in dynamic environments and rely upon secure communications to quickly move and share that information.

Collection sources involve many different activities including human sources operations, the use of technology, and the sharing of intelligence among our intelligence partners.[21] There are many sources available for the collection of intelligence, and the types most relevant to intelligence analysis include human intelligence, signals intelligence, imagery intelligence, open source intelligence, and measurement and signatures intelligence (see Table 1).

Table 1. Types of Intelligence[22]

Type	Acronym	Definition
Human intelligence	HUMINT	Intelligence collected from human sources and associated with clandestine activities, although primarily involves the use of covert actions performed to collect that intelligence
Signals intelligence	SIGINT	Signal intercepts of electronic transmissions collected by ground sites, ships, aircraft, and other covert operations and activities
Imagery intelligence	IMINT	Intelligence collected from images reproduced electronically through the use of hard (film) or soft (digital) copies
Open source intelligence	OSINT	Generally publicly available information that can provide information on processes and activities relevant to intelligence agencies and adversaries
Measurement and signatures intelligence	MASINT	Advances processing of intelligence gathered through IMINT and SIGINT to analyze weapons capabilities and industrial movement

[20] Federation of American Scientists, "Operations Security-Intelligence."

[21] Federal Bureau of Investigation, "Intelligence Cycle."

[22] Federal Bureau of Investigation, Intelligence Branch, "Intelligence Collection Disciplines," accessed April 20, 2016, https://www.fbi.gov/about-us/intelligence/disciplines.

These different collection sources of intelligence can be grouped together and referred to as all source intelligence. According to the journal article titled "A Guide to All-Source Intelligence," the previous methods of considering agencies and analysts as single sources is no longer practical.[23] The outdated concept of single sources correlates to the exhaustively documented IC issue of working in silos. Instead of working with siloed information, agencies and analysts need to have the ability to access information from multiple disciplines to allow every chance of success. Sharing information and intelligence across intelligence sources can provide context and a better understanding of the analysis at hand.

Although the technology available today has enabled the IC to collect unprecedented amounts of data, heavily relying on technology comes with risk. The IC should remain vigilant for collection errors that the technology could result in and should continue to verify the intelligence collected by those technologies. The risk of technology bias, based on the capabilities of technology as a collection strategy, could potentially result in errors with great consequences.[24] These all-source types of intelligence are routinely collected by the IC during the collection portion of the intelligence cycle. Although much of this intelligence is collected via technology, human intelligence (HUMINT) remains a very relevant collection strategy today.

This collection step of the intelligence cycle is critical in meeting the tactical, operational, and/or strategic objectives of the IC. As a result, much of the intelligence work occurs at this stage of the process. Once all of the intelligence is collected and secured, it then needs to be processed and exploited.

Processing and exploitation involves a tremendous amount of data that must be converted into a suitable format to enable the production of intelligence. Much of that information must be initially processed using technology, software programs, and specific techniques such as translations, decrypting data, and determining which of the

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[23] Thomas Fingar, "A Guide to All-Source Analysis," *Journal of U.S. Intelligence Studies* 19, no. 2 (2012): 63.

[24] Robert Jervis, *Perception and Misperception in International Politics* (Princeton, NJ: Princeton University Press, 1976), 156.

data is relevant and which has no value.[25] Once the information is vetted, it must be entered into databases to allow for the efficient exploitation during the intelligence analysis process. Once the intelligence is formatted, it can be used to manipulate the raw data into finished intelligence products. After that, the next step in the intelligence cycle is the analysis and production of intelligence.

Analysis and production is the process of making sense of the raw information and transforming it into intelligence assessments through the integration, evaluation, and analyzation of the data.[26] The information is vetted to determine if it is valid, relevant, and reliable. Intelligence can be misleading on purpose, and this fact must be considered during this phase of the process. Now that the individual bits of information have been collected, the information is connected to provide context and assist with a clearer operating picture and determination of relevance.

For the intelligence to be considered effective, it needs to be objective, timely, and accurate.[27] The analysis and production process attempts to eliminate erroneous or unsupported data. The analytical efforts sometimes results in the need for additional collection efforts to close the gaps in analysis. The goal is to complete this step in the process with actionable intelligence that has value to the consumer and is ready for dissemination.

Dissemination is the final step in the intelligence cycle analysis process and represents the conveyance to the consumer who initially requested the information. This final step usually involves the electronic transfer of that intelligence product, although that step could include verbal reports to the consumer and providing access to relevant databases. This phase of the process can lead to additional intelligence requirement requests, depending on the products received by the consumer. Intelligence analysis can lead to tactical, operational, and/or strategic decisions by understanding what is known, what is not known, and probabilities of future actions.

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[25] Federal Bureau of Investigation, “Intelligence Cycle.”

[26] Ibid.

[27] Federation of American Scientists, “Operations Security-Intelligence.”

In general, research indicates intelligence analysts have specific educational requirements and receive specific training concerning the intelligence cycle and preparation of intelligence products. However, there does not appear to be consistent standards across the IC on what exactly that education and training should include. Would that fact of lack of consistency reduce or enhance susceptibility to the effects of cognitive bias?

D. INTELLIGENCE ANALYST TRAINING PROGRAMS

There are many intelligence analyst training programs offered by government, colleges, and private institutions. One of the consistencies with all of these programs is the short amount of time spent addressing cognitive bias, resulting in a lack of analyst awareness at the crucial beginning stages of their careers. Some of the programs discovered in the research are described in following paragraphs.

In 2010, the DOJ released a document titled *Common Competencies for State, Local, and Tribal Intelligence Analysts*.[28] The guide identifies essential analytic competencies expected of state, local, and tribal intelligence analysts working in major urban area fusion centers, and the target audience is fusion directors. The analytic skill behavioural indicators deemed important include generating and testing multiple hypotheses, challenging key assumptions, avoiding common fallacies, and evaluating the quality of critical thinking.[29] These indicators are essential for intelligence analysts to understand the effects of cognitive bias and the importance of analytical reasoning.

The DHS Intelligence Training Branch teaches the Basic Intelligence and Threat Analysis Course (BITAC).[30] Module 2, Lesson 3 of this course covers critical thinking

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[28] Department of Justice, *Common Competencies for State, Local, and Tribal Intelligence Analysts* (Washington, DC: Department of Justice, 2010), https://www.ncirc.gov/documents/public/common_competencies_state_local_and_Tribal_intelligence_analysts.pdf.

[29] Ibid., 5.

[30] Department of Homeland Security, Intelligence Training Branch, "Training Requirements and Approved Course Catalogues," accessed April 20, 2016, http://www.dhs.gov/fema-approved-intelligence-analyst-training-courses.

and analytic methods/cognitive errors and memory.[31] This section of the basic course instructs analysts on "cognitive errors" (they do not use the term "cognitive bias" due to the term's alleged potential for being confused with "prejudice"). Approximately 2.5 hours of the six-week (240-hour) basic course are dedicated to this section covering cognitive biases. Research into the DHS training program has not yielded any evidence of ongoing training regarding cognitive errors.

Through the Global Justice Information Sharing Initiative, the International Association of Law Enforcement Intelligence Analysts (IALEIA) offers the Basic Criminal Intelligence Analysis (BCIA) training course along with many other intelligence courses.[32] The IALEIA follows the training recommendations outlined in the DOJ's *Minimum Criminal Intelligence Training Standards for Law Enforcement and Other Criminal Justice Agencies in the United States*.[33] A review of those standards reveals intelligence analysts and intelligence officers/collectors receive the same training (180 minutes total) in subject matter consisting of critical thinking/fallacies of logic/inference development.[34]

This is the only subject matter of IC agency courses that most closely resembles cognitive bias awareness. Interestingly, IC intelligence managers do not appear to receive any training relating to cognitive bias, and this is an identified gap in training standards. Intelligence managers may experience difficulties holding employees accountable regarding the influences of cognitive bias if they do not understand what those effects might be. The DOJ intelligence training standards document includes responses to a

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[31] Department of Homeland Security, "Intelligence Training Branch, "Critical Thinking and Analytic Methods" (unpublished course material, Department of Homeland Security, Washington, DC), Module 2-Lesson 3.

[32] International Association of Law Enforcement Intelligence Analysts, "Basic Criminal Intelligence Analysis Training," accessed January 9, 2016, http://www.ialeia.org/certification/basic-criminal-intelligence-analysis-training.html.

[33] Department of Justice, *Minimum Criminal Intelligence Training Standards for Law Enforcement and Other Criminal Justice Agencies in the United States: Findings and Recommendations* (Washington, DC: Department of Justice, 2004), https://it.ojp.gov/documents/minimum_criminal_intel_training_standards.pdf.

[34] Ibid., 7, 29.

questionnaire from a majority of the responding law enforcement agencies and states intelligence analysts and intelligence managers lack adequate training.[35] It would appear logical that 180 minutes out of six weeks of time dedicated to understanding of the effects of cognitive bias on intelligence analysis remains insufficient.

The Sherman Kent School for Intelligence Analysis is the premier training center for CIA analysts.[36] The intelligence analysis course consists of 11 weeks of instruction followed by five weeks in an interim assignment. The course has a module that alerts intelligence analysts to the risks of assumptions and biases in both their own analysis and the analysis by others during the intelligence process.[37] Due to the classified nature of the specific training curriculum, the only available information was retrieved from open source government reports, including the review by the U.S. Senate on the intelligence failures of pre-war access to weapons of mass destruction (WMD) by Iraq. This researcher was unable to obtain training specifics from the Sherman Kent School.

The Department of Defense (DOD) National Intelligence University (NIU) offers degrees in various intelligence disciplines to members of the armed forces and federal government employees. The academic programs work to support the IC mission by educating, researching, and providing outreach.[38] The university offers intelligence reasoning and analysis courses, although this researcher was unable to access any of the specifics of the programs. It does appear NIU is aware of the influences of cognitive bias and provides some context for it to its students.

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[35] Ibid., D2.

[36] Central Intelligence Agency, Sherman Kent School for Intelligence Analysis, "Offices of the CIA, Training Resources," accessed November 20, 2015, https://www.cia.gov/offices-of-cia/intelligence-analysis/training-resources.html.

[37] Senate Committee on Intelligence *Report on US Intelligence Community's Prewar Intelligence Assessment on Iraq* (Washington, DC: U.S. Senate, 2004), http://web.mit.edu/simsong/www/iraqreport2-textunder.pdf, 6.

[38] National Intelligence University, "About NIU," accessed January 10, 2016, http://ni-u.edu/wp/about-niu/.

E. INTELLIGENCE COMMUNITY PERSPECTIVE

According to Richards Heuer in his book *Psychology of Intelligence Analysis*, "Weaknesses and biases [are] inherent in human thinking processes … [they] can be alleviated by conscious application of tools and techniques that should be in the analytical tradecraft toolkit of all intelligence analysts."[39] Heuer's book is recommended reading for all perspective intelligence analysts by the National Intelligence University.[40]

As a long-time employee of the CIA, Heuer recognizes the limitations and influences of cognitive bias. He suggests there are strategies to mitigate those effects, and intelligence analysts should be aware of those strategies to avoid missing weak signals.[41] For example, to avoid anchoring bias, Heuer suggests that the intelligence analyst must rethink the problem from the very beginning and assume none of the judgments from the previous analyst are entirely accurate.[42] In addition, Heuer suggests analysts should ask themselves that if the opposite outcome had occurred following the analysis process, would the analyst be surprised.[43] This suggestion is consistent with requiring intelligence analysts to develop alternative assessments based on the different variables identified.

Dr. Steve Yetiv has been recognized by the DOD, Harvard University, and many other influential institutions as an intelligence expert on decision making and foreign policy. Dr. Yetiv describes cognitive biases as mental blind spots often leading to errors, and he is particularly concerned with confirmation bias and anchoring bias.[44] Those biases are consistent with the research completed by IC experts identified in this thesis. Dr. Yetiv describes these cognitive biases and demonstrates how they distort judgments,

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39 Richards Heuer, *Psychology of Intelligence Analysis* (Washington, DC: Center for the Study of Intelligence, Central Intelligence Agency, 1999), 1.

40 National Intelligence University, "Recommended Reading Lists," accessed September 7, 2015, http://ni-u.edu/wp/recommended-readings/.

41 Heuer, *Psychology of Intelligence Analysis*, Chapter 14.

42 Ibid., 152.

43 Ibid., 177.

44 Steve A. Yetiv, *National Security through a Cockeyed Lens* (Baltimore, MD: Johns Hopkins University Press, 2013), 2.

result in faulty intelligence assessments, and are often attributed to analytical errors.[45] His book *National Security through a Cockeyed Lens* studies five episodes in U.S. history, including the U.S. invasion of Iraq in 2003, in which cognitive biases influenced the foreign policy decision-making process.

Jack Davis is a research fellow at the CIA Kent School and has previously served as an analyst, manager, course director, and researcher on analytic tradecraft. His white paper titled *Improving CIA Analytic Performance: Strategic Warning* makes recommendations to improve the analysis process.[46] Some of his recommendations include forcing intelligence analysts to utilize alternative analyses, understanding the skill of challenging personal assumptions, and providing for a thorough evaluation of the authenticity of classified as well as open source information.[47] These recommendations are consistent with the need to address cognitive biases throughout the intelligence analysis process.

The ODNI is aware that cognitive bias can lead to errors in the intelligence analysis process. In partnership with its research and development branch, the ODNI is working with the Intelligence Advanced Research Projects Activity (IARPA) on the Integrated Cognitive-neuroscience Architectures for Understanding Sensemaking (ICArUS) project. The research is attempting to identify the cognitive biases that can compromise effective intelligence analysis by intelligence analysts.[48]

Sensemaking is defined as the process humans use to provide the ability to give meaning to environments.[49] Humans have the ability to detect patterns in the world and to provide meaning to those patterns. As an example, a fighter pilot operating in international airspace near enemy territory needs to be able to maintain hypersensitive

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[45] Ibid., 95.

[46] Jack Davis, *Improving CIA Analytic Performance: Strategic Warning* (Occasional Papers, no. 1) (Washington DC: Central Intelligence Agency, 2002), http://www.au.af.mil/au/awc/awcgate/cia/strategic_warning_kent.htm.

[47] Ibid.

[48] Davis, *Improving CIA Analytic Performance*.

[49] Ibid.

situational awareness regarding potential threats, location, the rules of engagement, and many other factors. In addition, the pilot needs to be able to manage all of these stimuli under difficult conditions with extreme consequences for any errors made. The ICArUS sensemaking model currently being developed could provide the IC with software that has the ability to mirror human cognitive performance without the limitations of cognitive bias.

Mark Lowenthal is an intelligence expert and scholar. In his book *Intelligence: From Secrets to Policy*, he discusses the intelligence cycle and presents the most common diagram, the CIA model.[50] In addition, Lowenthal talks about opportunities for improvement through a revised intelligence cycle diagram that more clearly represents the actual process used by intelligence analysts.[51] Lowenthal also provides context by explaining that at any point in the intelligence analysis process, the analyst may have to return to a previous step if new information is developed. He cites the reasons backtracking could occur, including if new information discovered, presented, or feedback forces change. Furthermore, Lowenthal proposes a revised intelligence cycle that is much more complex and is linear, circular, and open-ended, all at the same time.[52]

Jeffrey Cooper, the Director for the Center for Information Strategy and Policy at Science Applications International Corporation, served on the Presidential Commission on Future Intelligence Capabilities, and is recognized as an intelligence analysis expert. His paper titled *Curing Analytic Pathologies: Pathways to Improved Intelligence Analysis*, published by the Center for the Study of Intelligence, talks about professionalizing the intelligence analysis process.[53] Cooper stresses the need to balance inductive and deductive reasoning and the importance of not losing sight of

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[50] Mark M. Lowenthal, *Intelligence: From Secrets to Policy*, 6th ed. (Washington, DC: CQ Press, 2015), 83.

