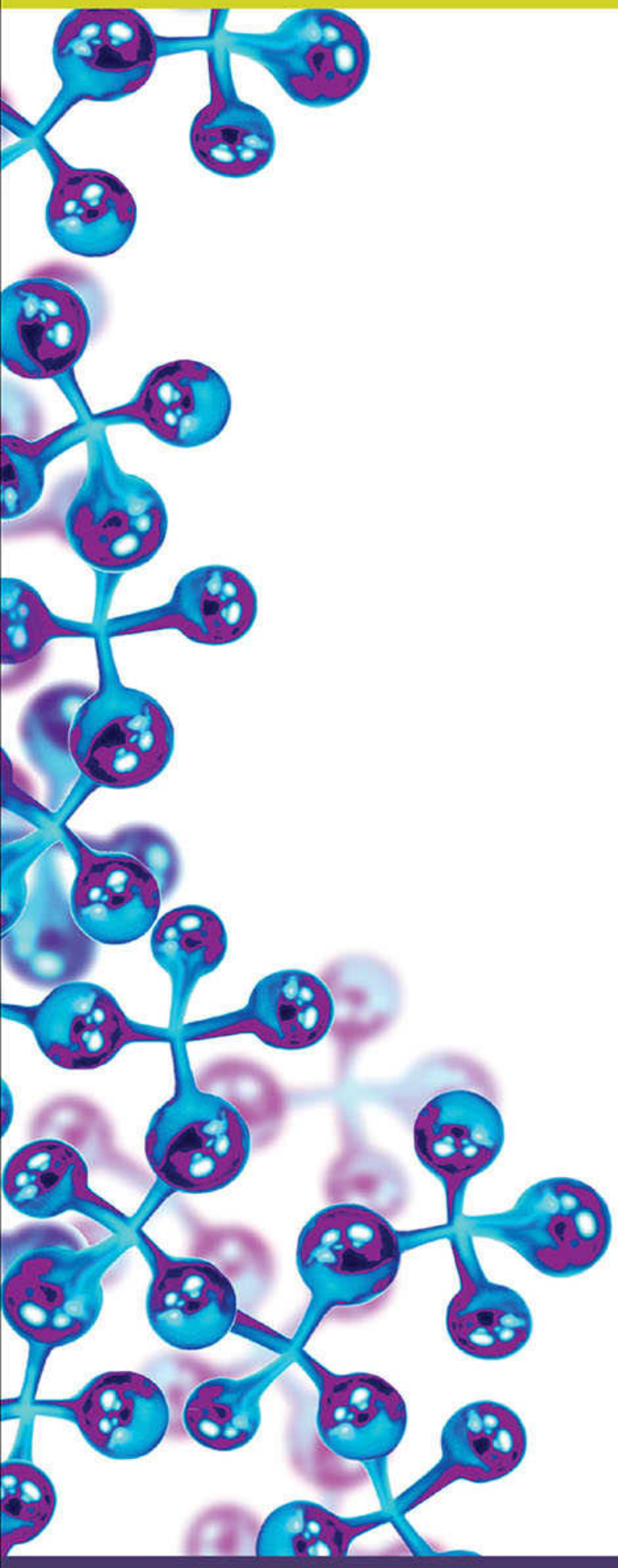
THIRD EDITION



STRUCTURED ANALYTIC TECHNIQUES

FOR INTELLIGENCE ANALYSIS

RANDOLPH H. PHERSON
RICHARDS J. HEUER JR.

FOREWORD BY JOHN McLAUGHLIN

MORE ADVANCE PRAISE FOR *STRUCTURED ANALYTIC TECHNIQUES FOR INTELLIGENCE ANALYSIS*

The 3rd edition of this wonderful book brings some additional tools which are relevant and invaluable to any analyst in any field. The structure and framework ensure ease of use and are very practical—particularly the grouping of the techniques into “families.” The applicability of the techniques is easily understood and demonstrates the value of their use in collaborative analytical teams. This is a book that should be used for teaching, but analysts and managers alike should have it beside them when undertaking analysis or making decisions.

—Gillian Wilson, retired inspector, Victorian Police; life member, Australian Institute of Professional Intelligence Officers

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Pherson and Heuer’s third edition of Structured Analytic Techniques consolidates its place as the go to source for teaching and learning SATs. In an ever increasing, complex security environment, this edition will help practitioners navigate the shoals of uncertainty, deception, and information overload for decision-makers.

—Dr. Patrick F. Walsh, associate professor, Charles Sturt University, Australia

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This is a must-read and essential reference guide for all intelligence analysts. In simple, clear language, Pherson and Heuer outline key structured techniques that when

applied result in better quality, higher impact analysis. Kudos to the authors for providing an invaluable resource to the intelligence community.

—Scott Leeb, head of knowledge, Fragomen LLC; former senior intelligence officer

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Structured Analytic Techniques for Intelligence Analysis is a comprehensive and accessibly written text that will be of interest to both novices and professionals alike. Its comprehensive coverage of analytic techniques, and the analytic process, make this work an essential reading for students of intelligence analysis.

A comprehensive handbook on analytic techniques.

— Christopher K. Lamont, University of Groningen; associate professor, Tokyo International University

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In these pages, we start to understand the role of cognitive bias, the value of words, the value of being. The authors bring you back to the base. If our instincts spur our brain to action, knowing the base helps you anticipate the ideas and recognize the mindsets. In the field of intelligence analysis, if you don’t understand this, you will never make sense of how others behave.

—Sabrina Magris, École Universitaire Internationale, Rome, Italy

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Excellent publication for the study of intelligence analysis, structured analytical techniques and their application in this increasingly dangerous environment. A must-read for anyone entering the intelligence community as an analyst, practitioner, stakeholder and leader.

— Charles E. Wilson, University of Detroit Mercy

STRUCTURED ANALYTIC TECHNIQUES FOR INTELLIGENCE ANALYSIS

Third Edition

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FOREWORD

John McLaughlin

Distinguished Practitioner-in-Residence, Paul H. Nitze School of Advanced International Studies, Johns Hopkins University

Former Deputy Director and Acting Director of Central Intelligence, Central Intelligence Agency

As intensively as America's Intelligence Community has been studied and critiqued, little attention has typically been paid to intelligence analysis. Most assessments focus on such issues as overseas clandestine operations and covert action, perhaps because they accord more readily with popular images of the intelligence world.

And yet, analysis has probably never been a more important part of the profession—or more needed by policymakers. In contrast to the bipolar dynamics of the Cold War, this new world is strewn with failing states, proliferation dangers, regional crises, rising powers, and dangerous non-state actors—all at play against a backdrop of exponential change in fields as diverse as population and technology.

To be sure, there are still precious secrets that intelligence collection must uncover—things that are knowable and discoverable. But this world is equally rich in mysteries having to do more with the future direction of events and the intentions of key actors. Such things are rarely illuminated by a single piece of secret intelligence data; they are necessarily subjects for analysis.

Analysts charged with interpreting this world would be wise to absorb the thinking in this book by Randolph Pherson and Richards J. Heuer Jr. and in Heuer's earlier work, *Psychology of Intelligence Analysis*. The reasons are apparent if one considers the ways in

which intelligence analysis differs from similar fields of intellectual endeavor.

Intelligence analysts must traverse a minefield of potential errors:

- First, they typically must begin addressing their subjects where others have left off; in most cases the questions they get are about what happens next, not about what is known.
- Second, they cannot be deterred by lack of evidence. As Heuer pointed out in his earlier work, the essence of the analysts' challenge is having to deal with ambiguous situations in which information is never complete and arrives only incrementally—but with constant pressure to arrive at conclusions.
- Third, analysts must frequently deal with an adversary that actively seeks to deny them the information they need and is often working hard to deceive them.
- Finally, for all of these reasons, analysts live with a high degree of risk—essentially the risk of being wrong and thereby contributing to ill-informed policy decisions.

The risks inherent in intelligence analysis can never be eliminated, but one way to minimize them is through more structured and disciplined thinking about thinking. On that score, I tell my students at the Johns Hopkins School of Advanced International Studies that the Heuer book is probably the most important reading I give them, whether they are heading into the government or the private sector. Intelligence analysts should reread it frequently. In addition, Randolph Pherson's work over the past decade and a half to develop and refine a suite of Structured Analytic Techniques offers invaluable assistance by providing analysts with specific techniques they can use to combat mindsets, Groupthink, and all the other potential pitfalls of dealing with ambiguous data in circumstances that require clear and consequential conclusions.

The book you now hold augments Heuer's pioneering work by offering a clear and more comprehensive menu of more than sixty techniques to build on the strategies he earlier developed for combating perceptual errors. The techniques range from fairly simple exercises that a busy analyst can use while working alone—the Key Assumptions Check, Indicators Validation, or What If? Analysis—to more complex techniques that work best in a group setting—Cluster Brainstorming, Analysis of Competing Hypotheses, or Premortem Analysis.

The key point is that all analysts should do something to test the conclusions they advance. To be sure, expert judgment and intuition have their place—and are often the foundational elements of sound analysis—but analysts are likely to minimize error to the degree they can make their underlying logic explicit in the ways these techniques demand.

Just as intelligence analysis has seldom been more important, the stakes in the policy process it informs have rarely been higher. Intelligence analysts these days therefore have a special calling, and they owe it to themselves and to those they serve to do everything possible to challenge their own thinking and to rigorously test their conclusions. The strategies offered by Randolph Pherson and Richards J. Heuer Jr. in this book provide the means to do precisely that.

PREFACE

ORIGIN AND PURPOSE

The investigative commissions that followed the terrorist attacks of 2001 and the erroneous 2002 National Intelligence Estimate on Iraq's weapons of mass destruction clearly documented the need for a new approach to how analysis is conducted in the U.S. Intelligence Community. Attention focused initially on the need for "alternative analysis"—techniques for questioning conventional wisdom by identifying and analyzing alternative explanations or outcomes. This approach was later subsumed by a broader effort to transform the tradecraft of intelligence analysis by using what have become known as Structured Analytic Techniques. Structured analysis involves a step-by-step process that externalizes an individual analyst's thinking in a manner that makes it readily apparent to others, thereby enabling it to be shared, built on, and critiqued by others. When combined with the intuitive judgment of subject-matter experts, such a structured and transparent process can significantly reduce the risk of analytic error.

Our current high-tech, global environment increasingly requires collaboration among analysts with different areas of expertise and different organizational perspectives. Structured Analytic Techniques are ideal for this interaction. Each step in a technique prompts relevant discussion, and, typically, this generates more divergent information and more new ideas than any unstructured group process. The step-by-step process of Structured Analytic Techniques organizes the interaction among analysts in a small analytic group or team in a way that helps avoid the multiple pathologies that often degrade group or team performance.

Progress in the development and use of Structured Analytic Techniques has been steady since the publication of the first edition of this book in 2011. By defining the domain of Structured Analytic Techniques and providing a manual for using and testing these techniques, the first edition laid the groundwork for continuing

improvement in how analysis is done within the U.S. Intelligence Community and a growing number of foreign intelligence services. Since then, the techniques have also made significant inroads into academic curricula and the business world. New techniques that the authors developed to fill gaps in what is currently available for intelligence analysis and that have broad applicability elsewhere are introduced in this book for the first time.

The second edition of the book added several techniques including Venn Analysis, Cone of Plausibility, Decision Trees, and the Impact Matrix and made significant revisions to Red Hat Analysis and the process of evaluating the diagnosticity of Indicators. The second edition also introduced the concepts of System 1 and System 2 Thinking (intuitive versus analytic approaches to thinking) and described ways to make the use of core structured techniques a daily habit for analysts.

In the third edition, we dropped several contrarian techniques and four critical thinking techniques that are described fully in a companion book, *Critical Thinking for Strategic Intelligence*.[1] That allowed us to add several new techniques including Analysis by Contrasting Narratives, Counterfactual Reasoning, Inconsistencies Finder™, Opportunities Incubator™, Bowtie Analysis, Critical Path Analysis, and two techniques for discovering key drivers. We substantially expanded the discussion of cognitive biases, misapplied heuristics, and intuitive traps and mapped which of the sixty-six structured techniques described in this edition are most effective in mitigating the impact of these cognitive limitations.