[51] Ibid.

[52] Ibid., 88.

[53] Jeffrey R. Cooper, *Curing Analytic Pathologies: Pathways to Improved Intelligence Analysis* (Washington, DC: Center for the Study of Intelligence, 2005), https://fas.org/irp/cia/product/curing.pdf, 46.

imagination.[54] His paper points out a series of strategic and operational failures by the IC and assigns some of the blame for those errors to cognitive bias. Moreover, Cooper stresses that self-awareness and redundancy built into the intelligence analysis process is critical to improve analytical performance. IC managers must be aware of potential analyst biases when reviewing the process and resulting assessments. Finally, Cooper references potentially using a "process watcher" to bring a clear, bias-free view to the analysis process.[55]

Dr. Rob Johnston is an ethnographer specializing in cultural anthropology. He has been a researcher at the Institute for Defense Analysis and a director of the Central Intelligence Postdoctoral Research Fellow at the CIA's Center for the Study of Intelligence where he currently is on staff. His book, *Analytic Culture of the U.S. Intelligence Community: An Ethnographic Study*, includes interviews with approximately 500 members, including many intelligence analysts, and it is recommended reading for all perspective intelligence analysts by the DOD National Intelligence University.[56]

Johnston views the problems with the IC and the intelligence cycle as being related to the IC culture and asserts that the pressures placed on intelligence analysts by the IC management result in exaggerated cognitive bias.[57] Johnston is particularly concerned about confirmation bias, and his research resulted in confirmation that the first step of the intelligence process was to research prior intelligence produced by that agency and apply that information into the new analysis.[58] He asserts the problem with this technique is that the previous analysis may have been based on a cognitive bias and/or faulty hypothesis. The intelligence analyst would then begin the intelligence cycle with a cognitive bias already positioned within the process. Furthermore, Johnston stresses the

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[54] Ibid., 45.

[55] Ibid., 8.

[56] Rob Johnston, *Analytic Culture of the U.S. Intelligence Community: An Ethnographic Study* (Washington, DC: Government Printing Office, 2005), https://www.cia.gov/library/center-for-the-study-of-intelligence/csi-publications/books-and-monographs/analytic-culture-in-the-u-s-intelligence-community/analytic_culture_report.pdf, 119.

[57] Ibid., Chapter 8.

[58] Ibid., 24.

need to understand cognitive bias as a step toward improving intelligence analysis and leading to an improved intelligence model.[59]

Jennifer Sims and Burton Gerber both have extensive experience in the IC and subscribe to the team intelligence analysis concept. In their book *Transforming US Intelligence*, the authors articulate the extensive challenges of mitigating cognitive bias in the IC. Additionally, the authors state that the relationship between analysis and the influences of cognitive bias can result in the production of faulty intelligence estimates, and they identify the need to employ a resilient strategy to address those issues.[60] The authors also recommend analytic teams of experts be formed from many disciplines of the IC to be responsible for "community products," similar to national intelligence estimates (NIE).[61] This strategy is consistent with the recommendations of other subject matter experts and presents an opportunity for the recognition of cognitive biases. Furthermore, this strategy may assist with the separation of signals from the noise.

Lawrence Woocher is a senior program officer at the United States Institute of Peace and specializes in conflict assessment and intelligence analysis. In his article titled "The Effects of Cognitive Biases on Early Warning and Response," Woocher proposes cognitive biases can weaken efforts by the IC to identify weak signals in the intelligence analysis process.[62] He suggests that cognitive bias reduces human cognitive performance by limiting the ability to detect weak signals present in seemingly random events and the potential for small changes to have a significant impact.[63]

Woocher asserts that humans remember occurrences much more readily than they remember non-occurrences.[64] As an example, most people remember where they were

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59 Ibid., 21.

60 Jennifer E. Sims and Burton Gerber, *Transforming US Intelligence* (Washington, DC: Georgetown University Press, 2005), 117.

61 Ibid., 124.

62 Lawrence Woocher, *The Effects of Cognitive Biases on Early Warning and Response* (Washington, DC: U.S. Institute of Peace, 2008), 6.

63 Ibid., 13.

64 Ibid., 8.

when the 9/11 tragedy occurred, as opposed to where they were when a terrorism warning that did not occur was broadcast. Intelligence analysts may assign greater significance on the previous analysis of a terrorist attack that actually occurred when compared with the analysis from an attack that did not occur. Heuer appears to agree when he stated that the more details known by an intelligence analyst from a prior scenario, the easier it is to construct a new scenario from imagination, leading to a higher perceived probability.[65]

Woocher recommends education and training as the most effective means of mitigating the effects of cognitive biases, and he cautions that analysts must be aware of the tendency to leverage a cognitive bias, thinking it might minimize the effects of another.[66] Consistent with this research, Woocher suggests implementing a more rigorous intelligence analysis structure to manage cognitive biases. An effective intelligence model must allow for externalization of the intelligence analysis process to provide opportunities for an independent review of that analysis and the possibility of detecting any biases.

In her book *Anticipating Surprise: Analysis for Strategic Warning*, Cynthia Grabo suggests that intelligence failures are not the result of cognitive biases and provides alternative hypotheses for those failures.[67] Grabo was a senior intelligence analyst for the Army and the Defense Intelligence Agency and is recognized as an expert in strategic warning. She suggests that reasons for failures include insufficient examination of evidence by the intelligence analysts, basing analysis on preconceptions as opposed to facts, the IC explaining weak signals away, and analysts failing to believe what the intelligence analysis is clearly leading to as the causes of almost every warning failure.[68] Consistent with this research, Grabo warns that reliance on prior experiences over facts is

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65 Heuer, *Psychology of Intelligence Analysis*, 149.

66 Woocher, *The Effects of Cognitive Biases*, 19.

67 Cynthia M. Grabo, *Anticipating Surprise: Analysis for Strategic Warning* (Washington, DC: Joint Military Intelligence College, 2002), http://www.niu.edu/ni_press/pdf/Anticipating_Surprise_Analysis.pdf, 162.

68 Ibid., 168.

a common error resulting in warning failures and that analysts often place more significance on interpretations of prior experiences than the facts in hand.[69] This is consistent with prior research and could be interpreted as confirmation bias.

F. PRIVATE SECTOR INTELLIGENCE PERSPECTIVE

This research discovered a number of private organizations that process intelligence. Business Executives for National Security (BENS) is a non-profit organization and serves as a means for senior level executives to assist with strengthening our national security and improving the performance of government agencies involved in that mission.[70] The BENS Practitioners Panel includes well-respected members of the IC. Some of those members include the former Secretary of DHS Michael Chertoff, former CIA and National Security Agency (NSA) Director Michael Hayden, and the former Director of the National Counterterrorism Center Michael Leiter.

The BENS 2014 report titled *Domestic Security: Confronting a Changing Threat to Ensure Public Safety and Civil Liberties* contains recommendations to the IC. One of the key recommendations states, "The ODNI, in consultation with the FBI and DHS, should develop and apply analytic standards, training protocols, and common systems and vernacular to underwrite standardized training for all federal domestic counterterrorism analysts."[71] This research supports that statement and the importance of updating and applying consistent and relevant training to the entire IC.

The Walt Disney Company employs intelligence analysts at its properties around the world. It has a global intelligence and threat analysis support team providing "strategic intelligence, threat assessments, vulnerability mitigation strategies and in-depth analytical products covering existing and developing threats that include counter

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[69] Ibid., 118.

[70] Business Executives for National Security, *Domestic Security: Confronting a Changing Threat to Ensure Public Safety and Civil Liberties* (Washington, DC: Business Executives for National Security, 2014), http://www.bens.org/file/CounterterrorismReport.pdf, 2.

[71] Ibid., 16.

terrorism, physical threats, cyber-attacks and all reputational risks…"[72] The responsibilities for these positions are remarkably similar to those of the IC, especially those that focus on the collection and production of estimates to counter potential threats.[73]

Similar to Walt Disney Company, the Target Corporation also employs analysts for its cyber threat intelligence operations.[74] The responsibilities of these analysts include the "collection, analysis and dissemination of technical cyber threat intelligence."[75] These two private corporations serve as examples of how intelligence analysis is no longer just a government function and how it presents the private sector with the same challenges and opportunities as the IC.

Lockheed Martin offers intelligence analysis training through its Center for Security Analysis.[76] The critical thinking training includes understanding cognitive biases and how they negatively impact the critical thinking process, analytic judgments, and training in structured analytic techniques for the purpose of countering and defeating terrorism.[77] The Lockheed Martin intelligence training covers the traditional intelligence cycle as well as the challenges associated with a dynamic and asymmetric threat analysis. Moreover, the course teaches the analyst how to produce intelligence products in accordance with existing IC needs. This Lockheed Martin program appears to be on the cutting edge of intelligence analysis training and should be evaluated more closely to determine whether or not the IC would benefit from these modern training topics offered by the private sector.

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72 Next Generation Initiative, "Global Intelligence Analyst Intern," accessed January 7, 2016, https://www.hellenext.org/internship/disney-company-global-intelligence-analyst-intern-spring-2016/.

73 Walt Disney Company, "Careers," accessed January 7, 2016, http://corporate.disneycareers.com/en/business-career-areas/overview/.

74 Target Corporation, "Careers," accessed January 7, 2016, https://jobs.target.com/job/brooklyn-park/cyber-threat-intelligence-operations-analyst-cyber-security/1118/706592.

75 Ibid.

76 Lockheed Martin, Center for Security Analysis, "Critical Thinking," accessed January 9, 2016, http://www.lockheedmartin.com/us/products/intelligence-analysis-training/intelligence-training/ctasp.html.

77 Ibid.

G. ACADEMIC PERSPECTIVE

Dr. James Wirtz is a recognized intelligence expert and Dean of the Naval Postgraduate School's International Graduate Studies Program. According to a *Defense Media Network* interview with Dr. Wirtz, he explained the intelligence cycle currently used by the IC does not account for the influences of cognitive bias and results in a limitation on intelligence analysis effectiveness.[78] Also during the interview, Dr. Wirtz states that if we know what people are thinking, we can anticipate their actions despite the presence of information that might dictate an alternative action.[79] Dr. Wirtz goes on to say humans are more willing to receive information confirming their beliefs and more reluctant to accept information not consistent with those beliefs.[80] Those statements are consistent with our understanding of cognitive biases.

In the article "The Art of the Intelligence Autopsy," Dr. Wirtz expands on work by Robert Jervis, who analyzed intelligence failures, including the U.S. invasion of Iraq in 2003, based on faulty intelligence estimates.[81] Additionally, Dr. Wirtz discusses the correlations between cognitive bias and faulty intelligence analysis. He also states people interpret information through cognitive filters that process everything they are thinking and believe at the moment they receive new information.[82] Moreover, he describes cognitive biases as consistent with the intelligence analysis process and IC politics that pose as significant challenges in identifying those errors.[83] Finally, Dr. Wirtz agrees that changes to analytic tradecraft may be a more effective strategy than a reorganization of the IC as has occurred following past intelligence failures.

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78 Eric Tegler, "Prevailing Beliefs: Why Intelligence Analysis Sometimes Fails," *Defense Media Network*, August 19, 2013, http://www.defensemedianetwork.com/stories/prevailing-beliefs-why-intelligence-analysis-sometimes-fails/.

79 Ibid.

80 Ibid.

81 James J. Wirtz, "The Art of the Intelligence Autopsy," *Intelligence and National Security* 29, no. 1 (2013).

82 Ibid.

83 Ibid.

In his book *Why Intelligence Fails: Lessons Learned from the Iranian Revolution and the Iraq War*, Dr. Robert Jervis explores the causes of the intelligence failures regarding two specific issues: the assumption that Iran was secure and the belief that Iraq had a WMD program.[84] Dr. Jervis is a recognized intelligence subject matter expert and is the Chair of the Historical Declassification Advisory Panel for the CIA. Additionally, Dr. Jervis prefers to use cognitive predispositions as opposed to cognitive biases. He also explains the human tendency to use beliefs as a filter all new information must pass through, despite the possibility that the information is not consistent with an assessment and therefore that evidence is altered or simply ignored.[85]

Furthermore, Dr. Jervis references cognitive limitations and describes reliance on intuitive thinking as opposed to analytical thinking, resulting in an analyst expending less effort to make decisions.[86] Among Dr. Jervis's recommendations to improve the intelligence analysis process is the development and support of a peer review program, encouragement of alternative hypotheses, and improved training for analysts that is ongoing.[87] Dr. Jervis notes that if the IC was aware of perceptual errors, processes would be improved to decrease those errors.[88] These recommendations are consistent with the research in this thesis and are discussed in later chapters.

Dr. Dahl is an intelligence expert, a professor at the Naval Postgraduate School, and a former intelligence officer for the Navy. In his book *Intelligence and Surprise Attack*, Dr. Erik Dahl provides an alternative view of why intelligence fails. He points out that most intelligence available prior to attacks is very general in nature and results in strategic warnings not specific enough to act on to prevent the attack.[89] In addition, Dr.

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84 Robert Jervis, *Why Intelligence Fails: Lessons from the Iranian Revolution and the Iraq War* (Ithaca, NY: Cornell University Press, 2010).

85 Ibid., 169.

86 Ibid.

87 Ibid., 188–196.

88 Jervis, *Perception and Misperception*, 409.

89 Erik J. Dahl, *Intelligence and Surprise Attack: Failures and Successes from Pearl Harbor to 9/11 and Beyond* (Washington, DC: Georgetown University Press, 2013), 2.

Dahl proposes a theory of preventive action and two factors required to deliver an actionable intelligence product: the intelligence must be precise and the policy makers who must be receptive to that intelligence.[90] Moreover, Dr. Dahl supports his theory with a comprehensive study of attacks from 1987–2012. He mentions hindsight bias several times when discussing why it is difficult today, when attempting to research intelligence failures of the past, to understand what the IC analysts were thinking at the time the event occurred.

There are many intelligence analysis courses offered in the U.S. at many levels, including programs offering a certificate, bachelor degree, and a graduate degree. Policy research needs to include what the intelligence analysts are being taught in terms of the intelligence analysis process and to provide for a better understanding of the issues.

Pennsylvania State University (Penn State) is one college offering an intelligence analysis course. According to the Penn State intelligence analysis course, titled *Foundations of Geographic Information and Spatial Analysis*, there are six basic intelligence sources to include human source, signals, imagery, measurement and signature, open source, and geospatial intelligence.[91] Each of these intelligence sources has the potential to arrive at the analysis stage with biases already present. In addition, Penn State teaches future analysts the same intelligence cycle used by the majority of the IC today, including the tasking, collecting, processing, analyzing, and disseminating of intelligence. It also references the IC procedure of tasking, processing, exploitation, and dissemination (TPED) of that intelligence product to the consumers.[92] TPED is referred to as bringing together the people, systems, and processes that add value to the intelligence collection system and the product resulting from the analysis.