As the use of Structured Analytic Techniques becomes more widespread, we anticipate that the ways these techniques are used will continue to change. Our goal is to keep up with these changes in future editions, so we welcome your suggestions, at any time, for updating this third edition or otherwise enhancing its utility. To facilitate the use of these techniques, CQ Press/SAGE published the second edition of *Cases in Intelligence Analysis: Structured Analytic Techniques in Action*, with seventeen case studies and detailed

exercises and lesson plans for learning how to use and teach twenty-eight of the Structured Analytic Techniques.

AUDIENCE FOR THIS BOOK

This book is for practitioners, managers, teachers, and students in the intelligence, law enforcement, and homeland security communities, as well as in academia, business, medicine, and elsewhere in the private sector. Managers, policymakers, corporate executives, strategic planners, action officers, and operators who depend on input from analysts to help them achieve their goals will also find it useful. Academics and consultants who specialize in qualitative methods for dealing with unstructured data will be interested in this pathbreaking book as well.

Many of the techniques described here relate to strategic intelligence, but almost all the techniques should be of interest to law enforcement, counterterrorism, and competitive intelligence analysts, as well as to business consultants, lawyers, doctors, and financial planners with a global perspective. Many techniques developed for these related fields have been adapted for use in intelligence analysis, and now we are starting to see the transfer of knowledge going in the other direction. Techniques such as Analysis of Competing Hypotheses (ACH), Key Assumptions Check, Quadrant Crunching™, and Indicators Validation and Evaluation developed specifically for intelligence analysts are now being adapted for use in other fields, such as law, medicine, and financial intelligence.

CONTENT AND DESIGN

The first four chapters describe structured analysis in general, how it fits into the spectrum of methods used by analysts, how to select which techniques are most suitable for your analytic project, and the value of integrating these techniques into collaborative team projects. The next six chapters describe when, why, and how to use six families of structured techniques. The final chapter provides a vision of how these techniques are likely to be used in the year 2030.

We designed the book for ease of use and quick reference. The spiral binding allows analysts to have the book open while they follow step-by-step instructions for each technique. In this edition, we regrouped the techniques into six families based on the analytic production process. Tabs separating each chapter contain a table of contents for the selected chapter. For each family of techniques, we provide an overarching description of that category and then a brief summary of each technique covered in that chapter.

THE AUTHORS

Randolph H. Pherson is CEO of Globalytica, LLC; president of Pherson Associates, LLC; and a founding director of the nonprofit Forum Foundation for Analytic Excellence. He teaches advanced analytic techniques and critical thinking skills to analysts in more than two dozen countries, supporting major financial institutions, global retailers, and security firms; facilitates Foresight workshops for foreign governments, international foundations, and multinational corporations; and consults with senior corporate and government officials on how to build robust analytic organizations. Mr. Pherson collaborated with Richards J. Heuer Jr. in developing and launching use of ACH.

Mr. Pherson coauthored *Critical Thinking for Strategic Intelligence* with Katherine Hibbs Pherson, *Cases in Intelligence Analysis: Structured Analytic Techniques in Action* with Sarah Miller Beebe, the *Analyst's Guide to Indicators* with John Pyrik, and guides for analysts on writing, briefing, managing the production process, and communicating intelligence analysis in the digital age. His most recent book is *How to Get the Right Diagnosis: 16 Tips for Navigating the Medical System*. He has published over a dozen articles on structured techniques, collaboration, cognitive bias, Digital Disinformation, Foresight analysis, and the Five Habits of the Master Thinker.

Mr. Pherson completed a twenty-eight-year career in the Intelligence Community in 2000, last serving as National Intelligence Officer (NIO) for Latin America. Previously at the Central Intelligence Agency (CIA), he managed the production of intelligence analysis on topics ranging from global instability to Latin America, served on the Inspector General's staff, and was chief of the CIA's Strategic Planning and Management Staff and Executive Assistant to the Executive Director of the Agency. He is the recipient of the Distinguished Intelligence Medal for his service as NIO and the

Distinguished Career Intelligence Medal. Mr. Pherson received his BA from Dartmouth College and an MA in International Relations from Yale University.

Richards J. Heuer Jr. is best known for his book *Psychology of Intelligence Analysis* and for developing and then guiding automation of the ACH technique. Both are being used to teach and train intelligence analysts throughout the intelligence community and in a growing number of academic programs on intelligence or national security.

After retiring from the CIA, Mr. Heuer was associated with the U.S. Intelligence Community in various roles for more than five decades until his death in August 2018. He wrote extensively on personnel security, counterintelligence, deception, and intelligence analysis. Mr. Heuer earned a BA in philosophy from Williams College and an MA in international relations from the University of Southern California. He also pursued graduate studies at the University of California, Berkeley, and the University of Michigan.

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For this edition, the authors would like to acknowledge the thoughtful comments and suggestions they received from managers of intelligence analysis in the United States, United Kingdom, Canada, Spain, and Romania. We thank Peter de Werd and Noel Hendrickson for reviewing and offering useful critiques on the sections describing Analysis by Contrasting Narratives and Counterfactual Reasoning, respectively. We also deeply appreciate the invaluable recommendations and edits provided by Rubén Arcos, Abigail DiOrio, Alysa Gander, Cindy Jensen, Kristine Leach, Penelope Mort Ranta, Mary O'Sullivan, Richard Pherson, Karen Saunders, and Roy Sullivan as well as the insightful graphics design support provided by Adriana Gonzalez.

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Both authors recognize the large contributions many individuals made to the first edition, reviewing all or large portions of the draft text. These include Professor J. Scott Armstrong at the Wharton School, University of Pennsylvania; Sarah Miller Beebe, a former CIA analyst who served on the National Security Council staff; Jack Davis, a noted teacher and writer on intelligence analysis; and Robert R. Hoffman, noted author of books on naturalistic decision making.

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The ideas, interest, and efforts of all the above contributors to this book are greatly appreciated, but the responsibility for any weaknesses or errors rests solely on the shoulders of the authors.

DISCLAIMER

All statements of fact, opinion, or analysis expressed in this book are those of the authors and do not reflect the official positions of the CIA or any other U.S. government agency. Nothing in the contents should be construed as asserting or implying U.S. government authentication of information or agency endorsement of the authors' views. This material has been reviewed by the CIA only to prevent the disclosure of classified information.

NOTE

1. Katherine Hibbs Pherson and Randolph H. Pherson, *Critical Thinking for Strategic Intelligence*, 2nd ed. (Washington, DC: CQ Press/SAGE, 2015).

CHAPTER 1 INTRODUCTION AND OVERVIEW

1.1 Our Vision [3]

1.2 Role of Structured Analytic Techniques [4]

1.3 History of Structured Analytic Techniques [5]

1.4 The Expanding Use of Structured Analytic Techniques [7]

1.5 Selection of Techniques for This Book [8]

1.6 Quick Overview of Chapters [10]

Analysis as practiced in the intelligence, law enforcement, and business communities is steadily evolving from a mental activity done predominantly by a sole analyst to a collaborative team or group activity.[1] The driving forces behind this transition include the following:

- The growing complexity of international issues and the consequent requirement for multidisciplinary input to most analytic products.[2]
- The need to share more information quickly across organizational boundaries.
- The dispersion of expertise, especially as the boundaries between analysts, collectors, operators, and decision makers become blurred.

- The need to identify and evaluate the validity of alternative mental models.
- The need to counter the use of social media to distribute Digital Disinformation or fake news.

This transition is being enabled by advances in technology, such as new collaborative networks, artificial intelligence, and blockchain as well as the mushrooming growth of social networking practices among the upcoming generation of analysts. The use of Structured Analytic Techniques facilitates the transition by guiding the exchange of information and reasoning among analysts in ways that identify and eliminate a wide range of cognitive biases and other shortfalls of intuitive judgment.

1.1 OUR VISION

This book defines the role and scope of Structured Analytic Techniques as a distinct analytic approach that provides a step-by-step process for dealing with the kinds of incomplete, ambiguous, and sometimes deceptive information with which analysts must work. Structured analysis is a mechanism by which internal thought processes are externalized in a systematic and transparent manner so that they can be shared, built on, and easily critiqued by others. Each technique leaves a trail that other analysts and managers can follow to see the basis for an analytic judgment. These techniques are used by individual analysts but are perhaps best utilized in a collaborative team effort in which each step of the analytic process exposes participants to divergent or conflicting perspectives. This transparency helps ensure that differences of opinion among analysts are heard and seriously considered early in the analytic process. Analysts tell us that this is one of the most valuable benefits of any structured technique.

Structured analysis helps analysts ensure that their analytic framework—the foundation upon which they form their analytic judgments—is as solid as possible. By helping break down a specific analytic problem into its component parts and specifying a step-by-step process for handling these parts, Structured Analytic Techniques help organize the amorphous mass of data with which most analysts must contend. Such techniques make our thinking more open and available for review and critique by ourselves as well as by others. This transparency enables the effective communication at the working level that is essential for intraoffice and interagency collaboration.

We call the various approaches described in this book “techniques” because they usually guide the analyst in thinking about a problem rather than provide the analyst with a definitive answer, as one might expect from a predictive tool. Structured techniques help analysts

think more rigorously about a problem; they do not solve it. Structured Analytic Techniques, however, do form a methodology—a set of principles and procedures for qualitative analysis of the kinds of uncertainties that many analysts must deal with daily.

1.2 ROLE OF STRUCTURED ANALYTIC TECHNIQUES

Structured Analytic Techniques are debiasing techniques. They do not replace intuitive judgment. Their role is to question intuitive judgments by identifying a wider range of options for analysts to consider. For example, a Key Assumptions Check requires the identification and consideration of additional assumptions. Analysis of Competing Hypotheses requires identification of alternative hypotheses, a focus on refuting rather than confirming hypotheses, and a more systematic analysis of the evidence. All structured techniques described in this book have a “Value Added” section that describes how this technique contributes to better analysis. Structured Analytic Techniques help mitigate cognitive biases, misapplied heuristics, and intuitive traps that analysts often fall victim to when relying only on expert-aided judgment. For many techniques, the benefit is self-evident. None purports to always give the correct answer; instead, they identify alternatives that merit serious consideration.

No formula exists, of course, for always getting it right, but the use of structured techniques can reduce the frequency and severity of error. These techniques can help analysts deal with proven cognitive limitations, sidestep some of the known analytic biases, and explicitly confront the problems associated with unquestioned mental models or mindsets. They help analysts think more rigorously about an analytic problem and ensure that preconceptions and assumptions are explicitly examined and, when possible, tested.[3]

The most common criticism of Structured Analytic Techniques is “I don’t have enough time to use them.” The experience of many analysts shows that this criticism is not justified. All the techniques will save an analyst time, on balance, when considering the entire arc of the analytic production schedule. Anything new does take time to learn; however, once learned, the incorporation of Structured

Analytic Techniques into the analytic process saves analysts time over time. They enable individual analysts to work more efficiently, especially at the start of a project, when the analyst may otherwise flounder trying to figure out how to proceed. Structured techniques also aid group processes by improving communication as well as enhancing the collection and interpretation of evidence. And, in the end, use of a structured technique results in a product in which the reasoning behind the conclusions is more transparent and more readily accepted than one derived from other methods. Transparent reasoning expedites review by supervisors and editors while also compressing the coordination process.[4]

Analytic methods are important, but method alone is far from sufficient to ensure analytic accuracy or value. Method must be combined with substantive expertise and an inquiring and imaginative mind. And these, in turn, must be supported and motivated by the organizational environment in which the analysis is done.