Furthermore, the Penn State analysis course references some of the reasons for intelligence failures and provides examples of those failures. The program materials

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[90] Ibid., 4.

[91] Pennsylvania State University, "Foundations of Geographic Information and Spatial Analysis," 7, accessed July 19, 2015, https://courseware.e-education.psu.edu/courses/bootcamp/lo07/01.html.

[92] Ibid., 9.

include information regarding the fact that cognitive bias in intelligence analysis can lead to intelligence failures.[93] Some other reasons articulated for cognitive bias failures include intelligence analysts producing products in line with a supervisor's hypothesis as opposed to the analyst's hypothesis, basing opinions on prior knowledge, and mistakenly relying on the results of an analysis that occurred on prior occasions.[94] These are cognitive bias limitations and consistent with the research on this topic.

The Penn State program materials also state that the intelligence cycle currently utilized by the IC was not designed to deal with globalization, which presents a very different threat to our homeland security. The IC is now required to build analysis from intelligence around the world and, more specifically, on terrorist organizations and the countries in which they operate.[95] From this research, it is clear that any change to the intelligence cycle model needs to be shared with the educational institutions teaching intelligence analysis. These institutions are tasked with providing future analysts with the tools and techniques to not only recognize and understand cognitive bias but also to recognize the effects on the intelligence process.

Located at Mercyhurst University, the Tom Ridge School of Intelligence Studies and Information Science offers certificates and undergraduate and graduate degrees in intelligence analysis.[96] These programs have over 400 students and offer the possibility of reaching future analysts to provide researchers and software developers the opportunity to test their ideas or products. It is an invaluable opportunity provided to the IC and is potentially a very important asset for future research.

H. CONCLUSION

This literature review has defined the intelligence cycle, the intelligence analysis process, and explored the training programs available to the IC. This chapter also

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93 Ibid., 10.

94 Ibid., 7.

95 Ibid., 9.

96 Mercyhurst University, Tom Ridge School of Intelligence Studies and Information Science, "Academic Programs," accessed January 7, 2016, http://www.ridgecollege.org/academics.

presented perspectives from the IC, the private sector, and academia. The next chapter of this thesis provides a history of cognitive psychology, explores cognitive bias from the psychological perspective, explains the relevance of cognitive bias awareness, provides for an understanding of how humans process information, and references a list of cognitive biases identified as relevant to intelligence analysis.

III. COGNITIVE BIAS

It's not what you look at that matters, it's what you see.

—Henry David Thoreau

A. HISTORICAL PERSPECTIVE

According to the *Blackwell Handbook on Judgment and Decision Making*, one of the first references to bias was in Shakespeare's *The Taming of the Shrew* in the line, "Well, forward, forward the bowle should run. And not unluckily against the bias." According to the authors, this reference is consistent with bias definitions used today to describe bias as deviations from the norm.[97]

The history of cognitive biases begins with the study of cognitive psychology. George Miller is a Harvard University educated psychologist who also spent time at the Massachusetts Institute of Technology and Princeton University. His work titled, "The Magical Number Seven, Plus or Minus Two," is one of the most quoted works in the field of cognitive psychology.[98] In summary, Miller used information theory to provide support for evidence regarding the limitations of the human capacity for short-term memory storage. Miller hypothesized that humans had the ability to store between five and nine items in short-term memory, hence the number seven as the average. Miller suggests that humans could increase short-term memory storage by organizing and grouping the stimulus to allow for an increase in that storage ability.

Miller states that in the late 1950s and early 1960s, the creation of the computer provided psychologists with the framework to begin to define how humans process

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[97] Derek Koehler and Nigel Harvey, *Blackwell Handbook of Judgment and Decision Making* (Malden, MA: Blackwell Publishing 2007), http://www.communicationcache.com/uploads/1/0/8/8/10887248/blackwell_handbook_of_judgement_and_decision_making_-_framing_loss_aversion_and_mental_accounting.pdf, 104.

[98] George A. Miller, "The Magical Number Seven, Plus or Minus Two: Some Limits on our Capacity for Processing Information," *Psychological Review* 101, no. 2 (1955): 343–353.

information.[99] How computers process information served as a model allowing psychologists to understand how humans process information. Psychologists refer to this as the "computer analogy" and use it to describe how a human (computer) codes, stores, uses, and produces information.[100] That analogy remains relevant and often quoted today in the psychological sciences literature.

Miller's work was followed up by Dr. Ulric Neisser, who is credited with the beginnings of cognitive psychology following his release of a book by the same name in 1967.[101] Dr. Neisser is considered the father of cognitive psychology, and he believed we could map our cognitive processes. His work led to defining cognitive psychology as the manner by which humans process information. Dr. Neisser postulated that memory is actually a reconstruction of the past, not a snapshot of an event, and the process of remembering is actually remembering our reconstructed memories.[102] Dr. Neisser also said that once humans make an assumption, a bias becomes present and any research that follows will be tainted by that cognitive limitation.[103]

Dr. Neisser studied memory and concluded that an emotional connection to an event resulted in a much clearer memory of that event when compared with a person who simply heard about it. He also concluded that emotional attachment has significant cognitive value.[104] This hypothesis is consistent with a bias in that when making decisions during the analysis process, intelligence analysts will place more value on an event that has occurred as opposed to the many events that did not occur. Dr. Neisser agreed with other researchers that memories were important and had the ability to present

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99 Saul McLeod, "Cognitive Psychology," Simple Psychology, last updated 2015, http://www.simplypsychology.org/cognitive.html.

100 Ibid.

101 Ulric Neisser, *Cognitive Psychology* (New York: Psychology Press, 1967).

102 Douglas Martin, "Ulric Neisser is Dead at 83; Reshaped Study of the Mind," *New York Times*, February 26, 2012, http://www.nytimes.com/2012/02/26/us/ulric-neisser-who-reshaped-thinking-on-the-mind-dies-at-83.html?_r=0.

103 Ibid.

104 Ulric Neisser and Ira E. Hayman Jr., *Memory Observed: Remembering in Natural Contexts* (New York: Worth Publishers, 1982), 68–73.

a cognitive limitation. He disagreed in that those memories were not without errors and should be verified before consideration during analysis. This is a pertinent point and consistent with this research in proposing an external analysis of intelligence products prior to dissemination.

In the late 1960s, Daniel Kahneman and Amos Tversky met while teaching graduate courses and immediately became friends and co-researchers. In a biographical article, Kahneman talks about the two of them writing on the availability heuristic, the psychology of prediction, and the study of biases.[105] Their first published article in 1974 identified cognitive biases, and they are credited with that term. The article postulated that judgment regarding uncertain events could sometimes result in predictable biases. Kahneman and Tversky identified with system 1 and system 2 thinking. The work by these two influential psychologists continued into the 1990s with additional research into cognitive processes and associated limitations.

B. PSYCHOLOGICAL DEFINITION

A seminal study by Amos Tversky and Daniel Kahneman, titled *Judgement under Uncertainty: Heuristics and Biases*, is often quoted in almost any credible research into cognitive biases. The term cognitive bias was first introduced by Amos Tversky and Daniel Kahneman in the 1970s and was used to describe a person's systematic but flawed patterns of response to both judgment and decision problems.[106] This work remains very influential regarding impacts and limitations in human reasoning/decision making and resulted in Kahneman being awarded the Nobel Prize in 2002. The authors posit that heuristics and biases impede our ability to determine the probability of an action occurring for an uncertain event.[107] Tversky and Kahneman focused on representativeness and how people apply this cognitive bias when making judgments

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105 Daniel Kahneman and Vernon L. Smith, "Daniel Kahneman-Biographical," Nobelprize.org, accessed March 10, 2016, http://www.nobelprize.org/nobel_prizes/economic-sciences/laureates/2002/kahneman-bio.html.

106 Tversky and Kahneman, *Judgment under Uncertainty*.

107 Ibid.

about the probability of an event under uncertainty.[108] This research on heuristics and biases appears throughout the literature, and the work appears to be just as significant today as it was in 1974.

Two of the cognitive biases relevant to the IC are confirmation bias and anchoring bias. Confirmation bias can be defined as a propensity to interpret intelligence in a way that confirms preconceptions.[109] This type of bias is most often referred to throughout this literature review. Confirmation bias is a potential fatal error analysts commit in seeking out intelligence information that simply confirms what they believe to be true, while ignoring other relevant information that may be to the contrary.

Anchoring bias describes the tendency in analyzing intelligence to rely almost exclusively on the first piece of information offered.[110] This type of bias is also referred to throughout this literature review. Anchoring bias can be a fatal error in that the intelligence analyst will rely on primary information and fail to perform additional analysis that could lead to an alternative hypothesis. Anchoring bias is cognitively easier on the analyst, and it requires much less cognitive effort. This is consistent with intuitive reasoning.

C. RELEVANCE OF COGNITIVE BIAS AWARENESS

There is very little literature regarding the influence of cognitive bias on the intelligence process. This could simply be attributed to the fact that on the whole, national intelligence is classified and not open to public scrutiny or review. According to Richards Heuer in his influential book *Psychology of Intelligence Analysis*, one of the limitations on intelligence analysis is cognitive bias.[111] Heuer is a recognized intelligence expert with a 45-year career working for the CIA, and his work is cited in almost any

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[108] Ibid., 1124.

[109] Science Daily, "Confirmation Bias," accessed November 11, 2015, http://www.sciencedaily.com/terms/confirmation_bias.htm.

[110] Science Daily, "Anchoring Bias," accessed November 11, 2015, http://www.sciencedaily.com/terms/anchoring.htm.

[111] Heuer, *Psychology of Intelligence Analysis*, 6.

research into intelligence analysis. Heuer defines cognitive bias as a limitation on human thinking that occurs when people process and interpret information.[112] A limitation on human thinking is relevant when understanding that intelligence analysis is a human task process.

In the *Journal of Management Studies* article "Cognitive Biases and Strategic Decision Process: An Integrative Perspective," the authors follow up on the research by Amos Tversky and Daniel Kahneman. They assert that intelligence analysts make decisions following an analysis and may not understand the relevance of how cognitive bias can influence those decisions. The article discusses the fact that often decision makers rely on intuitive reasoning in order to simplify a cognitively challenging decision, and the potential consequences of relying on that simple and fast cognitive process.[113]

In addition, authors Tversky and Kahneman state that cognitive biases can be viewed as one of the negative consequences of employing the intuitive reasoning process when the proper cognitive process should be the use of analytical reasoning.[114] Intelligence analysis is cognitively challenging, and their journal article stresses the importance of maximizing potential for success when making strategic decisions through the use of proper analytical reasoning. Furthermore. the authors propose an integrated framework that forces managers to be aware of their assumptions, heuristics, and cognitive biases in decision making.[115]

There is a large body of research exploring the influences of cognitive bias in many different disciplines, and much of that research involves the effects of cognitive bias when making a clinical diagnosis. For example, an article in the *New England Journal of Medicine* presents research into cognitive bias and decision making in the

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[112] Ibid., 111.

[113] Tversky and Kahneman, *Judgment under Uncertainty*, 1130.

[114] TK Das and Teng Bing-Sheng, "Cognitive Biases and Strategic Decision Making Processes: An Integrative Perspective," *Journal of Management Studies* 36, no. 6 (1999), http://aux.zicklin.baruch.cuny.edu/tkdas/publications/das-teng_jms99_cognitivebias_757-778.pdf, 760.

[115] Ibid., 773–774.

medical field.[116] The author, Pat Croskerry, explains the two processes used by human beings when making a decision—intuitive and analytical reasoning. Intuitive reasoning is described as reflexive based on our experiences and occurs in a fraction of second.[117] This type of cognitive thinking is completed subconsciously thousands of times every day and requires little if any thought processes. Croskerry argues that most cognitive errors occur during the intuitive process.[118]

Analytic reasoning is described as a conscious, deliberate cognitive effort that is mostly reliable and based on science, logic, and rational thinking.[119] The author suggests that recognizing cognitive biases is difficult, and de-biasing techniques will more than likely require lifelong maintenance once an effective strategy is identified.[120] Lifelong maintenance is a very important consideration in any meaningful discussion of cognitive bias mitigation strategies, and that view is shared by other subject matter experts in this literature review. The cognitive limitations require regular education, training, and awareness to decrease the possibility of allowing those biases to influence intelligence analysis.

In general, research indicates intelligence analysts have specific educational requirements and receive specific training. However, there does not appear to be consistent standards across the IC on what exactly that education and training should include. Would that fact of lack of consistency reduce or enhance susceptibility to the effects of cognitive bias? Interestingly, a separate study that complements the work of

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116 Pat Croskerry, "From Mindless to Mindful Practice-Cognitive Bias and Clinical Decision Making," *The New England Journal of Medicine* 368, no. 26 (2013): 2445.

117 Ibid.

118 Ibid., 2446.

119 Ibid., 2447.

120 Ibid.

Tversky and Kahneman postulates that cognitive intelligence does not reduce the effect of the biases identified during information processing or decision making.[121]

In the journal article "Cognitive Sophistication Does Not Attenuate the Bias Blind Spot," the researchers determined that those with high levels of cognitive sophistication were just as susceptible to bias blind spots as persons who are less cognitively sophisticated.[122] Perhaps more interesting is the premise that an intelligent person is able to identify the biases of another person but unable to recognize her or his own biases.[123] This is an important consideration when attempting to develop successful cognitive bias mitigation strategies. This research suggests that simply relying solely on personal reporting would thus yield inaccurate results.

D. SYSTEM 1 AND SYSTEM 2 THINKING

Understanding how humans process information is an important part of this research and relevant when identifying mitigation strategies. Humans make many decisions throughout the day that have no significant consequences if incorrect. Many of those decisions require no deep thought or critical thinking and safely rely on past experiences. These types of decisions are defined as the availability heuristic.[124] The availability heuristic is the cognitive process of problem solving based on learning and experience. This intuitive thinking process requires little cognitive effort and can lead to errors during the analysis process. Examples include the simplified rules humans live by that provide for effortless, quick decisions throughout the day. These types of decisions feel instinctive and effortless.

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121 Richard F. West et al, "Cognitive Sophistication Does Not Attenuate the Bias Blind Spot," *Journal of Personality and Social Psychology* 103, no. 3 (2012): 1, http://www4.ncsu.edu/~jlnietfe/Metacog_Articles_files/West,%20Meserve,%20%26%20Stanovich%20(2012).pdf.

122 Ibid.

123 Ibid., 11.

124 Tversky and Kahneman, *Judgment under Uncertainty*, 1127.

In contrast to intuitive reasoning is analytical reasoning, which can be defined as the deliberate cognitive effort required during complex analysis.[125] Analytical reasoning requires cognitive effort and the employment of critical thinking skills. This is the process people use when attempting to think through a problem where prior knowledge and experience may not be enough. Analytical reasoning is difficult and a necessity when people are forced to make decisions that have significant consequences. This is the preferred mental process that should be employed by intelligence analysts at each step of the intelligence cycle. There is great risk in using the intuitive reasoning process during the intelligence analysis process. This chapter explores the two types of cognitive reasoning processes to provide for a better understanding of the human cognitive experience.

An article in the *Journal of Intelligence and Counterintelligence*, titled "Cognitive Predispositions and Intelligence Analyst Reasoning," studies the issue of analyst reasoning and thinking. Two types of cognitive processes identified and defined in the article are natural and systematic reasoning. Natural reasoning is defined as fast, effortless, and requiring little cognitive effort, and it is useful in everyday decision making, social groups, and serves to store memories connected with emotions.[126] These types of decisions just feel right and are valid for familiar situations but not effective for situations involving uncertainty. Natural reasoning depends on familiarity with the situation. It is a cognitive response that cannot be "turned off" because it is the human automatic response.[127]

In contrast to natural reasoning is systematic reasoning, and this cognitive effort is slow, methodical, and requires a process that can be described.[128] The systematic reasoning process is normally associated with probabilities, logic, signals, methods, and

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125 Daniel Kahneman, *Thinking Fast and Slow* (New York: Farrar, Straus, and Giroux Publishers, 2011), http://shifter-magazine.com/wp-content/uploads/2015/02/Daniel-Kahneman-Thinking-Fast-and-Slow-.pdf, 22.

126 Colin A. Wastell, "Cognitive Predispositions and Intelligence Analyst Reasoning," *International Journal of Intelligence and Counterintelligence* 23, no. 3 (2010): 453.

127 Ibid., 454.

128 Ibid.

processes.[129] Cognitive reasoning is a slippery slope due to the human inclination to resort to natural reasoning because of the minimal cognitive effort it requires. Sometimes humans do it without the realization it has occurred, and sometimes at the expense of systematic reasoning. This article provides recommendations to reduce cognitive predispositions on analytic products, including analyst training utilizing veteran intelligence analysts who have prior positive and negative experiences to share, de-biasing and predisposition awareness training, IC acceptance of new practices and tradecraft, and continued regular training and development to reinforce the systematic reasoning process.[130]

Limitations of the human mind include cognitive biases in perception and judgment.[131] Human beings interpret information through "filters" and evaluate that information against past experiences. Who we are is a powerful influence when evaluating the world or, more specifically, when attempting to analyze information. Humans do not have the ability to turn off those filters but can certainly be trained to recognize their presence and work within a framework that forces an accounting for their limitations. Biases in human perception and judgment will always be present and forcing an intelligence analyst to consider alternatives would appear to be an important mitigation strategy.[132] Perception and judgment are different for everyone and being forced to account for that bias would lead to a better intelligence product.[133]

The business perspective on cognitive reasoning appears to be consistent with the IC perspective. In the article "The Big Idea before You Make That Big Decision" from the *Harvard Business Review*, the authors provide a background of the potential distortions in business decisions resulting from cognitive biases. The authors describe

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[129] Ibid.

[130] Ibid., 456–458.

[131] Heuer, *Psychology of Intelligence Analysis*, 111.

[132] Central Intelligence Agency, *A Tradecraft Primer: Structured Analytic Techniques for Improving Intelligence Analysis* (Washington, DC: Central Intelligence Agency, 2009), https://www.cia.gov/library/center-for-the-study-of-intelligence/csi-publications/books-and-monographs/Tradecraft%20Primer-apr09.pdf, 1.

[133] Ibid., 5.

two modes of thinking, intuitive and reflective. Intuitive thinking is considered System 1 and produces a constant representation of our daily environment.[134] There is no need to focus on this type of thinking as it is done throughout the day, such as going to bed when tired and drinking water when thirsty.

Reflective thinking is considered system 2, and not only is it slow, methodical, requires effort, it is governed by rules.[135] System 2 thinking is activated when errors are detected or reasoning is required. Additionally, system 2 thinking is necessary during the intelligence analysis process when patterns are identified and need to be connected in order to indicate a concern. All of these definitions are consistent with other research in this literature review and previously identified as intuitive and analytical reasoning.[136]

Cognitive biases are intuitive (system 1) errors, and humans are not aware when the result is limited thinking.[137] Decision makers have the opportunity to identify analyst biases by utilizing reflective (system 2) or analytical thinking. The *Harvard Business Review* article suggests most executives employ system 2 thinking to identify system 1 limitations and errors.[138] In addition, the authors developed a 12-question checklist designed to identify cognitive biases present in the recommendations executives receive. The questions force executives to consider motivations, bias, dissenting opinions, credibility, questions, alternatives, and sources of information.[139] Moreover, the authors assert these questions will assist in the identification of limitations resulting from cognitive biases of the teams providing the recommendations. The questions easily correlate to questions the IC could be asking when reviewing an intelligence product and should be considered during any intelligence analysis process.

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134 Daniel Kahneman, Dan Lovallo, Oliver Sibony, "The Big Idea before You Make That Big Decision," *Harvard Business Review* (June 2011), https://hbr.org/2011/06/the-big-idea-before-you-make-that-big-decision.

135 Ibid.

136 Croskerry, "From Mindless to Mindful Practice" 2445.

137 Kahneman, Lovallo, and Sibony, "The Big Idea."

138 Ibid.

139 Ibid.

In summary, this research has identified two modes of thinking. The first has been identified as intuitive, natural, or system 1 thinking. This is instinctive and occurs many times throughout the day and requires little cognitive effort. The second mode of thinking has been identified as analytical, systematic, reflective, or system 2 thinking. This is methodical and requires significant cognitive effort. Cognitive biases are thought to occur much more frequently as a result of system 1 thinking. Intelligence analysis would benefit from the use of system 2 thinking to decrease the potential for cognitive limitations.

E. RELEVANT COGNITIVE BIASES

The European Union funded a study called the Reduction of Cognitive Biases in Intelligence Analysis (RECOBIA). The goal of the study was to identify and reduce the negative effects of cognitive biases upon the intelligence analysis process. The study included a series of workshops involving intelligence organizations and analysts with project completion in early 2015. Unfortunately, the findings and recommendations are restricted and will not be made available to the public. This researcher was able to make contact with one of the project managers who agreed to provide very limited information that could be used for this thesis. That information provided by the RECOBIA project included a list of 47 cognitive biases identified as relevant to the IC (see Appendix A for the list and definitions).[140]

Some of the more recent sources of information reviewed for this thesis referred to the list of cognitive biases found on the *Wikipedia* website. That list contains 172 cognitive biases categorized by decision-making biases, belief biases, behavioral biases, social biases, and memory error biases. Any number of these biases could easily apply to the IC and the intelligence analysis process. This second list of cognitive biases is provided in Appendix B.[141] Although there are many more identified cognitive biases,

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[140] European Union Seventh Framework Programme, "Reduction of Cognitive Biases in Intelligence Analysis," accessed April 19, 2016, https://www.recobia.eu/home.

[141] *Wikipedia*, s.v., "List of Cognitive Biases," accessed April 28, 2016, https://en.wikipedia.org/wiki/List_of_cognitive_biases.

for the purposes of scoping, this thesis is focused on the two biases cited most frequently in the literature review; confirmation bias, and anchoring bias.

IV. THE INTELLIGENCE COMMUNITY

’Tis but a part we see, and not a whole.

—Alexander Pope

A. INTELLIGENCE CYCLE AS A SYSTEM

The intelligence analyst is asked to critically evaluate often ambiguous information derived from many different sources using the intelligence cycle as the structure for that analysis process. The intelligence cycle is an open structured system, and every step of that system is influenced by the preceding and the proceeding step. The purpose of this structured system is to carry out a specific activity (intelligence analysis) to accomplish an objective (e.g., produce a relevant intelligence product).[142] Each of the elements (steps) of this system are interrelated and influence each other, and the system allows for inputs and outputs while the structure remains in place, despite the dynamics of the external environment.[143] The inputs, outputs, and feedback are all critical elements of the intelligence cycle and support the structure of the system.

The inputs and outputs are driven by the intelligence analysts. The intelligence cycle requires both inputs and outputs, and both have the ability to influence each step in the intelligence cycle. If the inputs have a bias present, there is a strong possibility the outputs will also. Depending on whether or not the analyst is aware of the presence of that bias, the output will be influenced. Humans provide a great deal of the relevant information used by the IC, and in turn this provides many opportunities for the influences of cognitive bias to affect each step of the intelligence cycle. Feedback is also a part of this system and can be an opportunity to detect the presence of a cognitive bias.

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142 BusinessDictionary.com, s.v., “System,” accessed March 19, 2016, http://www.businessdictionary.com/definition/system.html.

143 Ibid.

Feedback is an important part of any system. At each step of the cycle, the intelligence analyst critically analyzes information, makes adjustments, and requests additional information depending on what was learned. In the dynamic environment of intelligence analysis, feedback is critical to the process as it presents the analyst with opportunities to corroborate the information received. The process of corroboration presents the analyst with the opportunity to mitigate any bias that may be present but remains susceptible to human factors, and those influences can lead to cognitive bias creep.

B. COGNITIVE BIAS CREEP

The intelligence cycle does not account for the human factor, and therefore is susceptible to cognitive bias creep. Human factors include the social, psychological, political, cultural, organizational, behavioral, and educational attributes influencing the decision-making process. Humans will always make errors and to think any differently would be unreasonable. However, knowing those human errors will occur presents the IC with opportunities to build a more resilient system through the intelligence cycle.

At every step of the intelligence cycle, there are opportunities for cognitive bias to creep into the process. As an example, the steps of the intelligence cycle do not force the analyst to externalize assumptions, critically evaluate information received, or consider alternative hypotheses. Each of these strategies could potentially alert the analyst to cognitive bias creep and counter the influence of those cognitive limitations on the analysis process.

Working through the intelligence cycle requires significant cognitive effort, and as such there may be temptation to resort to intuitive reasoning. This research strongly suggests that intelligence analysis should solely employ the use of analytical reasoning. The intuitive process is easy and fast but highly susceptible to errors. As soon as the critical thinking ceases, even for just a moment or two and a decision is made, cognitive bias is provided opportunities to creep into the process. Once that limitation occurs, all analysis after that time is now tainted and could potentially result in faulty analysis. That

moment could occur at any of the steps of the intelligence cycle from the requirements to planning, collection, processing, analysis, or dissemination.

Intelligence analysts need to be acutely aware of the inherent dangers of intuitive reasoning and the relevance of analytical reasoning. This is justification for the IC to employ mitigation strategies. One such strategy is the use of a more structured analytic technique requiring the analyst to list all assumptions. This improved analytic structure could provide an independent reviewer with an opportunity to question those assumptions and possibly identify the presence of cognitive biases. There are mitigation strategies available to the IC now with emerging strategies in development. Those strategies are presented in the following sections.

C. NATIONAL INTELLIGENCE ESTIMATES

The National Intelligence Estimate (NIE) represents the formal, written strategic intelligence product completed by the IC with a focus on foreign developments of interest and possible impact to the United States.[144] The concept for the NIE has its origins in the passage of the National Security Act of 1947, and today many of the agencies of the IC are responsible for assisting with the required production and analysis.[145] For instance, the National Intelligence Council (NIC) is responsible for coordinating NIE efforts and reports to the DNI.[146] NIEs are judgments from subject matter experts (SME) from inside and occasionally outside the IC regarding a specific issue of concern to the United States. NIEs are not expected to be accurate predictions of what will occur; they are merely estimates of what might occur. Therefore, they are assigned confidence values to assist the decision makers.

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144 Richard A. Best Jr., *Intelligence Estimates: How Useful to Congress?* (Washington, DC: Congressional Research Service, 2011), https://www.fas.org/sgp/crs/intel/RL33733.pdf, 1.

145 Greg Bruno and Sharon Otterman, *National Intelligence Estimates* (Washington, DC: Council on Foreign Relations, 2008), http://www.cfr.org/iraq/national-intelligence-estimates/p7758.

146 Ibid.

The creation of an NIE involves a formal process with many stakeholders involved. According to the Council on Foreign Relations that process consists of the following steps:[147]

1. NIEs can be requested by senior members of the executive branch of government, House or Senate committee chairs, senior officials of the military branches, or the NIC. The DNI authorizes all requests for NIEs.
2. Terms of reference (TOR) are produced to define the specific information being requested, who is ultimately responsible for drafting the document, and provides a time schedule. The TOR is then circulated through the IC to provide opportunities for comment. The draft of the NIE is reviewed by the NIC prior to distribution to the specific agencies of the IC.
3. Experts from different IC agencies then review the draft and are provided opportunities for analysis and comment.
4. Agency representatives will then participate in a meeting to discuss the draft NIE and any potential changes.
5. The National Clandestine Service (NCS) of the CIA then review the draft NIE in order to assist with vetting the intelligence to provide comment on the reliability of sources and information.
6. The final draft of the NIE is submitted to IC agency experts for review and can include analysis from SMEs employed outside of the U.S. government.
7. The NIC is provided with the final draft of the NIE and forwards it to representatives of the IC and the DNI, who together comprise the National Intelligence Board.
8. The NIE is then approved by the National Intelligence Board and delivered to the person who made the request. Additionally, copies of the NIE are provided to the president, senior government officials, and specific members of Congress.

NIEs are susceptible to the effects of cognitive bias at each step of production. The analysts and decision makers with any responsibility for the NIE possess cognitive biases that can influence the process or present limitations. Because creation of the NIE involves human task performance, the NIEs are also susceptible to additional biases related to the public discourse at that moment in time, including the politics of the day and the risk that the NIE may be counter to current U.S. strategy or policy. Time is also a

147 Ibid.

relevant factor that could influence intelligence analyst assessments. In a perfect world, the analysts would be provided with opportunities to evaluate any intelligence included in the NIE; however, in the reality of the war on terrorism, there will be dynamic events that will not allow such an opportunity.

Following the NIE released in 2002 regarding Iraq's continuing programs for weapons of mass destruction and the faulty intelligence attributed to that document, the DNI implemented changes to the NIE process as recommended in 2005 by the Silberman-Robb Commission to improve intelligence analysis.[148] Among the recommendations was compelling intelligence analysts to conduct a more thorough analysis, question any assumptions and judgments, be cognizant of groupthink, and provide for the inclusion of alternative analysis.[149] Although the DNI has implemented some of these recommendations, the IC continues to experience the negative effects of cognitive bias, as evidenced by the intelligence failures at Benghazi in 2012—explored in the following section.

D. CASE STUDY: BENGHAZI

On September 11, 2012, the nation was again remembering the terrorist events of 9/11. Terrorism has remained a critical concern to the IC and rightfully so. Between 1998 and 2012, there were 273 significant terrorist attacks against U.S. facilities and personnel.[150] Terrorist attacks were increasing around the world and the U.S. assets abroad were often the target of those attacks. Libya was no exception. Beginning in June of 2012, there were 12 separate attacks in or near Benghazi against U.S. assets, including

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148 Commission on the Intelligence Capabilities of the United States, *Commission on the Intelligence Capabilities of the United States Regarding Weapons of Mass Destruction* (Washington, DC: Commission on the Intelligence Capabilities of the United States, 2005), https://fas.org/irp/offdocs/wmd_report.pdf.

149 Harvard University, Belfer Center for Science and International Affairs, "National Intelligence Estimates," accessed April 15, 2016, http://belfercenter.ksg.harvard.edu/publication/19150/national_intelligence_estimates.html.

150 Department of State, Bureau of Diplomatic Security, *Significant Attacks Against U.S. Diplomatic Facilities and Personnel, 1998–2012* (Washington, DC: Department of State, 2014), http://www.state.gov/documents/organization/225846.pdf.