1.3 HISTORY OF STRUCTURED ANALYTIC TECHNIQUES

The term “structured analytic techniques” was first used in the U.S. Intelligence Community in 2005. The concept originated in the 1980s, when the eminent teacher of intelligence analysis, Jack Davis, first began teaching and writing about what he called “alternative analysis.”[5] The term referred to the evaluation of alternative explanations or hypotheses, better understanding of other cultures, and analysis of events from the other country’s point of view rather than by Mirror Imaging. In the mid-1980s, some initial efforts were made to initiate the use of more alternative analytic techniques in the Central Intelligence Agency’s Directorate of Intelligence. Under the direction of Robert Gates, then CIA Deputy Director for Intelligence, analysts employed several new techniques to generate scenarios of dramatic political change, track political instability, and anticipate military coups. Douglas MacEachin, Deputy Director for Intelligence from 1993 to 1996, supported new standards for systematic and transparent analysis that helped pave the path to further change.[6]

The term “alternative analysis” became widely used in the late 1990s after (1) Adm. David Jeremiah’s postmortem analysis of the U.S. Intelligence Community’s failure to foresee India’s 1998 nuclear test, (2) a U.S. congressional commission’s review of the Intelligence Community’s global missile forecast in 1998, and (3) a report from the CIA Inspector General that focused higher-level attention on the state of the Directorate of Intelligence’s analytic tradecraft. The Jeremiah report specifically encouraged increased use of what it called “red team analysis.”

> *The beginning of wisdom is the definition of terms.*
>
> —Socrates, Greek philosopher

When the Sherman Kent School for Intelligence Analysis at the CIA was created in 2000 to improve the effectiveness of intelligence analysis, John McLaughlin, then Deputy Director for Intelligence, tasked the school to consolidate techniques for doing what was then referred to as “alternative analysis.” In response to McLaughlin’s tasking, the Kent School developed a compilation of techniques that the CIA’s Directorate of Intelligence started teaching in a course that later evolved into the Advanced Analytic Tools and Techniques Workshop. The Kent School subsequently opened the class to analysts from the Defense Intelligence Agency and other elements of the U.S. Intelligence Community.

The various investigative commissions that followed the surprise terrorist attacks of September 11, 2001, as well as the erroneous analysis of Iraq’s possession of weapons of mass destruction, cranked up pressure for more rigorous approaches to intelligence analysis. For example, the Intelligence Reform Act of 2004 assigned to the Director of National Intelligence (DNI) “responsibility for ensuring that, as appropriate, elements of the intelligence community conduct alternative analysis (commonly referred to as ‘red-team’ analysis) of the information and conclusions in intelligence analysis.”

Over time, analysts who misunderstood, or resisted the call for more rigor, interpreted alternative analysis as simply meaning an alternative to the normal way that analysis is done. For them the term implied that alternative procedures were needed only in exceptional circumstances when an analysis is of critical importance. Kent School instructors countered that the techniques were not alternatives to traditional analysis but were central to good analysis and should become routine—instilling rigor and structure into the analysts’ everyday work process.

In 2004, when the Kent School decided to update its training materials based on lessons learned during the previous several years and publish *A Tradecraft Primer*,[7] Randolph H. Pherson and Roger Z. George were the primary drafters. As George observed at

the time, “There was a sense that the name ‘alternative analysis’ was too limiting and not descriptive enough. At least a dozen different analytic techniques were all rolled into one term, so we decided to find a name that was more encompassing and suited this broad array of approaches to analysis.”[8] Randy Pherson credits his wife, Kathy, with creating the name “Structured Analytic Techniques” during a dinner table conversation. George organized the techniques into three categories: diagnostic techniques, contrarian techniques, and imagination techniques. The term “Structured Analytic Techniques” became official in June 2005, when the Kent School formally approved the updated training materials.

The use of the term “alternative analysis,” however, persists in official directives. The DNI is tasked under the Intelligence Reform Act of 2004 with ensuring that elements of the U.S. Intelligence Community conduct alternative analysis, which it now describes as the inclusion of alternative outcomes and hypotheses in analytic products. We view “alternative analysis” as covering only a subset of what now is regarded as Structured Analytic Techniques and recommend avoiding use of the term “alternative analysis” to forestall any confusion. We strongly endorse, however, the “analysis of alternatives”—be they hypotheses or scenarios—as an essential component of good analysis.

1.4 THE EXPANDING USE OF STRUCTURED ANALYTIC TECHNIQUES

Intelligence community analysts in the United States and in foreign intelligence services have used structured techniques for over a decade, but the general use of these techniques by the typical analyst is a relatively new phenomenon. Most analysts using the techniques today were not exposed to them when they were college students. The driving forces behind the development and use of these techniques in the intelligence profession, and increasingly in the private sector, are (1) an increased appreciation of cognitive limitations that make intelligence analysis so difficult, (2) prominent intelligence failures that have prompted reexamination of how intelligence analysis is generated, (3) increased policy support and technical support for intraoffice and interagency collaboration, and (4) a desire by policymakers to make analytic conclusions more transparent.

In the early 2000s, the Directorate of Intelligence's senior management, which strongly supported using Structured Analytic Techniques, created Tradecraft Cells in its analytic units to mentor analysts in how to use structured techniques and to facilitate the integration of the techniques into ongoing projects. The Federal Bureau of Investigation (FBI), the Defense Intelligence Agency (DIA), and the Department of Homeland Security (DHS) were the next agencies to incorporate structured techniques formally into their training programs followed by the National Security Agency (NSA), the National Geospatial-Intelligence Agency (NGA), and the Office of Naval Intelligence (ONI). Structured techniques are now used throughout the entire U.S. Intelligence Community.

The U.S. Intelligence Community's adoption of structured techniques spurred many academic institutions to incorporate training in the techniques into their homeland security and intelligence studies programs, which were quickly propagating across the United States.

Foreign universities also incorporated instruction on structured techniques into their undergraduate and master's degree programs, including institutions in Spain, Canada, the United Kingdom, Denmark, Germany, and Australia, followed by other universities on six continents.

Publication of the first edition of this book in 2011, followed by an expanded second edition in 2015, and discussions of their utility in various annual international conferences helped propagate the use of Structured Analytic Techniques initially in the intelligence services of the Five Eyes countries (United States, Canada, United Kingdom, Australia, and New Zealand). Use of this book and the techniques has expanded over the years to almost all European intelligence services and other services around the world. The book is now being used by analysts in intelligence services, businesses, universities, and nongovernmental organizations in at least two dozen countries.[9]

Structured Analytic Techniques for Intelligence Analysis has been translated into Spanish, Chinese, and Korean. The publisher has received inquiries about translations into several other languages. A companion volume, *Critical Thinking for Strategic Intelligence*, has also been translated into Chinese and Polish.

1.5 SELECTION OF TECHNIQUES FOR THIS BOOK

The techniques described in this book are limited to those that meet our definition of Structured Analytic Techniques, as discussed earlier in this chapter. Although the focus is on techniques for strategic intelligence analysis, many of the techniques described in this book have wide applicability to tactical military analysis, law enforcement intelligence analysis, homeland security, business consulting, the medical profession, financial planning, cyber analysis, and complex decision making in any field. The book focuses on techniques that can be used by a single analyst working alone or, preferably, with a small group or team of analysts. We excluded techniques that require sophisticated computing or complex projects of the type usually sent to an outside expert or company. Several promising techniques recommended to us were not included for this reason.

From the several hundred techniques that might have been included in this book, we selected a core group of sixty-six techniques that appear to be most useful for the intelligence profession as well as analytic pursuits in government, academia, and the private sector.[10] We omitted techniques that tend to be used *exclusively* for a single type of analysis in fields such as law enforcement or business consulting.

This list is not static, and we expect it to increase and decrease as new techniques are identified and others are tested and found wanting. In the second edition, we dropped two techniques and added five new ones. In this edition, Devil's Advocacy, Red Team Analysis, Role Playing, and Virtual Brainstorming were dropped for reasons explained in later chapters. A suite of techniques that relate more to analytic production—Getting Started Checklist, Client Checklist, AIMS (**A**udience, **I**ssue, **M**essage, and **S**toryline), and Issue Redefinition—were also dropped because they are described fully in Pherson and Pherson's *Critical Thinking for Strategic*

Intelligence. Nine new techniques were added: Inconsistencies Finder™, Key Uncertainties Finder™, Key Drivers Generation™, Reversing Assumptions, Analysis by Contrasting Narratives, Counterfactual Reasoning, Opportunities Incubator™, Bowtie Analysis, and Critical Path Analysis.

Some training programs may have a need to boil down the list of techniques to the essentials required for a given type of analysis. No one list will meet everyone's needs. However, we hope that having one reasonably comprehensive list and lexicon of common terminology available to the growing community of analysts now employing Structured Analytic Techniques will help to facilitate discussion and use of these techniques in projects involving collaboration across organizational boundaries.

This collection of techniques builds on work previously done in the U.S. Intelligence Community. We also have included several techniques developed and used by our British, Canadian, Spanish, Dutch, and Australian colleagues. To select the most appropriate techniques for the initial edition of this book, Richards J. Heuer Jr. reviewed a large number of books and websites dealing with intelligence analysis methodology, qualitative methods in general, decision making, problem solving, competitive intelligence, law enforcement intelligence, strategic foresight or futures research, and social science research in general. In preparation for writing the third edition, Pherson interviewed managers of intelligence programs in over a dozen agencies and foreign intelligence services to identify which techniques could be dropped and which should be added. Given the immensity of this literature, there can be no guarantee that nothing was missed.

Almost half of the techniques described in this edition have become "standard fare" in training materials used by the CIA, DIA, Office of Intelligence and Analysis in the DHS, or other intelligence agencies. Over half were newly created or adapted to the needs of intelligence analysts by Richards J. Heuer Jr. or Randolph H. Pherson to fill perceived gaps. Several of the techniques that were originally

created by Randolph H. Pherson, while teaching structured techniques to intelligence analysts, students, and private-sector clients, have since been revised, reflecting lessons learned when applying the techniques to current issues.

Specific guidance is provided on how to use each technique, but this guidance is not written in stone. Many of the techniques can be implemented in more than one way, and some techniques have several different names. An experienced government analyst told one of the authors that he seldom uses a technique the same way twice. He adapts techniques to the requirements of the specific problem, and his ability to do that effectively is a measure of his experience.

In the popular literature, the names of some techniques are normally capitalized, but many are not. We have chosen to capitalize the names of all techniques for consistency's sake and to make them stand out.

1.6 QUICK OVERVIEW OF CHAPTERS

Chapter 2 (“The Role of Structured Techniques”) defines the domain of Structured Analytic Techniques by describing how it differs from three other major categories of intelligence analysis methodology. It presents a taxonomy with six distinct categories or families of Structured Analytic Techniques. The families are based on how each set of techniques contributes to a different phase of analytic tasks in the intelligence production process. The chapter discusses how structured techniques can help analysts avoid, overcome, or at least mitigate the cognitive biases, misapplied heuristics, and intuitive traps they fall prey to every day. It concludes with a discussion of how perpetrators of Digital Disinformation leverage these cognitive limitations to promote their agendas and how structured techniques can help counter this phenomenon.

Chapter 3 (“Choosing the Right Technique”) describes the criteria we used for selecting techniques, discusses which techniques might be learned first and used the most, and provides a guide for matching techniques to analysts’ needs. The guide asks twelve questions about what the analyst wants or needs to do. An affirmative answer to any question directs the analyst to the appropriate chapter(s), where the analyst can quickly zero in on the most applicable technique(s). It concludes with a description of the value of instilling five core habits of thinking into the analytic process.

Chapter 4 (“Practitioner’s Guide to Collaboration”) builds on our earlier observation that analysis done across the global intelligence community is in a transitional stage from a mental activity performed predominantly by a sole analyst to a collaborative team or group activity. The chapter discusses, among other things, how to expand the analytic process to include rapidly growing social networks of area and functional specialists who often work from several different geographic locations. It proposes that most analysis be done in two phases: a divergent analysis or creative phase with broad participation by a social network, followed by a convergent analysis phase and final report done by a small analytic team.

Chapters 5 through 10 each describe a different family of structured techniques, which taken together cover sixty-six structured techniques (see Figure 1.6).[11] Each of these chapters starts with a description of the specific family and how techniques in that family help to mitigate known cognitive biases, misapplied heuristics, or intuitive traps. A brief overview of each technique is followed by a detailed discussion of each, including when to use it, the value added, description of the method, potential pitfalls when noteworthy, relationship to other techniques, and origins of the technique.

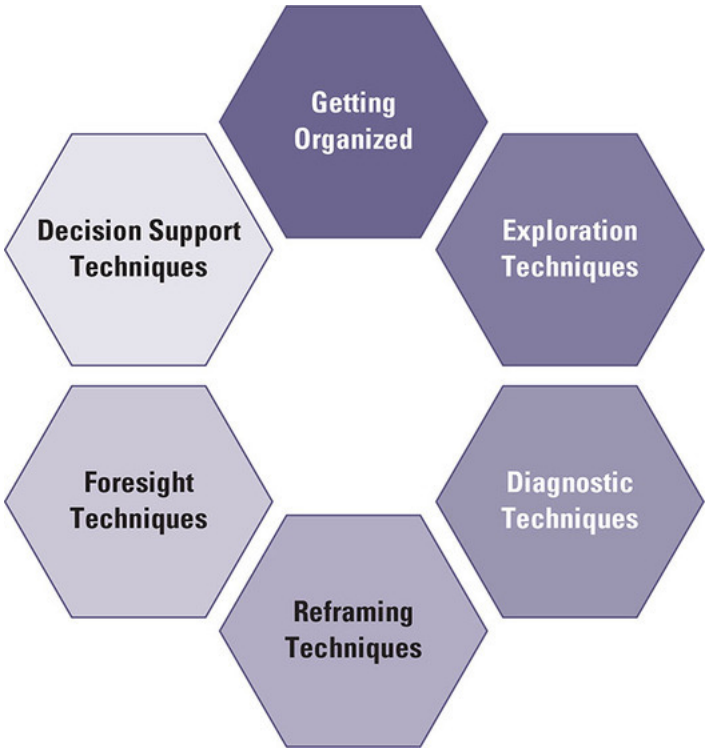


Figure 1.6 Six Families of Structured Analytic Techniques

Readers who go through these six chapters of techniques from start to finish may perceive some overlap. This repetition is for the convenience of those who use this book as a reference guide and seek out individual sections or chapters. The reader seeking only an overview of the techniques can save time by reading the introduction to each family of techniques, the brief overview of each technique, and the full descriptions of only those specific techniques that pique the reader's interest.

Highlights of the six chapters of techniques are as follows:

- Chapter 5: **Getting Organized.** The eight techniques cover the basics, such as checklists, sorting, ranking, and organizing your data.
- Chapter 6: **Exploration Techniques.** The nine techniques include several types of brainstorming, including Circleboarding™, Starbursting, and Cluster Brainstorming, which was called Structured Brainstorming in previous editions. The Nominal Group Technique is a form of brainstorming that is appropriate when there is concern that a brainstorming session might be dominated by a particularly aggressive analyst or constrained by the presence of a senior officer. It also introduces several mapping techniques, Venn Analysis, and Network Analysis.
- Chapter 7: **Diagnostic Techniques**. The eleven techniques covered in this chapter include the widely used Key Assumptions Check and Chronologies and Timelines. The Cross-Impact Matrix supports group learning about relationships in a complex system. Several techniques fall in the domain of hypothesis generation and testing (Multiple Hypothesis Generation, Diagnostic Reasoning, Analysis of Competing Hypotheses [ACH], Argument Mapping, and Deception Detection), including a new technique called the Inconsistencies Finder™, which is a simplified version of ACH.

- **Chapter 8: Reframing Techniques**. The sixteen techniques in this family help analysts break away from established mental models by using Outside-In Thinking, Structured Analogies, Red Hat Analysis, Quadrant Crunching™, and the Delphi Method to reframe an issue or imagine a situation from a different perspective. What If? Analysis and High Impact/Low Probability Analysis are tactful ways to suggest that the conventional wisdom could be wrong. Two important techniques developed by the authors, Premortem Analysis and Structured Self-Critique, give analytic teams viable ways to imagine how their own analysis might be wrong. The chapter concludes with a description of a subset of six techniques grouped under the umbrella of Adversarial Collaboration and an original approach to Structured Debate.

- **Chapter 9: Foresight Techniques**. This family of twelve techniques includes four new techniques for identifying key drivers, analyzing contrasting narratives, and engaging in Counterfactual Reasoning. The chapter also describes five methods for developing scenarios and expands the discussion of Indicators Validation and Evaluation by presenting several new techniques for generating indicators.

- **Chapter 10: Decision Support Techniques**. The ten techniques in this family include three new Decision Support Techniques: Opportunities Incubator™, Bowtie Analysis, and Critical Path Analysis. The chapter also describes six classic Decision Support Techniques, including Decision Matrix, Force Field Analysis, and Pros-Cons-Faults-and-Fixes, all of which help managers, commanders, planners, and policymakers make choices or trade-offs between competing goals, values, or preferences. The chapter concludes with a description of the Complexity Manager, which was developed by Richards J. Heuer Jr.

How can we know that the use of Structured Analytic Techniques does, in fact, improve the overall quality of the analytic product? Chapter 11 (“The Future of Structured Analytic Techniques”) begins with a discussion of two approaches to answer this question: logical reasoning and empirical research. The chapter then employs one of the techniques in this book, Complexity Manager, to assess the prospects for continued growth in the use of Structured Analytic Techniques. It asks the reader to imagine it is 2030 and answer the following questions based on an analysis of ten variables that could support or hinder the growth of Structured Analytic Techniques during this time period: Will structured techniques gain traction and be used with greater frequency by intelligence agencies, law enforcement, and the business sector? What forces are spurring the increased use of structured analysis? What obstacles are hindering its expansion?

NOTES

1. *Vision 2015: A Globally Networked and Integrated Intelligence Enterprise* (Washington, DC: Director of National Intelligence, 2008).

2. National Intelligence Council, *Global Trends 2025: A Transformed World* (Washington, DC: U.S. Government Printing Office, November 2008).

3. Judgments in this and the next sections are based on our personal experience and anecdotal evidence gained in work or discussion with other experienced analysts. As we will discuss in chapter 11, there is a need for systematic research on these and other benefits believed to be gained by using Structured Analytic Techniques.

4. Again, these statements are our professional judgments based on discussions with working analysts using Structured Analytic Techniques. As discussed in chapter 11, we strongly recommend research by both academia and the intelligence community on the benefits and costs associated with all aspects of the use of Structured Analytic Techniques.

5. Information on the history of the terms “structured analytic techniques” and “alternative analysis” is based on information provided by Jack Davis, Randolph H. Pherson, and Roger Z. George, all of whom were key players in developing and teaching these techniques at the CIA.

6. See Richards J. Heuer Jr., *Psychology of Intelligence Analysis* (Washington, DC: CIA Center for the Study of Intelligence, 1999; reprinted by Pherson Associates, LLC, Reston, VA, 2007), xvii–xix.

7. *A Tradecraft Primer: Structured Analytic Techniques for Improving Intelligence Analysis*, 2nd ed. (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

8. Personal communication to Richards Heuer from Roger Z. George, October 9, 2007.

9. This number was derived by examining the addresses of individuals or institutions purchasing the book from shop.globalytica.com and adding countries where workshops using the techniques have been taught.

10. Although the table of contents lists seventy techniques, three of them (Key Assumptions Check, Analysis of Competing Hypotheses, and Argument Mapping) are listed twice because they can be used to perform different functions and a fourth (Indicators Generation) is a compendium of techniques described elsewhere in the book.

11. Previous editions of this book listed eight categories of techniques based on the analytic function being performed: Decomposition and Visualization, Idea Generation, Scenarios and Indicators, Hypothesis Generation and Testing, Assessment of Cause and Effect, Challenge Analysis, Conflict Management, and Decision Support. In this edition, the techniques were re-sorted into six families that mirror the analytic production process to make it easier to locate a technique in the book.

CHAPTER 2 THE ROLE OF STRUCTURED TECHNIQUES

2.1 Two Types of Thinking [17]

2.2 Developing a Taxonomy of Structured Analytic Techniques [19]

2.3 Dealing with Cognitive Limitations [22]

2.4 Matching Cognitive Limitations to Structured Techniques [27]

2.5 Combating Digital Disinformation [28]

2.1 TWO TYPES OF THINKING

In the last thirty years, important gains have been made in psychological research on human judgment. Dual process theory, positing two systems of decision making called System 1 and System 2, has emerged as the predominant approach.[1] The basic distinction between System 1 and System 2 is intuitive versus analytical thinking.

- **System 1** Thinking is intuitive, fast, efficient, and often unconscious. It draws naturally on available knowledge, experience, and often a long-established mental model of how people or things work in a specific environment. System 1 Thinking requires little effort; it allows people to solve problems and make judgments quickly and efficiently. Although it is often accurate, intuitive thinking is a common source of cognitive biases and other intuitive mistakes that lead to faulty analysis. Three types of cognitive limitations—cognitive bias, misapplied heuristics, and intuitive traps—are discussed later in this chapter.
- **System 2** Thinking is analytic. It is slow, methodical, and conscious, the result of deliberate reasoning. It includes all types of analysis, such as critical thinking and Structured Analytic Techniques, as well as the whole range of empirical and quantitative methods.

The description of each Structured Analytic Technique in this book includes a discussion of which cognitive biases, misapplied heuristics, and intuitive traps are most effectively avoided, overcome, or at least mitigated by using that technique. The introduction to each family of techniques also identifies how the techniques discussed in that chapter help counter one or more types of cognitive bias and other common intuitive mistakes associated with System 1 Thinking.

Intelligence analysts have largely relied on intuitive judgment—a System 1 process—in constructing their analyses. When done well, intuitive judgment—sometimes referred to as traditional analysis—combines subject-matter expertise with basic thinking skills. Evidentiary reasoning, historical method, case study method, and reasoning by analogy are examples of this category of analysis.[2] *The key characteristic that distinguishes intuitive judgment from structured analysis is that intuitive judgment is usually an individual effort in which the reasoning remains largely in the mind of the individual analyst until it is written down in a draft report.* Training in this type of analysis is generally acquired through postgraduate education, especially in the social sciences and liberal arts, and often along with some country or language expertise.

This chapter presents a taxonomy that defines the domain of System 2 Thinking. A taxonomy is a classification of all elements of some body of information or knowledge. It defines the domain by identifying, naming, and categorizing all the various objects in a specialized discipline. The objects are organized into related groups based on some factor common to each object in the group.

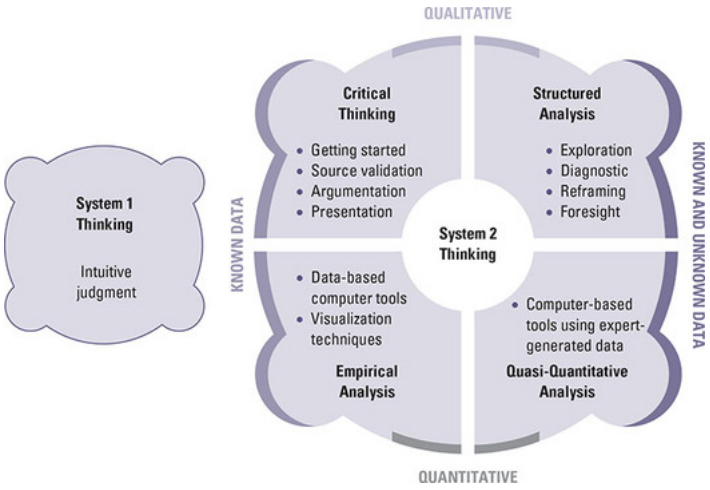
The word “taxonomy” comes from the Greek *taxis*, meaning arrangement, division, or order, and *nomos*, meaning law. Classic examples of a taxonomy are Carolus Linnaeus’s hierarchical classification of all living organisms by kingdom, phylum, class, order, family, genus, and species that is widely used in the biological sciences. The periodic table of elements used by chemists is another example. A library catalog is also considered a taxonomy, as it starts with a list of related categories that are then progressively broken down into finer categories.