20 security incidents at the U.S. facility in Benghazi.[151] There were increasing signs that our assets in Benghazi were very much at risk for a significant terrorist attack, and those on the ground were asking for additional security measures.[152]

According to a report by the U.S. Senate Committee, the following is a timeline of the terrorist attacks against two U.S. facilities in Benghazi in 2012[153]

> The US was occupying a Department of State (DS) Temporary Mission Facility (TMF) and approximately one mile away an Annex facility used by a different US government agency in Benghazi, Libya. The TMF was occupied by Ambassador Christopher Stevens, State Department Officer Sean Smith, two American security officers, and a small, contingent of US and Libyan personnel.
>
> At approximately 9:40 pm, the personnel inside the TMF began hearing shouting, gunshots, and an explosion outside. Security monitors showed a large number of armed terrorists entering the main gate unchallenged. The alarm was sounded and the US Embassy in Tripoli and the DS headquarters in Washington DC were immediately notified of the situation. The DS notified the DoD and the on-site DS officer notified the Annex and requested security personnel respond to assist.
>
> Ambassador Stevens, Officer Smith, and one of the DS officers sought refuge in the building's fortified area while three other agents went to retrieve weapons. Two of the three agents attempted to reach Ambassador Stevens and encountered armed terrorists. The terrorists attempted to breach the area where Ambassador Stevens was hiding and were unable to do so. They then began setting fire to the buildings resulting in thick smoke inside the TMF. Ambassador Stevens, Officer Smith, and the agent became separated as they attempted to escape from the smoke-filled building.
>
> At 10:30 pm the Annex security personnel reached the TMF and began exchanging gunfire with the terrorists. At 11:15 pm an unmanned, unarmed surveillance aircraft began circling overhead providing images of

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151 Senate Committee on Intelligence, *Review of the Terrorist Attacks on U.S. Facilities in Benghazi, Libya, September 11–12, 2012* (Washington, DC: Government Printing Office, 2014), 12–14.

152 Ibid., 14.

153 Senate Committee on Homeland Security and Governmental Affairs, *Flashing Red: A Special Report on the Terrorist Attack at Benghazi* (Washington, DC: Senate Committee on Homeland Security and Governmental Affairs, 2013), 1–3.

> what was occurring. At about midnight the terrorists began firing rocket propelled grenades (RPG) at the Annex.
>
> US government security personnel based in Tripoli arrived at Benghazi Airport at 1:15 on September 12. They were forced to negotiate with the Libyan government for approximately three hours before being allowed to respond for assistance. The security team arrived at the Annex at 5:04 am just as the terrorists began firing mortar rounds at the facility.
>
> Former Navy SEALs Tyrone Woods and Glen Doherty were both killed at that time. Before the terrorist attack ended Ambassador Stevens, Officer Sean Smith, and two US security officers were killed at the TMF.

This U.S. Senate Committee report provided findings and recommendations following the attacks at Benghazi. One of the findings was the IC failed to focus attention on other violent Islamist extremist groups not affiliated with al-Qaeda, despite the presence of open source intelligence indicating these groups were opportunistic and capable of attacking U.S. facilities in Benghazi.[154] One of the recommendations was that the IC should expand focus in Libya to include violent Islamist extremist groups not affiliated with al-Qaeda to improve tactical warning capabilities.[155] This finding and recommendation is consistent with confirmation bias in that the IC only focused on intelligence related to al-Qaeda, despite the presence of conflicting intelligence regarding threats from other extremist groups.

On September 16, 2012, U.S. Ambassador to the United Nations Susan Rice reported to the media that the attacks in Benghazi were the result of a small contingent of protestors attempting to replicate events occurring at the same time in Cairo where protestors had breached the U.S. embassy walls and destroyed an American flag.[156] Ambassador Rice stated the protests were the result of outrage over an anti-Muslim video. Many other U.S. government officials echoed the statements made by Ambassador Rice. Those statements contradicted Libyan President Mohamed Yousef El-Magariaf

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154 Ibid., 7–8.

155 Ibid.

156 Jake Tapper, "Ambassador Susan Rice: Libya Attack Not Premeditated," *ABC News*, September 16, 2012, http://abcnews.go.com/blogs/politics/2012/09/ambassador-susan-rice-libya-attack-not-premeditated/.

when he stated the attacks were preplanned by persons who came into Libya a few months earlier.[157] There was no mention of protests prior to the attacks on the U.S. facilities by the Libyan government.

One of the findings by the U.S. Senate Select Committee on Intelligence in the report on the Benghazi attacks was that the IC inaccurately referred to the presence of a protest at the TMF in Benghazi prior to the attacks.[158] The committee found that the IC relied on various reports when releasing the inaccurate intelligence products referring to protests prior to the attacks, including six media reports, two statements from Ansar al-Sharia (a terrorist organization),[159] and three intelligence reports.[160]

In addition, the committee found that the IC also had intelligence reports indicating there were no protests prior to the attacks, but it failed to include that information in the intelligence products released.[161] The IC's release of the inaccurate intelligence products surveillance videos from outside the TMF showed there were no protests prior to the attacks. According to the committee, the IC then changed the assessments, indicating that in fact there were no protests at the TMF prior to the attacks. The delay in revising the assessments resulted in many U.S. government officials falsely reporting the presence of protests to the media.[162] The IC failed to corroborate the open source press reports, thus basing faulty intelligence on the first piece of information received. This is indicative of anchoring bias in that the IC relied on the initial intelligence received and failed to attempt to corroborate that information even though there was conflicting intelligence present.

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157 Ibid.

158 Senate Committee on Intelligence, *Review of the Terrorist Attacks*, 32.

159 National Counterterrorism Center, "Ansar al-Sharia," accessed March 20, 2016, http://www.nctc.gov/site/groups/ansar_al_sharia.html.

160 Senate Committee on Intelligence, *Review of the Terrorist Attacks*, 34.

161 Ibid., 33–34.

162 Ibid., 34.

In summary, the IC failed to focus attention on other violent Islamist extremist groups despite the presence of open source intelligence indicating these groups were opportunistic and capable of attacking U.S. facilities in Benghazi. This is consistent with confirmation bias in that the IC was directing intelligence gathering efforts at al-Qaeda and affiliated groups, mistakenly believing they would be the only terrorists capable of attacking the U.S. in Libya. The IC was attempting to solely confirm intelligence that pointed to al-Qaeda. This cognitive bias influenced the collection, processing, analysis, and dissemination steps of the intelligence cycle.

Furthermore, the IC relied upon uncorroborated reports of protests prior to the attacks and failed to mention any of the information received indicating there were no protests. The IC then changed the assessments, but the damage was already done. The inaccurate intelligence products disseminated to the government resulted in inaccurate information delivered to the media following these attacks. The IC relied on the first intelligence reports received and failed to corroborate that intelligence, which is indicative of anchoring bias. This cognitive bias influenced the collection, processing, analysis, and dissemination steps of the intelligence cycle.

One of the additional committee findings was that the IC failed to place adequate emphasis on the exploitation of open source information and extremist social media.[163] That lack of emphasis can be interpreted as a cognitive bias in that the IC believed the current intelligence collection strategies were adequate. Furthermore, the IC did not feel it necessary to explore available open sources of information and social media despite the widespread use of both by many violent extremist organizations. This cognitive limitation influenced the collection step of the intelligence cycle, and as a result it influenced the ability to process, analyze, and disseminate accurate intelligence products.

D. ISRAELI INTELLIGENCE COMMUNITY

The Israeli Intelligence Community (IIC) is divided into three main agencies: the Directorate of Military Intelligence (AMAN), the Israeli Security Agency (SHABAK),

163 Ibid., 24–25.

and Mossad. AMAN is one of the branches inside the Israel Defense Force. AMAN provides intelligence required at the strategic and operational decision making at the national level, studies political trends, economic activity, technological innovations, and military affairs throughout the world, and it is responsible for the electronic and collection units of the IIC.[164]

The IIC has suffered major intelligence failures leading to positive changes as evidenced by the Yom Kippur War. The following history regarding the IIC comes from the Brookings Institution and the white paper titled *Lessons from Israel's Intelligence Reforms*.[165]

The Arab-Israeli conflict was ongoing in 1948 when the State of Israel was formed. Following the Six-Day War of 1967, Israel captured the Sinai Peninsula from Egypt, half of the Golan Heights from Syria, and the West Bank from Jordan. The Israeli Defense Forces (IDF) and, in particular AMAN, were responsible for intelligence assessments at that time.

Prior to October 6, 1973, AMAN dismissed warnings of a pending war against Israel despite having significant knowledge of Arab war plans. The Egyptian Army was conducting military exercises near the Israeli border, and the Israeli military had responded with military exercises at a significant cost in terms of resources and money. When no attack occurred, AMAN attributed the moves by Egypt as simply military exercises. In the week leading up to Yom Kippur, large-scale troop movement by Egypt continued, and again the intelligence was dismissed as military exercises; AMAN also dismissed Syrian troop movements occurring at the same time. At the start of Yom Kippur, Egypt and Syria attacked Israel, and the IIC had not provided the intelligence required to prepare for the invasion. This event is recognized as a significant failure on the part of the IIC.

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164 Yosef Kupperwasser, *Lessons from Israel's Intelligence Reforms* (Analysis Paper No. 14) (Washington, DC: Brookings Institution, 2007), http://www.brookings.edu/~/media/research/files/papers/2007/10/intelligence%20kuperwasser/10_intelligence_kuperwasser.pdf.

165 Ibid.

Following the Yom Kippur War intelligence failures, the Israeli government established the Agranat Commission in November 1973 to investigate the performance of the Israeli intelligence and security services. The Agranat Commission released the *Inquiry Interim Report* in 1974, and it provided a summary of the initial findings and recommendations.[166] The report concluded the director of military intelligence had adopted the groupthink that was present in the IIC and therefore was not open to new intelligence information that might contradict known information.[167] Groupthink is identified as a cognitive bias and is limitation to the intelligence analysis process. The Agranat Commission also recommended the creation of a control unit that was expected to challenge provide alternative assessments and challenge assumptions.[168]

The Israeli intelligence reforms began following the Yom Kippur War but continued through 1998.[169] Unlike the U.S., Israel did not wait until a catastrophic event to implement intelligence reforms. The changes in the characteristics of war, changes in the military doctrine of Israeli's enemies, and the impact of the information age were all catalysts for changes to the IIC.[170] The IIC appears to have recognized early on that the fight against terrorism would require a significant change in intelligence strategy.

AMAN values openness, and the intelligence analysts are expected to express dissenting opinions as evidenced by its slogan "freedom of opinion, discipline in action."[171] Encouraging dissenting opinions appears to be unique to the IIC, and this researcher was unable to locate any similar strategies employed by the IC. AMAN has a "devil's advocate office" to ensure creativity and assist with avoiding cognitive bias and

166 Israeli Government, *Agranat Commission Inquiry Interim Report* (Tel Aviv: Israeli Government, 1974), https://israeled.org/wp-content/uploads/2015/06/1974.4-Agranat-Commission-of-Inquiry-Interim-Report.pdf.

167 Ibid.

168 Robert J. Joustra, *The Tenth Man* (Washington, DC: Center for Public Justice, 2013), http://www.cpjustice.org/public/capital_commentary/article/264.

169 Kupperwasser, *Lessons from Israel's Intelligence Reforms*.

170 Ibid.

171 Ibid.

groupthink.[172] The use of a devil's advocate approach is a strategy whereby a group or individual provides for ideas and questions that run counter to the consensus.[173]

This strategy provides opportunities for balance and a more objective view of the analysis. The IIC employs the devil's advocate approach during the intelligence analysis process to remain relevant and effective. The intelligence analysts are encouraged and allowed to participate in the intelligence analysis process as well as provided opportunities to ask questions and challenge assumptions to identify any cognitive biases or groupthink that may be present.

Some of AMAN's responsibilities are to critically evaluate intelligence assessments, author written opinions counter to those assessments, explore alternative assessments, and present alternative assumptions.[174] Intelligence analysts are provided the freedom and ability to express alternative opinions and encouraged to author "different opinion" memos, allowing them to safely critique conclusions from their department.[175] This strategy appears to be very similar to loyal opposition. Loyal opposition allows for the same goal (providing intelligence to safeguard a nation) while perhaps disagreeing on the majority opinion. Loyal opposition provides an acceptable platform to allow an intelligence analyst to combat cognitive bias and groupthink.[176]

The IIC strategy of permitting and encouraging cognitive freedom provides opportunities to identify and combat cognitive biases and groupthink that may be present in the intelligence assessments. This strategy also provides opportunities to mitigate those negative effects. In addition to this strategy, AMAN appears to maintain close relationships with both decision makers and collectors. These relationships appear to

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[172] Ibid.

[173] Uri Bar-Joseph, "The Professional Ethics of Intelligence Analysis," *International Journal of Intelligence and Counterintelligence* 24, no. 1 (2010): 35–36.

[174] Kupperwasser, *Lessons from Israel's Intelligence Reforms*.

[175] Ibid.

[176] Joustra, *The Tenth Man*.

strengthen the effectiveness and resiliency of the IIC. The IIC strategy and others present the USIC with opportunities to improve its own intelligence analysis.

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V. COGNITIVE BIAS MITIGATION STRATEGIES

The journey of a thousand miles begins with one step.

—Lao Tzu

A. INTRODUCTION

This research has identified potential strategies to successfully mitigate the effects of cognitive bias during the intelligence analysis process and, more specifically, the effects on the intelligence cycle. Academia and the social sciences are still attempting to understand how to mitigate the effects of cognitive biases and how human cognitive performance can be optimized; there are promising possibilities.[177] This research has identified strategies the IC could employ now to mitigate the effects of cognitive bias on the intelligence cycle. Those strategies include perspectives on this problem from the IC, the private sector, and academia.

This research has also identified emerging strategies that will be available in the future, including the use of technology. Although this technology remains in the development and testing stages, it holds great promise for the future of intelligence analysis. Developments in artificial intelligence technologies are increasing, and the prospects of incorporating that type of technology for use in the intelligence field is significant.

IBM's Watson is an example of an emerging cognitive technology that has the ability to analyze enormous amounts of unstructured data, learn from that data, and presents answers and solutions.[178] Watson is already being employed in the fields of business, healthcare, developers, and universities. However, this is still the very beginning stages of cognitive technologies. With the substantial investments in these

[177] Katherine L. Milkman Dolly Chugh, and Max H. Bazerman, *How Can Decision Making Be Improved* (Cambridge: Harvard University, 2008), http://www.hbs.edu/faculty/Publication%20Files/08-102.pdf.

[178] IBM, "Watson," accessed April 16, 2016, http://www.ibm.com/smarterplanet/us/en/ibmwatson/.

types of technologies, there will undoubtedly be rapid growth in this field that will present opportunities to the IC.

Potential mitigation strategies to decrease cognitive limitations will be grouped in the following chapter as psychological strategies, analytical strategies and technological strategies. These groupings will serve to organize the various strategies and provide context for the possible solutions.

B. PSYCHOLOGICAL STRATEGIES

A report by the CIA's Directorate of Intelligence at Kent School's Global Futures Partnership and the RAND Corporation looked at how the IC could make sense of transnational threats.[179] The researchers for the project also held a series of workshops. These workshops were attended by IC analysts and experts from the private sector representing fields, such as cognitive psychology, organizational culture, and terrorism. One of the primary findings of the workshops was the need for IC analysts to employ critical thinking skills or "mindfulness" during the analysis process. Mindfulness was described in the report as being preoccupied with past and future failures and associated with a learning environment in which there was value in admitting mistakes, raising doubts, and asking questions.[180]

Critical thinking must occur regularly and cannot be specific to certain aspects of the intelligence analysis process. The report documents the need for mindfulness to be continual, creative, collaborative, counter-intuitive, and consumer friendly.[181] In addition, the report describes continual as consistently exploring alternative outcomes and assumptions, creative as encouraging diversity on the team, allowing for the freedom to discuss the intelligence out loud with others, collaborative as working as a team,

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[179] Gregory F. Treverton, *Making Sense of Transnational Threats* (Santa Monica: RAND, 2005), http://www.rand.org/content/dam/rand/pubs/conf_proceedings/2005/RAND_CF200.pdf.