Development of a taxonomy is an important step in organizing knowledge and furthering the development of any discipline. Rob Johnston developed a taxonomy of variables that influenced intelligence analysis but did not go into depth on analytic techniques or methods. He noted that “a taxonomy differentiates domains by specifying the scope of inquiry, codifying naming conventions,

identifying areas of interest, helping to set research priorities, and often leading to new theories. Taxonomies are signposts, indicating what is known and what has yet to be discovered."[3]

Robert Clark has described a taxonomy of intelligence sources.[4] He also categorized some analytic methods commonly used in intelligence analysis, but not to the extent of creating a taxonomy. To the best of our knowledge, no one has developed a taxonomy of analytic techniques for intelligence analysis, although taxonomies have been developed to classify research methods used in forecasting,[5] operations research,[6] information systems,[7] visualization tools,[8] electronic commerce,[9] knowledge elicitation,[10] and cognitive task analysis.[11]

After examining taxonomies of methods used in other fields, we found that there is no single right way to organize a taxonomy—only different ways that are useful in achieving a specified goal. In this case, our goal is to gain a better understanding of the domain of Structured Analytic Techniques, investigate how these techniques contribute to providing a better analytic product, and consider how they relate to the needs of analysts. The objective has been to identify various techniques that are currently available, identify or develop additional potentially useful techniques, and help analysts compare and select the best technique for solving any specific analytic problem. Standardization of terminology for Structured Analytic Techniques will facilitate collaboration across agency and international boundaries during the use of these techniques.



Description

Figure 2.1 System 1 and System 2 Thinking

Source: Pherson Associates, LLC, 2019.

The taxonomy presented in Figure 2.1 distinguishes System 1, or intuitive thinking, from the four broad categories of analytic methods used in System 2 Thinking. It describes the nature of these four categories, one of which is structured analysis. The others are critical thinking, empirical analysis, and quasi-quantitative analysis. This chapter describes the rationale for these four broad categories. In the next chapter, we review the six categories or families of Structured Analytic Techniques.

2.2 DEVELOPING A TAXONOMY OF STRUCTURED ANALYTIC TECHNIQUES

Intelligence analysts employ a wide range of methods to deal with an even wider range of subjects. Although this book focuses on the field of structured analysis, it is appropriate to identify some initial categorization of all the methods to see where structured analysis fits. Many researchers write of only two general approaches to analysis, contrasting qualitative with quantitative, intuitive with empirical, or intuitive with scientific. Others might claim that there are three distinct approaches: intuitive, structured, and scientific. In our taxonomy, we have sought to address this confusion by describing two types of thinking (System 1 and System 2) and defining four categories of System 2 Thinking.

> *The first step of science is to know one thing from another. This knowledge consists in their specific distinctions; but in order that it may be fixed and permanent, distinct names must be given to different things, and those names must be recorded and remembered.*
>
> —Carolus Linnaeus, *Systema Naturae* (1738)

Whether intelligence analysis is, or should be, an art or science is one of the long-standing debates in the literature on intelligence analysis. As we see it, intelligence analysis has aspects of both spheres. The range of activities that fall under the rubric of intelligence analysis spans the entire range of human cognitive abilities, and it is not possible to divide it into just two categories—art and science—or to say that it is only one or the other. The extent to which any part of intelligence analysis is either art or science is entirely dependent upon how one defines “art” and “science.”

The taxonomy described here posits four functionally distinct methodological approaches to intelligence analysis. These approaches are distinguished by the nature of the analytic methods used, the type of quantification if any, the type of data that is available, and the type of training that is expected or required. Although each method is distinct, the borders between them can be blurry.

- **Critical thinking**. Critical thinking, as defined by longtime intelligence methodologist and practitioner Jack Davis, is the application of the processes and values of scientific inquiry to the special circumstances of strategic intelligence.[12] Good critical thinkers will stop and reflect on who is the client, what is the question, where can they find the best information, how can they make a compelling case, and what is required to convey their message effectively. They recognize that this process requires checking key assumptions, looking for disconfirming data, and entertaining multiple explanations. Most students are exposed to critical-thinking techniques at some point in their education—from grade school to university—but few colleges or universities offer specific courses to develop critical thinking and writing skills.

- **Structured analysis**. Structured Analytic Techniques involve a step-by-step process that externalizes the analyst's thinking in a manner that makes it readily apparent to others, thereby enabling it to be reviewed, discussed, and critiqued piece by piece. For this reason, structured analysis usually becomes a collaborative effort in which the transparency of the analytic process exposes participating analysts to divergent or conflicting perspectives. We believe this type of analysis helps to mitigate some of the adverse effects of a single analyst's cognitive limitations, an ingrained mindset, and the whole range of cognitive biases, misapplied heuristics, and intuitive traps. Frequently used techniques include Cluster Brainstorming, Foresight analysis, Indicators, Analysis of Competing

Hypotheses, and Key Assumptions Check. Structured techniques are taught in undergraduate and graduate school programs as well as many intelligence service training courses and can be used by analysts who do not have a background in statistics, advanced mathematics, or the hard sciences.

- **Empirical analysis**. When large stores of quantitative data or social media reporting are available, analysts can engage quantitative methods to study the available information or "Big Data." Quantifiable empirical data are so different from expert-generated data that the methods and types of problems the data are used to analyze are also quite different. Econometric modeling is a common example of this method. With the mushrooming of data obtainable from social media providers and the internet of things, sophisticated algorithms can identify trends and test hypotheses. Empirical data are collected by various types of sensors and are used, for example, in analysis of weapons systems or public response to a new product placement. Training is generally obtained through graduate education in statistics, economics, cyber analysis, or the hard sciences.

- **Quasi-quantitative analysis**. When analysts lack the empirical data needed to analyze an intelligence problem, one strategy is to fill the gaps using expert-generated data. Many methods rely on experts to rate key variables as High, Medium, Low, or Not Present, or by assigning a subjective probability judgment. Experts use special procedures to elicit these judgments, and the ratings usually are integrated into a larger model that describes a phenomenon, such as the vulnerability of a civilian leader to a military coup, the level of political instability, or the likely outcome of a legislative debate. This category includes methods such as Bayesian inference, dynamic modeling, and simulation. Training in the use of these methods is provided through graduate education in fields such as mathematics, information science, political science, operations research, or business.

No one of these four methods is better or more effective than another. All are needed in various circumstances to optimize the odds of finding the right answer. The use of multiple methods over the course of a single analytic project should be the norm, not the exception. For example, even a highly quantitative technical analysis may entail assumptions about motivation, intent, or capability that are best handled with critical thinking approaches and/or structured analysis. A brainstorming technique might be used to identify the variables to include in a dynamic model that uses expert-generated data to quantify these variables.

Of these four methods, structured analysis is the "new kid on the block," so it is useful to consider how it relates to System 1 Thinking. System 1 Thinking combines subject-matter expertise and intuitive judgment in an activity that takes place largely in an analyst's head. Although the analyst may gain input from others, the analytic product is frequently perceived as the product of a single analyst, and the analyst tends to feel "ownership" of his or her analytic product. The work of a single analyst is particularly susceptible to the wide range of cognitive pitfalls described in *Psychology of Intelligence Analysis, Critical Thinking for Strategic Intelligence,* and throughout this book.[13]

Structured analysis, which is System 2 Thinking, follows a step-by-step process that can be used by an individual analyst, but we believe a group process provides more benefit. Structured Analytic Techniques guide the dialogue among analysts with common interests as they work step-by-step through an analytic problem. The critical point is that this approach exposes participants with various types and levels of expertise to alternative ideas, evidence, or mental models early in the analytic process and helps even experts avoid some common cognitive pitfalls. The structured group process that identifies and assesses alternative perspectives can also help to avoid Groupthink, the most common problem of small-group processes.

When used by a group or a team, structured techniques can become a mechanism for information sharing and group learning that helps to compensate for gaps or weaknesses in subject-matter expertise. This is especially useful for complex projects that require a synthesis of multiple types of expertise.

2.3 DEALING WITH COGNITIVE LIMITATIONS

As good as intuitive judgment often is, such judgment is still System 1 activity in the brain and is subject to many different types of cognitive limitations. Potential causes of such biases and mental mistakes include professional experience leading to an ingrained analytic mindset, training or education, the nature of one's upbringing, type of personality, a salient personal experience, or personal equity in a decision.

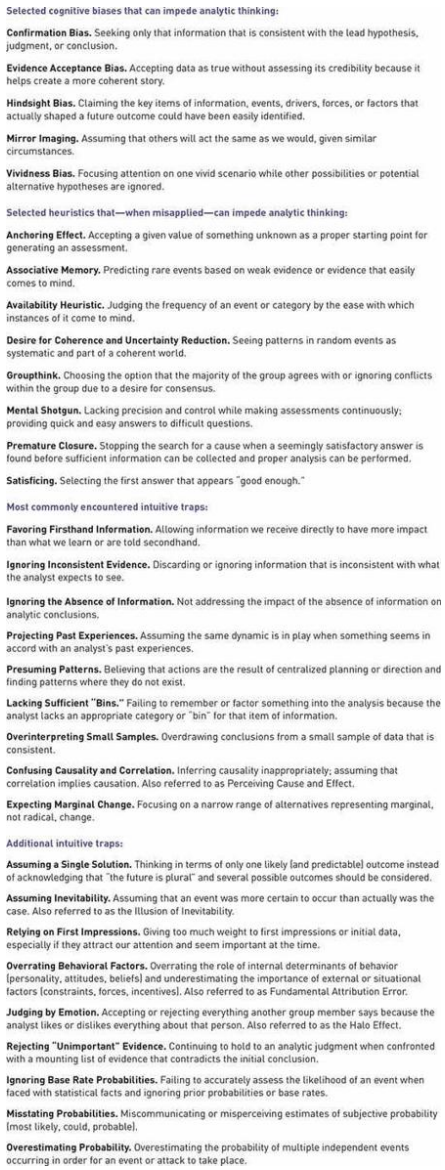
In this chapter, we distinguish between three types of cognitive limitations (see Figure 2.3):

- **Cognitive biases** are inherent thinking errors that people make in processing information. They prevent an analyst from accurately understanding reality even when all the needed data and evidence that would form an accurate view is in hand.
- **Heuristics** are experience-based techniques that can give a solution that is not guaranteed to be optimal. The objective of a heuristic is to produce quickly a solution that is good enough to solve the problem at hand. Analysts can err by overrelying on or misapplying heuristics. Heuristics help an analyst generate a quick answer, but sometimes that answer will turn out to be wrong.
- **Intuitive traps** are practical manifestations of commonly recognized cognitive biases or heuristics that analysts in the intelligence profession—and many other disciplines—often fall victim to in their day-to-day activities.

There is extensive literature on how cognitive biases and heuristics affect a person's thinking in many fields. Intuitive traps, however, are a new category of bias first identified by Randolph Pherson and his teaching colleagues as they explored the value of using Structured Analytic Techniques to counter the negative impact of cognitive limitations. Additional research is ongoing to refine and revise the list of eighteen intuitive traps.

All cognitive biases, misapplied heuristics, or intuitive traps, except perhaps the personal equity bias, are more frequently the result of fast, unconscious, and intuitive System 1 Thinking and not the result of thoughtful reasoning (System 2). System 1 Thinking—though often correct—is more often influenced by cognitive biases and mindsets as well as insufficient knowledge and the inherent unknowability of the future. Structured Analytic Techniques—a type of System 2 Thinking—help identify and overcome the analytic biases inherent in System 1 Thinking.

Behavioral scientists have studied the impact of cognitive biases on analysis and decision making in many fields, such as psychology, political science, medicine, economics, business, and education ever since Amos Tversky and Daniel Kahneman introduced the concept of cognitive biases in the early 1970s.[14] Richards Heuer's work for the CIA in the late 1970s and the 1980s, subsequently followed by his book *Psychology of Intelligence Analysis*, first published in 1999, applied Tversky and Kahneman's insights to problems encountered by intelligence analysts.[15] Since the publication of *Psychology of Intelligence Analysis*, other authors associated with the U.S. Intelligence Community (including Jeffrey Cooper and Rob Johnston) have identified cognitive biases as a major cause of analytic failure at the CIA.[16]



Selected cognitive biases that can impede analytic thinking:

Confirmation Bias. Seeking only that information that is consistent with the lead hypothesis, judgment, or conclusion.