[180] Ibid., 28–29.

[181] Ibid., 50.

counterintuitive as seeking evidence contrary to assumptions, and consumer friendly as allowing for changes in variables to produce different outcomes.[182]

Critical thinking is employing the analytical reasoning process (system 2) and results in questioning assumptions and identifying areas of analysis susceptible to errors. Based on the research presented in this thesis, this mitigation strategy appears to be crucial to effective intelligence analysis and the cornerstone in attempts to limit the influence of cognitive bias. Analytical reasoning requires cognitive effort and the employment of critical thinking skills. This is the preferred mental process that should be employed by intelligence analysts at each step of the intelligence cycle.

C. ANALYTICAL STRATEGIES

There are other strategies available to the IC in addition to the psychological strategies. Analytical strategies are just as important to the tradecraft of intelligence analysis and some of those strategies will be explored in this section.

1. Alternative Analysis

Alternative analysis is the process of empowering intelligence analysts and decision makers to question analytical estimates, perform cognitively rigorous review, and explore alternative outcomes.[183] Alternative analysis takes advantage of the power of diversity and/or groups as opposed to individual analysts working through the intelligence cycle. Some of the sources identified during this literature review promote the value of providing opportunities for an independent review of the intelligence cycle steps and associated assumptions. A few of the alternative analysis strategies worth exploring are red teaming, devil's advocate, and the peer review process.

According to the Joint Chiefs of Staff in the *Joint Publication 2-0*, red teams are "organizational elements comprised of trained, educated, and practiced experts that provide [an] independent capability to conduct critical reviews and analysis [from] an

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182 Treverton, *Making Sense of Transnational Threats*.

183 Ibid.

alternative perspective."[184] This appears to be an important strategy that could assist with identifying any cognitive bias present in an intelligence product and is consistent with other research in this literature review. The use of a red team has been identified for many years as a potential strategy for success already utilized by the DOD.[185]

This report highlights the advantage of utilizing red teams to combat pre-existing assumptions and biases.[186] Red teams have the ability to view the analysis from an independent perspective and could provide alternative hypotheses worthy of consideration by the decision makers. Moreover, the red team brings added value to the intelligence product by assuring that the information has been vetted through a collection of experts who bring diverse backgrounds to that intelligence product.[187]

The use of a devil's advocate approach is a strategy whereby an individual or group provides for ideas and questions that run counter to the consensus.[188] This strategy provides balance and an objective view of the issues. There are many examples of groupthink remaining unchallenged, and the result can be catastrophic. One such example was the loss of the *Challenger* spacecraft and the subsequent identification of groupthink as a major contributing factor to that failure.[189] It is important that at each step of the intelligence cycle the devil's advocate be encouraged and allowed to participate in the process by asking questions to identify any cognitive biases that may be present.

The use of a peer review process has been the practice of journal publications for many years, with articles submitted for publication subjected to an evaluation for accuracy and importance to the field. The *New England Journal of Medicine* (NEJM) is

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184 Department of Defense, *Joint Intelligence* (Joint Publication 2-0) (Washington, DC: Department of Defense, 2013),1–4.

185 Defense Science Board Task Force, *The Role and Status of DoD Red Teaming Activities* (Washington, DC: Department of Defense, 2003), http://fas.org/irp/agency/dod/dsb/redteam.pdf.

186 Ibid., 3.

187 Ibid., 31.

188 Bar-Joseph, "The Professional Ethics of Intelligence Analysis," 35–36.

189 James E. Ricciuti, "Groupthink: A Significant Threat to the Homeland Security of the United States" (master's thesis, Naval Postgraduate School, 2014).

one of the most prestigious and respected journals in the world and it employs a rigorous peer review process to maintain its reputation. That peer review process includes editorial review, peer review by two subject matter experts, statistical review, additional review by an editor, and finally approval from an editor-in-chief.[190] This process may be more intensive than required by the IC, but it does provide a solid foundation for a peer review process that could be constructed to identify the presence of cognitive biases during the analysis process.

Alternative analysis techniques, such as the use of red teams, devil's advocate, and peer review, have existed for many years, and they provide opportunities for external reviewers to identify and account for the effects of cognitive bias during each of the intelligence cycle steps. Additionally, these strategies are currently available to the IC. Although these processes require the use of additional personnel, the use of these techniques would be an efficient and effective strategy to take advantage of the power of people who have an expertise in the analysis process and yet may not share the same cognitive limitations as other analysts or experts. In addition, analysts are unable to identify personal biases, and these strategies present opportunities to identify those potential roadblocks to effective analysis.

2. External Analysis

Dr. Yetiv provides recommendations on de-biasing techniques that could assist in avoiding the influences of cognitive bias. The first technique described is self-awareness.[191] Training that creates bias awareness can be a positive de-biasing technique to teach intelligence analysts how to recognize biases and the potential consequences of allowing those biases to influence intelligence analysis.[192] Although there are opportunities where this strategy might be effective, cognitive biases are subconscious,

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190 *New England Journal of Medicine*, "Media Center Publication Process," accessed March 10, 2016, http://www.nejm.org/page/media-center/publication-process.

191 Yetiv, *National Security through a Cockeyed Lens*, 97.

192 Elizabeth J. Reese, "Techniques for Mitigating Cognitive Bias in Fingerprint Identification," *UCLA Law Review* 59, no.1252 (2012), http://www.uclalawreview.org/pdf/59-5-3.pdf.

and humans may not be aware of these cognitive limitations or the negative effects on the intelligence cycle. Self-awareness is important but is certainly open to continued errors.

A second approach to de-biasing is to externalize the decision-making process through the use of formal procedures.[193] This technique would be a similar strategy to the use of a structured analytical technique (SAT).[194] Externalizing the intelligence analysis process provides an opportunity to consider alternative hypotheses, encourages a more robust collection of information, allows for an independent review of the intelligence analysis process to identify the presence of biases, and presents an opportunity for that independent analyst to play devil's advocate.[195]

Furthermore, externalizing the analysis process would force the intelligence analyst to list all assumptions at the beginning of the intelligence cycle process. As the analyst proceeds through the intelligence cycle steps, the process of continuing to list all assumptions remains until the analyst is ready to disseminate the intelligence product. An independent reviewer then has the opportunity to review the assumptions and analysis searching for the presence of cognitive biases.

3. Structured Analytical Technique

Many sources in the literature cited the importance of the use of a structured analytical technique (SAT) during the intelligence analysis process. One such SAT was identified in an article titled "The Lockwood Analytical Method for Prediction (LAMP) within a Probabilistic Framework" in which the author notes, the "sequential and cyclical arrangement of the intelligence cycle."[196] Additionally, the article discusses the importance of the externalization of the mental framework used by the intelligence analyst to mitigate the effects of cognitive bias. This is a very important step in any

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193 Ibid., 98.

194 Jay Singh, "The Lockwood Analytical Method for Prediction within a Probabilistic Framework," *Journal of Strategic Security* 6, no. 3 (2013), http://scholarcommons.usf.edu/cgi/viewcontent.cgi?article=1219&context=jss.

195 Yetiv, *National Security through a Cockeyed Lens,* 97100.

196 Singh, "The Lockwood Analytical Method," 83.

effective structured intelligence model to allow for an independent review of the intelligence product to provide opportunities to identify any cognitive biases that may be present in the analysis.[197] The LAMP potentially assists in mitigating the limitations of cognitive bias by externalizing the intelligence analysis process. Furthermore, this is a transparent process that allows for an outside reviewer to understand how the intelligence analyst developed the intelligence product.

A CIA white paper titled *A Tradecraft Primer: Structured Analytic Techniques for Improving Intelligence Analysis* highlights how a SAT can assist intelligence analysts to "challenge judgments, identify mental mindsets, stimulate creativity, and manage uncertainty."[198] There are many influencing factors within intelligence analysis based on current organizational climate, politics, ambiguous data, globalization, and the limitations of the human mind.[199] A strategy that forces an intelligence analyst to challenge hypotheses and provides for an opportunity for the independent analyst to challenge another analyst's hypothesis would be invaluable.

4. Analyst Teams

In 2005, Philip Tetlock and Dan Garner's book *Superforecasting: The Art and Science of Prediction* presented a groundbreaking study involving thousands of ordinary people attempting to forecast future events. This research supports the fact that teams of forecasters were approximately 23 percent more accurate than individual analysts.[200] This is very relevant research and important in understanding the value of analyst teams as opposed to the current strategy of employing intelligence analysts who work alone. In Tetlock and Garner's study, the participants worked in groups and were provided the opportunity to evaluate each other's assumptions, were made aware of groupthink, and provided with strategies to avoid it. Crowd-sourcing success, or using analyst teams, can

197 Ibid., 85.

198 Central Intelligence Agency, *A Tradecraft Primer*, 1.

199 Ibid., 3.

200 Philip Tetlock and Dan Gardner, *Superforecasting: The Art and Science of Prediction* (New York: Crown Publishing Group, 2015), 201.

simply be explained by the fact that knowledge is often dispersed among many different people; no one person can know everything.[201]

The author discusses the importance of remaining flexible and open to new information during the process of gathering information as well as the relevance of being willing to adjust the hypothesis as the information changes. Humans will learn from their mistakes as long as there is awareness a mistake occurred. In this study, the people who performed the best were cautious, humble, open minded, curious, enjoyed cognitive challenges, were good with numbers, were analytical, understood the value in alternative views, were not afraid to change their minds, and understood cognitive biases.[202] These would be valuable character traits to consider during the process of employing intelligence analysts.

In summary, Tetlock and Garner's significant research discovered the following factors to improved predictions: high intelligence is a benefit, subject matter expertise is valuable, practice improves accuracy, teams outperform individuals, open minded people perform better, training can guard against cognitive biases, and revising predictions based on new information improves results.[203] Tetlock and Garner's research presents the IC with opportunities for significant improvement to the intelligence analysis process.

According to the authors of "Psychology of Intelligence Analysis: Drivers of Prediction Accuracy in World Politics," teams of analysts are more effective than individuals, and civilians without any formal intelligence background can be trained to be effective forecasters.[204] The researchers from the University of Pennsylvania organized an exercise from 2011 through 2013 that sought predictions for 199 world events of interest to the IC. As an example, those events included deciding whether or not North

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[201] Ibid., 73.

[202] Ibid., 191–192.

[203] Walter Frick, "What Research Tells Us About Making Accurate Predictions," *Harvard Business Review*, February 2, 2015, https://hbr.org/2015/02/what-research-tells-us-about-making-accurate-predictions.

[204] Barbara Mellers et al, "The Psychology of Intelligence Analysis: Drivers of Prediction Accuracy in World Politics," *Journal of Experimental Psychology: Applied* 21, no. 1 (2015): 8.

Korea would attempt another nuclear weapons test between a specific period of time and whether Moody's would lower Greece's debt rating by a specific date.[205]

According to the study results, teams performed better than individuals by 10 percent, and the participants who received training during the study performed better than average when that training included methods to mitigate the effects of cognitive bias.[206] In addition, the top performers in the study scored higher on intelligence and knowledge of world politics were open to all possibilities as outcomes, excelled following specific training/working in an open and collaborative team, and were provided with strategies to mitigate the effects of cognitive bias.[207] Moreover, this study showed with proper education and training intelligence analysts could be very successful as defined in this study by anticipating future world events.

D. TECHNOLOGICAL STRATEGIES

The use of use of serious games for intelligence analysts is relatively new strategy showing great promise in mitigating the effects of cognitive bias present during the intelligence analysis process. The ODNI is working with its research partner, IARPA, in the creation of games that could be used to teach intelligence analysts how to recognize and mitigate cognitive biases.[208] The objective is to develop games that can be manipulated by changing the variables in order to teach the intelligence analyst to engage the cognitive process (system 2) resulting in the recognition and mitigation of cognitive biases.[209] The study identified the cognitive biases having the greatest impact on intelligence analysis to include confirmation bias and anchoring bias consistent with this thesis research.

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[205] Ibid., 5.

[206] Ibid., 10.

[207] Ibid.

[208] Office of the Director of National Intelligence, "IARPA, Sirius Program," accessed July 25, 2015, http://www.iarpa.gov/index.php/research-programs/sirius.

[209] Ibid.

Intelligence analysts are responsible for working with information from many sources while under the constant pressure to produce actionable intelligence products.[210] IARPA recognized that the current intelligence analysis process does not provide the intelligence analyst with the structure to mitigate the effects of cognitive biases,[211] and that gap in analysis could result in missed weak signals.

In response to this identified gap in analysis, the University of Oklahoma, with funding provided by IARPA, developed a game called Mitigating Analyst Cognitive Bias by Eliminating Task Heuristics (MACBETH).[212] The strategy of this interactive game requires the analyst to collect and analyze intelligence data to stop a terrorist attack located at an imaginary place. The MACBETH research study resulted in very little loss of the recognition of biases eight weeks after playing the game for one hour or less, and this confirmed the de-biasing effect remained largely intact following participation in the program.[213] In addition, this study suggests that repeated play and for a longer time could increase the de-biasing effects as a result of MACBETH game playing. When compared with simple de-biasing training, such as viewing a training video, MACBETH was much more effective in teaching intelligence analysts about the effects of cognitive biases.[214]

A new strategy to mitigate the influences of bias and predispositions is the Simulation of Intelligence Analysis (SINTELLA) program.[215] This research project is funded by the Australian government and Macquarie University. The research began with the recognition that effective intelligence analysis is influenced by biases and cognitive

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210 Ibid.

211 Office of the Director of National Intelligence, "IARPA."

212 Norah E. Dunbar et al., "Macbeth: Development of a Training Game for the Mitigation of Cognitive Bias," *International Journal of Game-Based Learning* 3, no. 4 (2013): 7–26.

213 Ibid.

214 Nora Dunbar et al, "Mitigation of Cognitive Bias Through the Use of a Serious Game," in *Proceedings of the Games Learning Society Annual Conference*, 2013, http://www.researchgate.net/publication/259043715_Mitigation_of_Cognitive_Bias_Through_the_Use_of_a_Serious_Game, 7.

215 Colin A. Wastel, "SINTELLA: Simulation of Intelligence Analysis," *Journal of Policing, Intelligence and Counter Terrorism* 4, no. 2 (2011): 71–81.

predispositions.[216] The project targets the gathering and interpretation steps of the intelligence analysis process (collection, exploitation, analysis) with the understanding that intelligence activities require assessments made under the umbrella of uncertainty.[217]

The SINTELLA program requires participants to complete analytical tasks and threat assessments by accessing a standardized database, then author a report making judgments based on the information provided.[218] The software records search behaviors, including information viewed, sequence of viewing, time viewed, copied materials, decisions made, and final reports.[219] According to this research study, the early results are positive, and the program holds great promise for the future. Furthermore, the SINTELLA program may provide the IC with a resource to evaluate, train, and develop intelligence analysts by providing them with the ability to recognize cognitive biases and predispositions.

A mitigation strategy being developed in conjunction with the Office of Naval Research (ONR) Collaborative Knowledge Interoperability (CKI) program is a networked collaborative intelligence analysis tool called the Joint Intelligence Graphical Situation Awareness Web (JIGSAW).[220] JIGSAW is based on the theory that a shared environment between intelligence analysts will lead to less biased analysis. This is consistent with the concept of analyst teams using software to connect analysts in different locations. JIGSAW is a web-based technology workspace allowing analysts to post and share their assessments of the analysis being completed by other intelligence analysts.[221]

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216 Ibid., 72.

217 Ibid.

218 Ibid., 73.

219 Ibid., 79.

220 Matthew R. Risser and Harvey S. Smallman, *Networked Collaborative Intelligence Assessment* (San Diego: Pacific Science & Engineering Group, 2008), http://www.dodccrp.org/events/13th_iccrts_2008/CD/html/papers/101.pdf.

221 Ibid., 1.

Additionally, JIGSAW allows for the exchange of information and reduces biases among intelligence analysts who do not know each other by providing opportunities to question assumptions while the analysts remain in different locations.[222] This type of collaborative technology is still under development but holds great promise. Furthermore, it has the potential to reduce the effects of cognitive bias on intelligence analysis by providing opportunities for intelligence analysts from different IC agencies to work together toward a common objective.

[222] Ibid., 3.

VI. FINDINGS, RECOMMENDATIONS, CONCLUSION

The strength of a nation derives from the integrity of the home.

—Confucius

A. SUMMARY OF RESEARCH

This research has provided a historical understanding of the intelligence activities of the U.S. that resulted in the development of the intelligence cycle. The intelligence cycle has remained relatively unchanged, despite the fact that the threats against the U.S. have changed significantly. The research has provided an understanding of the training intelligence analysts currently receive. Additionally, the effects of cognitive bias have been presented from the perspective of the IC, the private sector, and academia to provide context and different viewpoints on the issue.

Moreover, this research has provided a historical perspective regarding the identification of cognitive bias, including the resulting psychological definition, which remains in place today. The research has also supported the relevance of cognitive bias awareness and why it is important to the IC. Human cognitive performance was researched and the difference between intuitive and analytical thinking was explored, and it was explained why it is important to understand the difference. In addition, confirmation bias and anchoring bias were identified as the most relevant cognitive biases influencing intelligence analysis and, more specifically, the intelligence cycle.

This thesis has also analyzed the intelligence cycle and identified it as a system that includes opportunities for cognitive bias creep at every step. NIEs were included in this research because they are susceptible to cognitive bias and represent the end product of the intelligence cycle. Also, this thesis analyzed the tragic killings of U.S. personnel at Benghazi, and it inferred the negative effects of cognitive bias resulted in faulty intelligence assessments before and after the event's occurrence. This thesis also includes

a study of the IIC resulting in the identification of strategies employed to combat the effects of cognitive bias and/or groupthink during the intelligence analysis process.

Cognitive bias mitigation strategies from many different sources were researched, identified, and separated between psychological solutions, analytical solutions, and technological solutions. Some of these strategies have been tested and have proven to be effective in reducing the effects of cognitive bias. Many of these strategies are available to the IC now, and some are emerging and will be available in the future. All of the mitigation strategies present the IC with opportunities to decrease the influences of cognitive bias on the intelligence cycle.

This thesis supports the hypothesis that the intelligence cycle is indeed influenced by cognitive bias. Additionally, the research supports the fact that humans do not have the ability to self-identify when those cognitive biases are influencing intelligence analysis and decision making. This is a significant concern for the IC, which is tasked with providing the intelligence required to protect this country. However, all is not lost, and there is hope. Mitigation strategies are available to the IC today, and there are additional emerging strategies that will be available in the near future. Many of these strategies are not only very promising but are relevant to the specific activities required during the difficult process of separating the signals from the noise. The employment of these strategies will decrease the influence of cognitive bias on the intelligence cycle and increase the resilience of the IC.

B. FINDINGS

The intelligence cycle has remained unchanged since its inception following the end of WWII; however, the threats faced by the IC today are very different from the threats of the past. Unlike the intelligence environment during the Cold War, the threats of today do not necessarily involve nations or states; rather, they often involve terrorist organizations with allegiance to no single nation or state and no specific boundaries. These dynamic threats require enhanced intelligence analysis providing accountability for the limitations of human cognitive performance.

The study of the human cognitive reasoning process and associated biases remains relatively new. Recognizing that cognitive biases influence our decision-making process, these findings indicate a lack of formal acknowledgement of that fact by the IC, and no identified changes to the intelligence cycle in attempt to mitigate those effects. In addition, the IC continues to provide very little cognitive bias training to new intelligence analysts, and there is no evidence of any recurring training regarding the effects of cognitive bias to analysts deployed within the IC.

Finally, this thesis provides evidence that the effects of cognitive bias do in fact influence the intelligence cycle in a negative manner. The IC is in a position to take advantage of identified mitigation strategies to decrease those negative effects resulting in a more resilient intelligence cycle leading to more effective intelligence analysis.

C. RECOMMENDATIONS

The first step in improving the intelligence analysis process should be formal recognition by the DNI that the effects of cognitive bias do in fact influence the intelligence cycle in a negative manner. Formal recognition by the leadership of the IC would serve as a catalyst for change and the only real possibility for significant changes to the IC practices. Any recommendations for change will require significant funding and resources. Perhaps that funding could be used by the DNI as incentive to influence the IC to explore and implement recommended changes. This researcher recommends the following to the IC:

1. Establish a diverse working group comprised of representatives from throughout the IC, including SMEs from outside the government to evaluate and explore potential mitigation strategies available today and in the future.
2. Training for the IC should be consistent and at regular intervals include significant education on the effects of cognitive bias and strategies to decrease those effects.
3. Improve the critical thinking skills of analysts through recurring education and training that is on the cutting edge of cognitive psychology.
4. Explore the concept of analyst teams as opposed individual analysts to assist with the identification of cognitive biases.

5. Revisit the intelligence cycle and determine if a more structured analytic technique would lead to improved intelligence analysis.
6. Intelligence analysts should be required to document all assumptions to provide opportunities for an external analysis.
7. Intelligence analysts should be required to include alternative assessments depending on variables.

Any changes to the intelligence analysis process should be documented in performance appraisals so that IC managers are aware of the requirements and can hold analysts accountable to those standards. In addition, decision makers should be provided access to all of the intelligence utilized in the intelligence product to be provided opportunities to ask for clarification.

D. CONCLUSION

This research supports the fact that cognitive bias is very much a concern in the government, public sector, private sectors, academia, and the social sciences. This research and thesis supports the hypothesis that cognitive bias has a negative effect on the intelligence cycle. The significance of this research impacts U.S. national security, and the IC cannot allow the negative effects of cognitive bias to influence the intelligence analysis process. Missing weak signals leads to intelligence analysis failures resulting in tragedies and the loss of lives here at home and abroad. The complexity of today's fight against terrorism demands the IC's best efforts in this dynamic environment. The U.S. needs resilient intelligence programs providing analysts with the tools and training in order to be effective and successful. This research resulted in the identification of cognitive bias mitigation strategy recommendations that will release the cognitive limitations of those biases.

The ODNI recently released the *National Counterintelligence Strategy of the United States of America 2016*, which includes recommendations that the IC focus efforts on anticipating, identifying, and warning of emerging threats.[223] One of the recommendations is the development of relevant educational programs and opportunities

[223] National Counterintelligence and Security Center, *National Counterintelligence Strategy of the United States of America 2016* (Washington, DC: Office of Director of National Intelligence, 2015), http://www.dni.gov/files/documents/ncsc/National%20CI%20Strategy%202016_Unclassified_Final.pdf, 3.

that will assist with the identification of those threats.[224] The topic of this thesis is consistent with our most recent national counterintelligence strategy and provides an opportunity to contribute to our nation's security. This thesis presents the IC with recommendations to strengthen our nation's intelligence analysis effectiveness in order to better protect this nation and our interests abroad. This research presents the IC with an opportunity to release the cognitive binds that blind us.

[224] Ibid., 8.

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APPENDIX A. LIST OF COGNITIVE BIASES (RELEVANT TO IC)

Table 2. Cognitive Biases Relevant to the IC[225]

COGNITIVE BIAS	DEFINITION
Anchoring	Tendency to rely on past reference or information when making decisions or judgments
Attribution	Tendency to explain the actions of others or events
Availability heuristic	Tendency to estimate the likelihood of an event if it is more available in memory
Backfire effect	Tendency to react to disconfirming evidence by strengthening their beliefs or position
Bandwagon effect	Tendency to increase adoption of an idea, etc. based on proportion who have already done so
Base Rate fallacy	Tendency to base judgments on specifics while ignoring general statistical information
Belief bias	Tendency to evaluate the logic of an argument depending on the believability of the conclusion
Biased assimilation	Tendency to interpret information in a manner, which supports the desired conclusion
Choice supportive bias	Tendency to retroactively ascribe positive attributes to an option one has already selected
Commission bias	Tendency toward action rather than inaction despite not having all information
Confirmation bias	Tendency to regard information, which supports a pre-established opinion
Conjunction fallacy	Tendency to assume that specific conditions are more probable than a single, general one
Conservatism	Tendency to retain prior views at the expense of acknowledging

[225] Adapted from European Commission, European Union Seventh Framework Programme, "Reduction of Cognitive Biases in Intelligence Analysis," accessed April 19, 2016, http://recobia.atosresearch.eu/recopedia/index.php/Category:Cognitive_Biases.

COGNITIVE BIAS	DEFINITION
	new information exists
Contrast effect	Tendency to enhance or diminish relevance of information when compared with more recent, contrasting information
Disconfirmation bias	Tendency to critically scrutinize information that contradicts prior beliefs
Distinction bias	Tendency to view two options as more dissimilar when evaluating them simultaneously than when evaluating them separately
Expertise bias	Tendency to select sources with the highest perceived expertise, even if that expertise is not relevant to the question at hand
False consensus effect	Tendency to overestimate the degree to which others agree with you based on the self-perception that your beliefs are common
Familiarity bias	Tendency to believe those having a conversation with you are more credible than those who are not
Framing effect	Tendency to draw different conclusions from the same information depending on context
Fundamental attribution error	Tendency to over-emphasize personality-based explanations for behaviors while under-emphasizing the influences of the environment on those behaviors
Halo effect	Tendency to allow a person's positive or negative traits to influence the perceptions of that person's character
Hard-Easy effect	Tendency to subjectively perceive the suspected level of difficulty of a specific task
Hindsight effect	Tendency to view past events as being predictable at the time those events occurred, or view past events through present knowledge about them
Hostile attribution error	Tendency to over-emphasize personality-based explanations for behaviors in others while under-emphasizing the power of environmental influences
Hostile media effect	Tendency to view media reports as biased based on subjective personal views
Illusion of validity	Tendency to add credibility to new information that supports the data in hand, even if objectively it does not

COGNITIVE BIAS	DEFINITION
Illusory correlation	Tendency to perceive a relationship between two unrelated events and inaccurately recall a relationship between two events
Mere exposure effect	Tendency to view dislike for something based on familiarity with it
Morality as self-interest illusion	Tendency to participate in attempting to solve a dilemma based on the inaccurate belief a benefit will be realized in the long run
Negativity bias	Tendency to place more value on negative information rather than the positive
Objectivity bias	Tendency to consider people with perceived objectivity more credible than others
Omission	Tendency to judge harmful actions as worse or less moral than equally harmful inactions
Optimism bias	Tendency to believe we are at less risk of experiencing a negative event when compared with others
Out group homogeneity	Tendency to view members of our own group as more varied than members of other groups
Overconfidence effect	Tendency to place excessive value on our personal abilities or answers to questions
Parochialism effect	Tendency to favor a specific group, or group we belong to, while dismissing the effects on others
Planning fallacy bias	Tendency to underestimate the time or resources required to complete a task
Recency effect	Tendency to recall the most recent information presented above all else
Selective perception	Tendency for expectations to affect perception
Self-fulfilling prophecy	Tendency to engage in behaviors that will elicit results which will confirm existing attitudes
Self-serving bias	Tendency to claim more responsibility for successes than failures
Similarity bias	Tendency to believe that that people with similar characteristics to our own are more credible than others

COGNITIVE BIAS	DEFINITION
Stereotyping	Tendency to expect a member of a group to possess certain characteristics without any actual information about that individual
Student syndrome	Tendency to wait until the a deadline approaches to fully engage a pending task
Trait ascription bias	Tendency to view ourselves as well-rounded while viewing others as predictable
Ultimate attribution error	Tendency to assign an attribute to an entire group instead of the individuals

APPENDIX B. LIST OF COGNITIVE BIASES (DECISION MAKING, BELIEF, AND BEHAVIORAL)

Table 3. Decision Making, Belief, and Behavioral Biases[226]

Name	Description
Ambiguity effect	The tendency to avoid options for which missing information makes the probability seem unknown
Anchoring	The tendency to rely too heavily, or "anchor," on one trait or piece of information when making decisions
Anthropomorphism	The tendency to characterize animals, objects, and abstract concepts as possessing human-like traits, emotions, and intentions
Attentional bias	The tendency of our perception to be affected by our recurring thoughts
Automation bias	The tendency to excessively depend on automated systems, which can lead to erroneous automated information overriding correct decisions
Availability heuristic	The tendency to overestimate the likelihood of events with greater "availability" in memory, which can be influenced by how recent the memories are or how unusual or emotionally charged they may be
Availability cascade	A self-reinforcing process in which a collective belief gains more and more plausibility through its increasing repetition in public discourse
Backfire effect	When people react to disconfirming evidence by strengthening their beliefs

[226] Adapted from *Wikipedia*, s.v., "List of Cognitive Biases," accessed April 28, 2016, https://en.wikipedia.org/wiki/List_of_cognitive_biases.