Evidence Acceptance Bias. Accepting data as true without assessing its credibility because it helps create a more coherent story.

Hindsight Bias. Claiming the key items of information, events, drivers, forces, or factors that actually shaped a future outcome could have been easily identified.

Mirror Imaging. Assuming that others will act the same as we would, given similar circumstances.

Vividness Bias. Focusing attention on one vivid scenario while other possibilities or potential alternative hypotheses are ignored.

Selected heuristics that—when misapplied—can impede analytic thinking:

Anchoring Effect. Accepting a given value of something unknown as a proper starting point for generating an assessment.

Associative Memory. Predicting rare events based on weak evidence or evidence that easily comes to mind.

Availability Heuristic. Judging the frequency of an event or category by the ease with which instances of it come to mind.

Desire for Coherence and Uncertainty Reduction. Seeing patterns in random events as systematic and part of a coherent world.

Groupthink. Choosing the option that the majority of the group agrees with or ignoring conflicts within the group due to a desire for consensus.

Mental Shotgun. Lacking precision and control while making assessments continuously; providing quick and easy answers to difficult questions.

Premature Closure. Stopping the search for a cause when a seemingly satisfactory answer is found before sufficient information can be collected and proper analysis can be performed.

Satisficing. Selecting the first answer that appears "good enough."

Most commonly encountered intuitive traps:

Favoring Firsthand Information. Allowing information we receive directly to have more impact than what we learn or are told secondhand.

Ignoring Inconsistent Evidence. Discarding or ignoring information that is inconsistent with what the analyst expects to see.

Ignoring the Absence of Information. Not addressing the impact of the absence of information on analytic conclusions.

Projecting Past Experiences. Assuming the same dynamic is in play when something seems in accord with an analyst's past experiences.

Presuming Patterns. Believing that actions are the result of centralized planning or direction and finding patterns where they do not exist.

Lacking Sufficient "Bins." Failing to remember or factor something into the analysis because the analyst lacks an appropriate category or "bin" for that item of information.

Overinterpreting Small Samples. Overdrawing conclusions from a small sample of data that is consistent.

Confusing Causality and Correlation. Inferring causality inappropriately; assuming that correlation implies causation. Also referred to as Perceiving Cause and Effect.

Expecting Marginal Change. Focusing on a narrow range of alternatives representing marginal, not radical, change.

Additional intuitive traps:

Assuming a Single Solution. Thinking in terms of only one likely (and predictable) outcome instead of acknowledging that "the future is plural" and several possible outcomes should be considered.

Assuming Inevitability. Assuming that an event was more certain to occur than actually was the case. Also referred to as the Illusion of Inevitability.

Relying on First Impressions. Giving too much weight to first impressions or initial data, especially if they attract our attention and seem important at the time.

Overrating Behavioral Factors. Overrating the role of internal determinants of behavior (personality, attitudes, beliefs) and underestimating the importance of external or situational factors (constraints, forces, incentives). Also referred to as Fundamental Attribution Error.

Judging by Emotion. Accepting or rejecting everything another group member says because the analyst likes or dislikes everything about that person. Also referred to as the Halo Effect.

Rejecting "Unimportant" Evidence. Continuing to hold to an analytic judgment when confronted with a mounting list of evidence that contradicts the initial conclusion.

Ignoring Base Rate Probabilities. Failing to accurately assess the likelihood of an event when faced with statistical facts and ignoring prior probabilities or base rates.

Misstating Probabilities. Miscommunicating or misperceiving estimates of subjective probability (most likely, could, probable).

Overestimating Probability. Overestimating the probability of multiple independent events occurring in order for an event or attack to take place.

Figure 2.3 Glossary of Cognitive Biases, Misapplied Heuristics, and Intuitive Traps

This book is a logical follow-on to *Psychology of Intelligence Analysis*, which described in detail many of the biases and heuristics that influence intelligence analysis.[17] Since then, hundreds of cognitive biases and heuristics have been described in the academic literature using a wide variety of terms. As Heuer noted many years ago, "Cognitive biases are similar to optical illusions in that the error remains compelling even when one is fully aware of its nature. Awareness of the bias, by itself, does not produce a more accurate perception."[18] This is why cognitive limitations are exceedingly difficult to overcome. For example, Emily Pronin, Daniel Y. Lin, and Lee Ross observed in three different studies that people see the existence and operation of cognitive and motivational biases much more in others than in themselves.[19] This explains why so many analysts believe their own intuitive thinking (System 1) is sufficient.

Analysts in the intelligence profession—and many other disciplines—often fall victim to cognitive biases, misapplied heuristics, and intuitive traps that are manifestations of commonly recognized biases. Structured Analytic Techniques help analysts avoid, overcome, or at least mitigate their impact.

How a person perceives information is strongly influenced by factors such as experience, education, cultural background, and what that person is expected to do with the data. Our brains are trained to process information quickly, which often leads us to process data incorrectly or to not recognize its significance if it does not fit into established patterns. Some heuristics, such as the fight-or-flight instinct or knowing you need to take immediate action when you smell a gas leak, are helpful. Others are nonproductive. Defaulting to “rules of thumb” while problem solving can often lead to inherent thinking errors, because the information is being processed too quickly or incorrectly.

- **Cognitive biases**, such as Confirmation Bias or Hindsight Bias, impede analytic thinking from the very start.[20]
- **Misapplied heuristics**, such as Groupthink or Premature Closure, could lead to a correct decision based on a non-rigorous thought process if one is lucky. More often, they impede the analytic process because they prevent us from considering a full range of possibilities.
- **Intuitive traps**, such as Projecting Past Experiences or Overinterpreting Small Samples, are mental mistakes practitioners make when conducting their business. A classic example is when a police detective assumes that the next case he or she is working will be like the previous case or a general prepares to fight the last war instead of anticipating that the next war will have to be fought differently.

Unfortunately for analysts, these biases, heuristics, and traps are quick to form and extremely hard to correct. After one’s mind has reached closure on an issue, even a substantial accumulation of contradictory evidence is unlikely to force a reappraisal. Analysts often do not see new patterns emerging or fail to detect inconsistent data. An even larger concern is the tendency to ignore or dismiss outlier data as “noise.”

Structured Analytic Techniques help analysts avoid, overcome, or at least mitigate these common cognitive limitations. Structured techniques help analysts do the following:

- Reduce error rates.
- Avoid intelligence and other analytic failures.
- Embrace more collaborative work practices.
- Ensure accountability.
- Make the analysis more transparent to other analysts and decision makers.

2.4 MATCHING COGNITIVE LIMITATIONS TO STRUCTURED TECHNIQUES

Cognitive Bias or Misapplied Heuristic	Family of Structured Analytic Techniques	Intuitive Trap
Vividness Bias Associative Memory	Getting Organized	Ignoring the Absence of Information Overinterpreting Small Samples
Mental Shotgun Satisficing	Exploration	Projecting Past Experiences Lacking Sufficient Bins
Confirmation Bias Evidence Acceptance Bias	Diagnostic	Relying on First Impressions Ignoring Inconsistent Evidence
Anchoring Effect Mirror Imaging	Reframing	Expecting Marginal Change Rejecting Evidence
Hindsight Bias Availability Heuristic	Foresight	Assuming Inevitability Assuming a Single Solution
Groupthink Premature Closure	Decision Support	Overrating Behavioral Factors Overestimating Probability

Figure 2.4 Matching Cognitive Limitations to the Six Families of Structured Techniques

In this book, we proffer guidance on how to reduce an analyst's vulnerability to cognitive limitations. In the overview of each family of Structured Analytic Techniques, we list two cognitive biases or misapplied heuristics as well as two intuitive traps that the techniques in that family are most effective in countering (see Figure 2.4). The descriptions of each of the sixty-six techniques include commentary on which biases, heuristics, and traps that specific technique helps mitigate. In our view, most techniques help counter cognitive limitations with differing degrees of effectiveness, and the matches we selected are only illustrative of what we think works best. Additional research is needed to empirically validate the matches we have identified from our experience teaching the techniques over the past decade and exploring their relationship to key cognitive limitations.

2.5 COMBATING DIGITAL DISINFORMATION

The growing use of social media platforms to manipulate popular perceptions for partisan political or social purposes has made democratic processes increasingly vulnerable in the United States and across the world. Largely unencumbered by commercial or legal constraints, international standards, or morality, proponents of Digital Disinformation[21] have become increasingly adept at exploiting common cognitive limitations, such as Confirmation Bias, Groupthink, and Judging by Emotion. History may show that we have grossly underestimated how easy it has been to influence popular opinion by leveraging cognitive biases, misapplied heuristics, and intuitive traps.

Digital Disinformation is purposely intended to mislead the reader. Perpetrators of Digital Disinformation compose compelling and seemingly coherent narratives that usually dismiss inconsistent evidence and ignore basic rules of logic. The primary objective of digital deceivers is to provide incorrect information in a seemingly persuasive format that confirms the readers' biases and either hardens mental mindsets or sows apathy or disbelief in the ability to know the truth.[22] Uncritical readers will often believe they have "found the truth" when actually they are functioning as both victims and perpetrators of cognitive bias, misapplied heuristics, and intuitive traps.

Purposeful misinformation, conspiracy theories, deception, and active measures have been used by activists and nation-states to influence people for decades, if not centuries.[23] Such efforts at perception management appear to have had greater impact in recent years because of the following:

- The breadth and volume of misinformation has become staggering, owing to the power of social media platforms.
- The speed of the spread of disinformation is breathtaking as stories can quickly go “viral,” spreading to millions of readers. A Massachusetts Institute of Technology study in *Science* documents that false rumors travel across the internet six times faster than factual stories.[24]
- People appear to be increasingly seeking simple answers to complex problems. Social network platforms usually present information in simplified form, which makes the message more digestible but far less nuanced—and often inaccurate.[25]

The incentives for digital deceivers to leverage social media platforms to manipulate popular perceptions have also increased dramatically because of the following:

- Millions of people can be reached almost instantaneously.
- Few perpetrators are held accountable for their posts.
- Perpetrators can micro-target their messages to those most easily swayed and open to persuasion.

Another underlying and often overlooked factor explaining the growing impact of Digital Disinformation is the susceptibility of individuals to false messaging. Perpetrators of conspiracy theories know what is most likely to “stick” in the minds of their audiences. This “stickiness” is usually attributable to the exploitation of human vulnerabilities that are manifestations of omnipresent, and well-ingrained, cognitive biases, misapplied heuristics, and intuitive traps.

Perpetrators of Digital Disinformation know that the best way to manipulate popular perceptions is to exploit well-ingrained cognitive

limitations. They can anticipate when a person is likely to fall victim to a cognitive bias or to misapply a heuristic, and they leverage this knowledge to increase the impact of their messaging. Experts in false messaging, for example, are aware that people's perceptions of data are strongly influenced by their past experiences, education, cultural values, and how they identify themselves. People with different backgrounds will perceive information differently.

Moreover, knowledge of someone's social media profile greatly facilitates the process of identifying how best to package misinformation to reinforce that person's thinking. With the explosive growth in the use of social media platforms and databases, the use of such micro-targeting strategies has proven increasingly effective in product marketing and more recently in political campaigns.

Two of the most powerful biases that perpetrators of misinformation exploit are Confirmation Bias—seeking only information that confirms your viewpoint—and Vividness Bias—focusing attention only on the most vivid possibility.[26,27] Digital deceivers have also become masters of exploiting misapplied heuristics, such as the Anchoring Effect, Groupthink, and Satisficing. Intuitive traps that create vulnerabilities include Judging by Emotion, Presuming Patterns, and Overinterpreting Small Samples.

Recognizing one's vulnerability to Digital Disinformation is insufficient for mitigating the threat. A more productive strategy is needed—one that involves the use of critical thinking strategies and Structured Analytic Techniques. People are less likely to be deceived if they make it a habit to evaluate the quality of the evidence used to support a claim and ask what other credible, alternative narratives could explain what has occurred. Four Structured Analytic Techniques that are particularly effective in helping counter the impact of Digital Disinformation are as follows:[28]

- **Key Assumptions Check**. Making explicit and questioning the assumptions that guide an analyst's interpretation of evidence

and the reasoning underlying a judgment or conclusion.

- **Analysis of Competing Hypotheses**. The evaluation of information against a set of alternative hypotheses to determine the consistency/inconsistency of each piece of data against each hypothesis and the rejection of hypotheses with much inconsistent data.

- **Premortem Analysis and Structured Self-Critique**. A systematic process using brainstorming and checklist procedures to identify critical weaknesses in an argument and assess how a key analytic judgment could be spectacularly wrong.

NOTES

1. For further information on dual process theory, see the research by Jonathan Evans and Keith Frankish, *In Two Minds: Dual Processes and Beyond* (Oxford, UK: Oxford University Press, 2009); and Pat Croskerry, "A Universal Model of Diagnostic Reasoning," *Academic Medicine* 84, no. 8 (August 2009).

2. Reasoning by analogy can also be a structured technique called Structured Analogies, as described in chapter 8.

3. Rob Johnston, *Analytic Culture in the U.S. Intelligence Community* (Washington, DC: CIA Center for the Study of Intelligence, 2005), 34.

4. Robert M. Clark, *Intelligence Analysis: A Target-Centric Approach*, 2nd ed. (Washington, DC: CQ Press, 2007), 84.

5. Forecasting Principles website, last accessed November 6, 2019, www.forecastingprinciples.com/files/pdf/methodsselectionchart.pdf

6. Russell W. Frenske, "A Taxonomy for Operations Research," *Operations Research* 19, no. 1 (January–February 1971).

7. Kai R. T. Larson, "A Taxonomy of Antecedents of Information Systems Success: Variable Analysis Studies," *Journal of Management Information Systems* 20, no. 2 (Fall 2003).

8. Ralph Lengler and Martin J. Epler, "A Periodic Table of Visualization Methods," n.d., www.visual-literacy.org/periodic_table/periodic_table.html

9. Roger Clarke, *Appropriate Research Methods for Electronic Commerce* (Canberra, Australia: Xanax Consultancy Pty Ltd., 2000), www.forecastingprinciples.com/files/pdf/methodsselectionchart.pdf

10. Robert R. Hoffman, Nigel R. Shadbolt, A. Mike Burton, and Gary Klein, "Eliciting Knowledge from Experts," *Organizational Behavior*

and Human Decision Processes 62 (May 1995): 129–158.

11. Robert R. Hoffman and Laura G. Militello, *Perspectives on Cognitive Task Analysis: Historical Origins and Modern Communities of Practice* (Boca Raton, FL: CRC Press/Taylor and Francis, 2008); Beth Crandall, Gary Klein, and Robert R. Hoffman, *Working Minds: A Practitioner's Guide to Cognitive Task Analysis* (Cambridge, MA: MIT Press, 2006).

12. See Katherine Hibbs Pherson and Randolph H. Pherson, *Critical Thinking for Strategic Intelligence,* 2nd ed. (Washington, DC: CQ Press/SAGE, 2017), xxii.

13. Richards J. Heuer Jr., *Psychology of Intelligence Analysis* (Washington, DC: CIA Center for the Study of Intelligence, 1999; reprinted by Pherson Associates, LLC, Reston, VA, 2007).

14. Amos Tversky and Daniel Kahneman, "Judgment under Uncertainty: Heuristics and Biases," *Science* 185, no. 4157 (1974): 1124–1131.

15. *Psychology of Intelligence Analysis* was republished by Pherson Associates, LLC, in 2007, and can be purchased on its website at shop.globalytica.com.

16. Jeffrey R. Cooper, *Curing Analytic Pathologies: Pathways to Improved Intelligence Analysis* (Washington, DC: CIA Center for the Study of Intelligence, 2005); Rob Johnston, *Analytic Culture in the U.S. Intelligence Community: An Ethnographic Study* (Washington, DC: CIA Center for the Study of Intelligence, 2005).

17. Heuer, *Psychology of Intelligence Analysis.*

18. Ibid., 112.

19. Emily Pronin, Daniel Y. Lin, and Lee L. Ross, "The Bias Blind Spot: Perceptions of Bias in Self versus Others," *Personality and Social Psychology Bulletin* 28, no. 3 (2002): 369–381.

20. Definitions of these and other cognitive biases, misapplied heuristics, and intuitive traps mentioned later in this chapter are provided in Figure 2.3 on pages **24–25**.

21. Efforts to purposefully mislead or misinform have also been described as “Fake News,” “False News,” or “Agenda-Driven News.” The phrase most often used in the public domain is Fake News, but the inaccurate use of this term to describe any critical news reporting has undermined its usefulness.

22. Rob Brotherton, “Five Myths about Conspiracy Theories,” *Washington Post*, January 17, 2019, https://www.washingtonpost.com/outlook/five-myths/five-myths-about-conspiracy-theories/2019/01/17/0ef1b840-1818-11e9-88fe-f9f77a3bcb6c_story

23. The term “active measures” refers to actions taken by the Soviet Union, and later Russia, beginning in the 1920s to influence popular perceptions through propaganda, false documentation, penetration of institutions, persecution of political activists, and political violence, including assassinations. For more information, see the testimony of Gen. (ret.) Keith B. Alexander, *Disinformation: A Primer in Russian Active Measures and Influence Campaigns, United States Senate Select Committee on Intelligence*, March 30, 2017, https://www.intelligence.senate.gov/sites/default/files/documents/os-kalexander-033017.pdf.

24. Soroush Vosoughi, Deb Roy, and Sinan Aral, “The Spread of True and False News Online,” *Science* 359, no. 6380 (2018): 1146–1151.

25. Elisa Shearer and Jeffrey Gottfried, *News Use across Social Media Platforms 2017*, (Washington, DC: Pew Research Center, September 7, 2017), http://www.journalism.org/2017/09/07/news-use-across-social-media-platforms-2017/

26. A fuller discussion of this issue can be found in Randolph H. Pherson and Penelope Mort Ranta, “Cognitive Bias, Digital

Disinformation, and Structured Analytic Techniques," *Revista Română de studii de intelligence* (*Romanian Journal of Intelligence Studies*), Vol. 21, 2019). The article was inspired in large part by observations made during the U.S. presidential election in 2016. Similar dynamics, however, have been observed in subsequent elections in France, Germany, and several other European states as well as the Brexit campaign in the United Kingdom.

27. A review of the cognitive biases and misapplied heuristics most often experienced by intelligence analysts can be found in Katherine Hibbs Pherson and Randolph H. Pherson, *Critical Thinking for Strategic Intelligence*, 2nd ed. (Washington, DC: CQ Press/SAGE, 2017), 55.

28. Randolph H. Pherson, *Handbook of Analytic Tools and Techniques*, 5th ed. (Tysons, VA: Pherson Associates, LLC, 2019), 5, 9, 19, 31, 43, 53.

Descriptions of Images and Figures

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In system 1 thinking, the judgment is intuitive. System 2 thinking involves critical thinking, structured analysis, quasi-quantitative analysis, and empirical analysis. Critical thinking is qualitative with known data and includes getting started, source validation, argumentation, and presentation. Structured analysis is qualitative with known and unknown data, and includes exploration, diagnostic, reframing, and foresight. Quasi-Quantitative Analysis is quantitative with known and unknown data, and includes computer-based tools using expert-generated data. Empirical analysis is quantitative with known data, and includes data-based computer tools and visualization techniques.

CHAPTER 3 CHOOSING THE RIGHT TECHNIQUE

3.1 The Six Families [35]

3.2 Core Techniques [36]

3.3 Selecting the Right Technique [38]

3.4 Projects Using Multiple Techniques [41]

3.5 Common Errors in Selecting Techniques [41]

3.6 Making a Habit of Using Structured Techniques [42]

This chapter provides analysts with a practical guide to identifying the various techniques that are most likely to meet their needs. It also does the following:

- Reviews the reorganization of the book, decreasing the number of families of techniques from eight to six.
- Identifies a set of core techniques that are used frequently and should be part of every analyst's toolkit. Instructors may want to review this list when deciding which techniques to teach.
- Provides a framework for deciding which techniques to employ for a given problem or project.
- Discusses the value of using multiple techniques for a single project.
- Lists common mistakes analysts make when deciding which technique or techniques to use for a project.

- Describes five habits of thinking that an analyst should draw upon when under severe time pressure to deliver an analytic product.

3.1 THE SIX FAMILIES

Considering that the U.S. Intelligence Community started focusing on structured techniques to enhance the rigor of analysis, it is fitting to categorize these techniques by the various ways they help achieve this goal. Structured Analytic Techniques can mitigate some human cognitive limitations, sidestep some of the well-known analytic pitfalls, and address the problems associated with unquestioned assumptions and outdated mental models. They can ensure that assumptions, preconceptions, and mental models are not taken for granted but are explicitly examined and tested. They can support the decision-making process, and the use and documentation of these techniques can facilitate information sharing and collaboration.

A secondary goal when categorizing structured techniques is to correlate categories with different types of common analytic tasks. These often map to the basic analytic production process: getting started, collecting and organizing your information, developing your conceptual framework, conducting the analysis, challenging your conclusions, estimating future trends, and supporting use of the analysis by decision makers. In this book we have organized sixty-six techniques into six families: Getting Organized, Exploration Techniques, Diagnostic Techniques, Reframing Techniques, Foresight Techniques, and Decision Support Techniques. We have allocated about ten techniques to each family, but several techniques —such as the Key Assumptions Check, Outside-In Thinking, What If? Analysis, and Argument Mapping—fit comfortably in several categories because they serve multiple analytic functions.

The six families of Structured Analytic Techniques are described in detail in chapters 5–10. The introduction to each chapter describes how that specific category of techniques helps to improve analysis.

3.2 CORE TECHNIQUES

The average analyst is not expected to know how to use every technique in this book. All analysts should, however, understand the functions performed by various types of techniques and recognize the analytic circumstances in which it is advisable to use them. An analyst can gain this knowledge by reading the introductions to each of the technique chapters and the overviews of each technique. Tradecraft or methodology specialists should be available to assist when needed in the actual implementation of many of these techniques. In the U.S. Intelligence Community, for example, the CIA and several other agencies support the use of these techniques through the creation of analytic tradecraft support cells or mentoring programs.

All analysts should be trained to use the core techniques discussed here because they support several of the basic requirements of generating high-quality analysis. They are also widely applicable across many different types of analysis—strategic and tactical, intelligence and law enforcement, and cyber and business. Eight core techniques are described briefly in the following paragraphs.

Cluster Brainstorming (chapter 6).

A commonly used technique, Cluster Brainstorming (referred to as Structured Brainstorming in previous editions of this book) is a simple exercise employed at the beginning of an analytic project to elicit relevant information or insight from a small group of knowledgeable analysts. The group's goal might be to identify a list of such things as relevant variables, driving forces, a full range of hypotheses, key players or stakeholders, and available evidence or sources of information. Analysts can also use Cluster Brainstorming to explore potential solutions to a problem, potential outcomes or scenarios, or potential responses by an adversary or competitor to some action or situation. Law enforcement analysts can use the

technique to brainstorm potential suspects or develop avenues of investigation. Analysts should consider using other silent brainstorming techniques or the Nominal Group Technique (chapter 6) as an alternative to Cluster Brainstorming when there is concern that a senior officer or recognized expert might dominate a regular brainstorming session or that participants may be reluctant to speak up.

Key Assumptions Check (chapter 7).

One of the most frequently used techniques is the Key Assumptions Check. It requires analysts to explicitly list and question the most important working assumptions underlying their analysis. Any explanation of current events or estimate of future developments requires the interpretation of incomplete, ambiguous, or potentially deceptive evidence. To fill in the gaps, analysts typically make assumptions about such things as the relative strength of political forces, another country's intentions or capabilities, the way governmental processes usually work in that country, the trustworthiness of key sources, the validity of previous analyses on the same subject, or the presence or absence of relevant changes in the context in which the activity is occurring. It is important that analysts explicitly recognize and question their assumptions.