Name	Description
Bandwagon effect	The tendency to do (or believe) things because many other people do (or believe) the same
Base rate fallacy	The tendency to ignore base rate information (generic, general information) and focus on specific information (information only pertaining to a certain case)
Belief bias	An effect where someone's evaluation of the logical strength of an argument is biased by the believability of the conclusion
Bias blind spot	The tendency to see oneself as less biased than other people, or to be able to identify more cognitive biases in others than in oneself
Cheerleader effect	The tendency for people to appear more attractive in a group than in isolation
Choice-supportive bias	The tendency to remember one's choices as better than they actually were
Clustering illusion	The tendency to overestimate the importance of small runs, streaks, or clusters in large samples of random data
Confirmation bias	The tendency to search for, interpret, focus on and remember information in a way that confirms one's preconceptions
Congruence bias	The tendency to test hypotheses exclusively through direct testing, instead of testing possible alternative hypotheses
Conjunction fallacy	The tendency to assume that specific conditions are more probable than general ones
Conservatism (belief revision)	The tendency to revise one's belief insufficiently when presented with new evidence

Name	Description
Contrast effect	The enhancement or reduction of a certain perception's stimuli when compared with a recently observed, contrasting object
Curse of knowledge	When better-informed people find it extremely difficult to think about problems from the perspective of lesser-informed people
Declinism	The belief that a society or institution is tending towards decline. Particularly, it is the predisposition to view the past favorably and future negatively
Decoy effect	Preferences for either option A or B changes in favor of option B when option C is presented, which is similar to option B but in no way better
Denomination effect	The tendency to spend more money when it is denominated in small amounts
Disposition effect	The tendency to sell an asset that has accumulated in value and resist selling an asset that has declined in value
Distinction bias	The tendency to view two options as more dissimilar when evaluating them simultaneously than when evaluating them separately
Dunning-Kruger effect	The tendency for unskilled individuals to overestimate their own ability and the tendency for experts to underestimate their own ability
Duration neglect	The neglect of the duration of an episode in determining its value
Empathy gap	The tendency to underestimate the influence or strength of feelings in either oneself or others
Endowment effect	The tendency for people to demand much more to give up an object than they would be willing to pay to acquire it

Name	Description
Essentialism	Categorizing people and things according to their essential nature, in spite of variations
Exaggerated expectation	Based on the estimates, real-world evidence turns out to be less extreme than our expectations
Experimenter's or expectation bias	The tendency for experimenters to believe, certify, and publish data that agree with their expectations for the outcome of an experiment, and to disbelieve, discard, or downgrade the corresponding weightings for data that appear to conflict with those expectations
Focusing effect	The tendency to place too much importance on one aspect of an event
Forer effect or Barnum effect	The observation that individuals will give high accuracy ratings to descriptions of their personality that supposedly are tailored specifically for them, but are in fact vague and general enough to apply to a wide range of people
Framing effect	Drawing different conclusions from the same information, depending on how that information is presented
Frequency illusion	The illusion in which a word, a name, or other thing that has recently come to one's attention suddenly seems to appear with improbable frequency shortly afterwards
Functional fixedness	Limits a person to using an object only in the way it is traditionally used
Gambler's fallacy	The tendency to think that future probabilities are altered by past events, when in reality they are unchanged
Hard-easy effect	Based on a specific level of task difficulty, the confidence in judgments is too conservative and not extreme enough
Hindsight bias	The tendency to see past events as being predictable at the time those events happened.

Name	Description
Hot-hand fallacy	The fallacious belief that a person who has experienced success with a random event has a greater chance of further success in additional attempts
Hyperbolic discounting	Discounting is the tendency for people to have a stronger preference for more immediate payoffs relative to later payoffs
Identifiable victim effect	The tendency to respond more strongly to a single identified person at risk than to a large group of people at risk
IKEA effect	The tendency for people to place a disproportionately high value on objects that they partially assembled themselves (IKEA)
Illusion of control	The tendency to overestimate one's degree of influence over other external events
Illusion of validity	Belief that furtherly acquired information generates additional relevant data for predictions, even when it evidently does not
Illusory correlation	Inaccurately perceiving a relationship between two unrelated events
Impact bias	The tendency to overestimate the length or the intensity of the impact of future feeling states
Information bias	The tendency to seek information even when it cannot affect action
Insensitivity to sample size	The tendency to under-expect variation in small samples
Irrational escalation	The phenomenon where people justify increased investment in a decision, based on the cumulative prior investment, despite new evidence suggesting that the decision was probably wrong

Name	Description
Less-is-better effect	The tendency to prefer a smaller set to a larger set judged separately, but not jointly
Loss aversion	The disutility of giving up an object is greater than the utility associated with acquiring it
Mere exposure effect	The tendency to express undue liking for things merely because of familiarity with them
Money illusion	The tendency to concentrate on the nominal value (face value) of money rather than its value in terms of purchasing power
Moral credential effect	The tendency of a track record of non-prejudice to increase subsequent prejudice
Negativity effect	The tendency of people, when evaluating the causes of the behaviors of a person they dislike, to attribute their positive behaviors to the environment and their negative behaviors to the person's inherent nature
Negativity bias	Psychological phenomenon by which humans have a greater recall of unpleasant memories compared with positive memories
Neglect of probability	The tendency to completely disregard probability when making a decision under uncertainty
Normalcy bias	The refusal to plan for, or react to, a disaster, which has never happened before
Not invented here	Aversion to contact with or use of products, research, standards, or knowledge developed outside a group
Observer-expectancy effect	When a researcher expects a given result and therefore unconsciously manipulates an experiment or misinterprets data in order to find it

Name	Description
Omission bias	The tendency to judge harmful actions as worse, or less moral, than equally harmful omissions (inactions)
Optimism bias	The tendency to be over-optimistic, overestimating favorable and pleasing outcomes
Ostrich effect	Ignoring an obvious (negative) situation.
Outcome bias	The tendency to judge a decision by its eventual outcome instead of based on the quality of the decision at the time it was made
Overconfidence effect	Excessive confidence in one's own answers to questions
Pareidolia	A vague and random stimulus (often an image or sound) is perceived as significant
Pessimism bias	The tendency for some people, especially those suffering from depression, to overestimate the likelihood of negative things happening to them
Planning fallacy	The tendency to underestimate task-completion times
Post-purchase rationalization	The tendency to persuade oneself through rational argument that a purchase was good value
Pro-innovation bias	The tendency to have an excessive optimism towards an invention or innovation's usefulness throughout society, while often failing to identify its limitations and weaknesses
Pseudocertainty effect	The tendency to make risk-averse choices if the expected outcome is positive, but make risk-seeking choices to avoid negative outcomes
Reactance	The urge to do the opposite of what someone wants you to do out of a need to resist a perceived attempt to constrain your freedom of choice

Name	Description
Reactive devaluation	Devaluing proposals only because they purportedly originated with an adversary
Recency illusion	The illusion that a word or language usage is a recent innovation when it is in fact long-established
Regressive bias	A certain state of mind wherein high values and high likelihoods are overestimated while low values and low likelihoods are underestimated
Restraint bias	The tendency to overestimate one's ability to show restraint in the face of temptation
Rhyme as reason effect	Rhyming statements are perceived as more truthful. A famous example being used in the O.J Simpson trial with the defense's use of the phrase "If the gloves don't fit, then you must acquit."
Risk compensation	The tendency to take greater risks when perceived safety increases
Selective perception	The tendency for expectations to affect perception
Semmelweis reflex	The tendency to reject new evidence that contradicts a paradigm
Social comparison bias	The tendency, when making hiring decisions, to favor potential candidates who do not compete with one's own particular strengths
Social desirability bias	The tendency to over-report socially desirable characteristics or behaviors in oneself and under-report socially undesirable characteristics or behaviors
Status quo bias	The tendency to like things to stay relatively the same
Stereotyping	Expecting a member of a group to have certain characteristics without having actual information about that individual

Name	Description
Subadditivity effect	The tendency to judge probability of the whole to be less than the probabilities of the parts
Subjective validation	Perception that something is true if a subject's belief demands it to be true
Survivorship bias	Concentrating on the people or things that "survived" some process and inadvertently overlooking those that did not because of their lack of visibility
Time-saving bias	Underestimations of the time that could be saved (or lost) when increasing (or decreasing) from a relatively low speed and overestimations of the time that could be saved (or lost) when increasing (or decreasing) from a relatively high speed
Third-person effect	Belief that mass communicated media messages have a greater effect on others than on themselves
Triviality / Parkinson's Law of	The tendency to give disproportionate weight to trivial issues
Unit bias	The tendency to want to finish a given unit of a task
Weber–Fechner law	Difficulty in comparing small differences in large quantities
Well-traveled road effect	Underestimation of the duration taken to traverse oft-traveled routes and overestimation of the duration taken to traverse less familiar routes
Zero-risk bias	Preference for reducing a small risk to zero over a greater reduction in a larger risk
Zero-sum heuristic	Intuitively judging a situation to be zero-sum (i.e., that gains and losses are correlated)

Table 4. Social Biases[227]

Name	Description
Actor–observer bias	The tendency for explanations of other individuals' behaviors to overemphasize the influence of their personality and underemphasize the influence of their situation
Defensive attribution hypothesis	Attributing more blame to a harm-doer as the outcome becomes more severe or as personal or situational similarity to the victim increases
Egocentric bias	Occurs when people claim more responsibility for themselves for the results of a joint action than an outside observer would credit them with
Extrinsic incentives bias	When people view others as having (situational) extrinsic motivations and (dispositional) intrinsic motivations for oneself
False consensus effect	The tendency for people to overestimate the degree to which others agree with them
Forer effect	The tendency to give high accuracy ratings to descriptions of their personality that supposedly are tailored specifically for them, but are in fact vague and general enough to apply to a wide range of people
Fundamental attribution error	The tendency for people to over-emphasize personality-based explanations for behaviors observed in others while under-emphasizing the role and power of situational influences on the same behavior
Group attribution error	The biased belief that the characteristics of an individual group member are reflective of the group as a whole or the tendency to assume that group decision

[227] Adapted from *Wikipedia*, s.v., "List of Cognitive Biases," accessed April 28, 2016, https://en.wikipedia.org/wiki/List_of_cognitive_biases.

Name	Description
	outcomes reflect the preferences of group members, even when information is available that clearly suggests otherwise
Halo effect	The tendency for a person's positive or negative traits to "spill over" from one personality area to another in others' perceptions of them
Illusion of asymmetric insight	People perceive their knowledge of their peers to surpass their peers' knowledge of them
Illusion of external agency	When people view self-generated preferences as instead being caused by insightful, effective and benevolent agents
Illusion of transparency	People overestimate others ability to know them, and they also overestimate their ability to know others
Illusory superiority	Overestimating one's desirable qualities, and underestimating undesirable qualities, relative to other people
In-group bias	The tendency for people to give preferential treatment to others they perceive to be members of their own groups
Just-world hypothesis	The tendency for people to want to believe that the world is fundamentally just, causing them to rationalize an otherwise inexplicable injustice as deserved by the victim(s)
Moral luck	The tendency for people to ascribe greater or lesser moral standing based on the outcome of an event
Naïve cynicism	Expecting more egocentric bias in others than in oneself

Name	Description
Naïve realism	The belief that we see reality as it really is, objectively and without bias; that the facts are plain for all to see; that rational people will agree with us; and that those who do not are either uninformed, lazy, irrational, or biased
Outgroup homogeneity bias	Individuals see members of their own group as being relatively more varied than members of other groups
Projection bias	The tendency to unconsciously assume that others (or one's future selves) share one's current emotional states, thoughts and values
Self-serving bias	The tendency to claim more responsibility for successes than failures
Shared information bias	The tendency for group members to spend more time and energy discussing information that all members are already familiar with (i.e., shared information), and less time and energy discussing information that only some members are aware of (i.e., unshared information)
System justification	The tendency to defend and bolster the status quo
Trait ascription bias	The tendency for people to view themselves as relatively variable in terms of personality, behavior, and mood while viewing others as much more predictable
Ultimate attribution error	Similar to the fundamental attribution error, in this error a person is likely to make an internal attribution to an entire group instead of the individuals within the group
Worse-than-average effect	A tendency to believe ourselves to be worse than others at tasks that are difficult

Table 5. Memory Errors and Biases[228]

Name	Description
Bizarreness effect	Bizarre material is better remembered than common material
Choice-supportive bias	In a self-justifying manner retroactively ascribing one's choices to be more informed than they were when they were made
Change bias	After an investment of effort in producing change, remembering one's past performance as more difficult than it actually was
Childhood amnesia	The retention of few memories from before the age of four
Conservatism or **regressive bias**	Tendency to remember high values and high likelihoods/probabilities/frequencies as lower than they actually were and low ones as higher than they actually were
Consistency bias	Incorrectly remembering one's past attitudes and behavior as resembling present attitudes and behavior
Context effect	That cognition and memory are dependent on context, such that out-of-context memories are more difficult to retrieve than in-context memories
Cross-race effect	The tendency for people of one race to have difficulty identifying members of a race other than their own
Cryptomnesia	A form of misattribution where a memory is mistaken for imagination, because there is no subjective experience of it being a memory

[228] Adapted from *Wikipedia*, s.v., "List of Cognitive Biases," accessed April 28, 2016, https://en.wikipedia.org/wiki/List_of_cognitive_biases.

Name	Description
Egocentric bias	Recalling the past in a self-serving manner
Fading affect bias	A bias in which the emotion associated with unpleasant memories fades more quickly than the emotion associated with positive events
False memory	A form of misattribution where imagination is mistaken for a memory
Generation effect	That self-generated information is remembered best
Google effect	The tendency to forget information that can be found readily online by using Internet search engines
Hindsight bias	The inclination to see past events as being more predictable than they actually were
Humor effect	That humorous items are more easily remembered than non-humorous ones
Illusion of truth effect	That people are more likely to identify as true statements those they have previously heard, regardless of the actual validity of the statement
Illusory correlation	Inaccurately remembering a relationship between two events
Leveling and sharpening	Memory distortions introduced by the loss of details in a recollection over time, often concurrent with sharpening or selective recollection of certain details that take on exaggerated significance in relation to the details or aspects of the experience lost through leveling
Levels-of-processing effect	That different methods of encoding information into memory have different levels of effectiveness

Name	Description
List-length effect	A smaller percentage of items are remembered in a longer list, but as the length of the list increases, the absolute number of items remembered increases as well
Misinformation effect	Memory becoming less accurate because of interference from post-event information
Modality effect	That memory recall is higher for the last items of a list when the list items were received via speech than when they were received through writing
Mood-congruent memory bias	The improved recall of information congruent with one's current mood
Next-in-line effect	That a person in a group has diminished recall for the words of others who spoke immediately before himself, if they take turns speaking
Part-list cueing effect	That being shown some items from a list and later retrieving one item causes it to become harder to retrieve the other items
Peak–end rule	That people seem to perceive not the sum of an experience but the average of how it was at its peak
Persistence	The unwanted recurrence of memories of a traumatic event
Picture superiority effect	The notion that concepts that are learned by viewing pictures are more easily and frequently recalled than are concepts that are learned by viewing their written word form counterparts
Positivity effect	That older adults favor positive over negative information in their memories

Name	Description
Primacy/recency effect	That items near the end of a sequence are the easiest to recall, followed by the items at the beginning of a sequence; items in the middle are the least likely to be remembered
Processing difficulty effect	That information that takes longer to read and is thought about more (processed with more difficulty) is more easily remembered
Reminiscence bump	The recalling of more personal events from adolescence and early adulthood than personal events from other lifetime periods
Rosy retrospection	The remembering of the past as having been better than it really was
Self-relevance effect	That memories relating to the self are better recalled than similar information relating to others
Source confusion	Confusing episodic memories with other information, creating distorted memories
Spacing effect	That information is better recalled if exposure to it is repeated over a long span of time rather than a short one
Spotlight effect	The tendency to overestimate the amount that other people notice your appearance or behavior
Stereotypical bias	Memory distorted towards stereotypes
Suffix effect	Diminishment of the recency effect because a sound item is appended to the list that the subject is not required to recall
Suggestibility	A form of misattribution where ideas suggested by a questioner are mistaken for memory

Name	Description
Telescoping effect	The tendency to displace recent events backward in time and remote events forward in time, so that recent events appear more remote, and remote events, more recent
Testing effect	The fact that you more easily remember information you have read by rewriting it instead of rereading it
Tip of the tongue effect	When a subject is able to recall parts of an item, or related information, but is frustratingly unable to recall the whole item
Travis syndrome	Overestimating the significance of the present
Verbatim effect	That the “gist” of what someone has said is better remembered than the verbatim wording
Von Restorff effect	That an item that sticks out is more likely to be remembered than other items
Zeigarnik effect	That uncompleted or interrupted tasks are remembered better than completed ones

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