Analysis of Competing Hypotheses (chapter 7).

This technique requires analysts to start with a full set of plausible hypotheses rather than with a single most likely hypothesis. Analysts then take each item of relevant information, one at a time, and judge its consistency or inconsistency with each hypothesis. The idea is to refute hypotheses rather than confirm them. The most likely hypothesis is the one with the least inconsistent information that would argue against it, not the one with the most relevant information that supports it. This process applies a key element of the scientific method to intelligence analysis.

Premortem Analysis and Structured Self-Critique (chapter 8).

This pair of easy-to-use techniques enables a small team of analysts who have been working together on any type of analysis to challenge effectively the accuracy of its own conclusions. Premortem Analysis uses a form of reframing, in which restating the question or problem from another perspective enables one to see it in a different way and formulate different answers. For example, analysts could place themselves months or years in the future and imagine that they suddenly learn from an unimpeachable source that their original estimate was wrong. Then imagine what could have happened to cause the estimate to be wrong. Looking back to explain something that has happened is much easier than looking into the future to forecast what will happen.

With the Structured Self-Critique, analysts respond to a list of questions about a variety of factors, including sources of uncertainty, analytic processes, critical assumptions, diagnosticity of evidence, information gaps, and the potential for deception. Rigorous use of both techniques can help prevent a future need for a postmortem.

What If? Analysis (chapter 8).

In conducting a What If? Analysis, one imagines that an unexpected event has happened and then, with the benefit of “hindsight,” analyzes how it could have come about and considers the potential consequences. This reframing approach creates an awareness that prepares the analyst’s mind to recognize early signs of a significant change. It can also enable decision makers to plan for contingencies. In addition, a What If? Analysis can be a tactful way of alerting a decision maker to the possibility that he or she may be wrong.

Multiple Scenarios Generation (chapter 9).

One of the most commonly used Foresight analysis techniques, Multiple Scenarios Generation, uses key drivers in a 2-×-2 matrix to generate multiple explanations for how a situation may develop when considerable uncertainty is present. The technique leverages the knowledge and imagination of a diverse group of experts to identify alternative future trajectories that both warn decision makers of downside risks and illuminate new opportunities.

Indicators Generation, Validation, and Evaluation (chapter 9).

Indicators are observable actions or events that can be generated using a variety of structured techniques. They can be monitored to detect or anticipate change. For example, analysts can use Indicators to measure changes toward an undesirable condition, such as political instability, a pending financial crisis, or a coming attack. Indicators can also point toward a desirable condition, such as economic reform or democratic institution building. The special value of Indicators is that they create an awareness that prepares an analyst’s mind to recognize the earliest signs of significant change that might otherwise be overlooked. Indicators must be validated, and the Indicators Evaluation process helps analysts assess the diagnostic value of their Indicators.

3.3 SELECTING THE RIGHT TECHNIQUE

Analysts must be able, with minimal effort, to identify and learn how to use the techniques that best meet their needs and fit their styles. The selection guide provided in Figure 3.3a lists twelve tasks that analysts perform and matches the task to several Structured Analytic Techniques that would maximize their performance. The tasks are organized to conform generally with the analytic production process as represented by the six families of techniques. For the purposes of the graphic, the Getting Organized family was incorporated into the Exploration task.

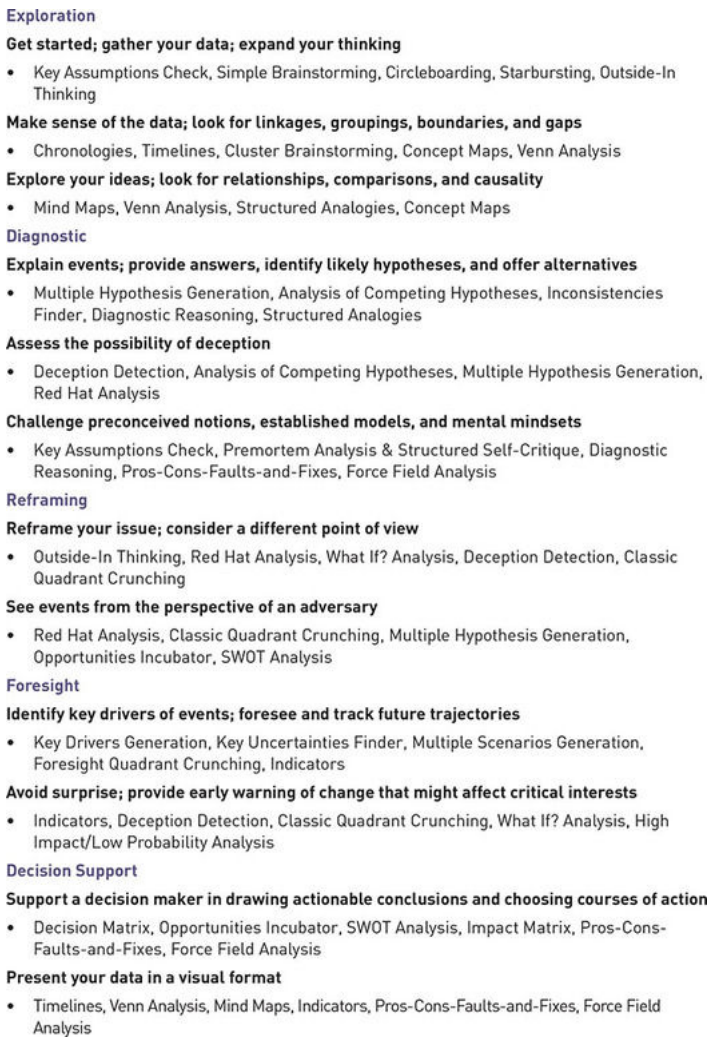
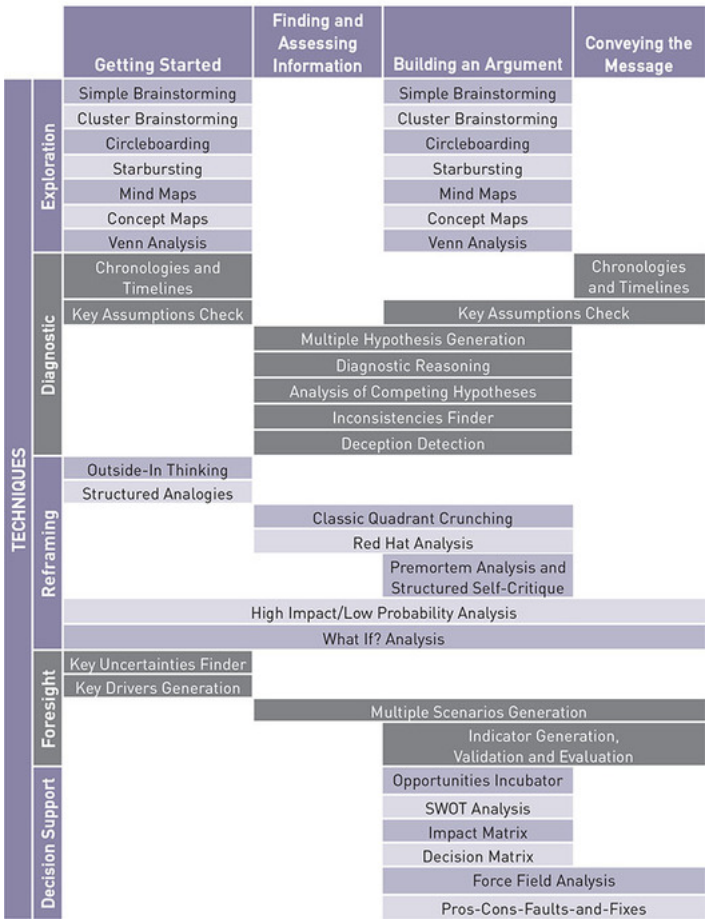


Figure 3.3A Selecting the Right Structured Analytic Technique

Source: Pherson Associates, LLC, 2019.

This timeline suggests an optimal time to use the techniques rather than a hard and fast temporal rule. Many techniques could be used, or continue to be used, outside of the identified project periods. For example, although Chronologies and Timelines are most useful when organizing your data, if new information became available an analyst might need to update the Chronology or Timeline.



Description

Figure 3.3B When to Use Structured Analytic Techniques

Source: Pherson Associates, LLC, 2019.

To identify the structured techniques that would be most helpful in learning how to perform a task with more rigor and imagination, analysts pick the statement that best describes their objectives and then choose one or two of the techniques listed below the task. Analysts should refer to the appropriate chapter in the book and first read the brief discussion of that family of techniques (which includes a short description of each technique in the chapter) to validate their choice(s). The next step is to read the section of the chapter that describes when, why, and how to use the chosen technique. For many techniques, the information provided sufficiently describes how to use the technique. Some more complex techniques require specialized training or facilitation support by an experienced user.

Another question often asked is, “When should I use the techniques?” Figure 3.3b provides a reference guide for when to use thirty-three of the most used structured techniques.

3.4 PROJECTS USING MULTIPLE TECHNIQUES

Many projects require the use of multiple techniques, which is why this book includes sixty-six different techniques. Each technique may provide only one piece of a complex puzzle; knowing how to put these pieces together for a specific project is part of the art of structured analysis. Separate techniques might be used for organizing the data, evaluating ideas, and identifying assumptions. There are also several techniques appropriate for generating and testing hypotheses, drawing conclusions, challenging key findings, and implementing new strategies.

Multiple techniques can be used to check the accuracy of and increase confidence in an analytic conclusion. Research shows that forecasting accuracy is increased by combining "forecasts derived from methods that differ substantially and draw from different sources of information."[1] This is a particularly appropriate function for the Delphi Method (chapter 8), which is a structured process for eliciting judgments from a panel of outside experts. If a Delphi panel produces results similar to the initial internal analysis, one can have significantly greater confidence in those results. If the results differ, further research may be appropriate to understand why and to evaluate the differences.

A key lesson learned from mentoring analysts in the use of structured techniques is that major benefits can result—and major mistakes be avoided—if analysts use two different techniques to conduct the same analysis (for example, pairing Cluster Brainstorming with Diagnostic Reasoning or pairing Key Uncertainties Finder™ with Key Drivers Generation™). Two groups can either (1) attack the same problem independently applying the same structured technique or (2) work the same problem independently using a different but complementary technique. They

then should share their findings with each other and meld their results into a single more comprehensive solution.

3.5 COMMON ERRORS IN SELECTING TECHNIQUES

The value and accuracy of an analytic product depends in part upon selection of the most appropriate technique or combination of techniques for doing the analysis. Unfortunately, it is easy for analysts to go astray when selecting the best method. Lacking effective guidance, analysts are vulnerable to various influences:[2]

- **College or graduate-school recipe**. Analysts are inclined to use the tools they learned in college or graduate school regardless of whether those tools are most appropriate for dealing with an intelligence problem.
- **Tool rut**. Analysts are inclined to use whatever tool they already know or have readily available. Psychologist Abraham Maslow observed that "if the only tool you have is a hammer, it is tempting to treat everything as if it were a nail."[3]
- **Convenience shopping**. The analyst, guided by the evidence that happens to be available, uses a method appropriate for that evidence, rather than seeking out the evidence that is really needed to address the intelligence issue. In other words, the evidence may sometimes drive the technique selection instead of the analytic need driving the evidence collection.
- **Time constraints**. Analysts can easily be overwhelmed by their inboxes and the myriad tasks they must perform in addition to their analytic workload. The temptation is to avoid techniques that would "take too much time." However, many useful techniques take relatively little time to perform, even as little as an hour or two. This ultimately helps analysts produce higher-quality and more compelling analysis than might otherwise be possible.

3.6 MAKING A HABIT OF USING STRUCTURED TECHNIQUES

Analysts sometimes express concern that they do not have enough time to use Structured Analytic Techniques. The experience of most analysts and particularly managers of analysts is that this concern is unfounded. If analysts stop to consider how much time it takes to research an issue and draft a report, coordinate the analysis, walk the paper through the editing process, and get it approved and disseminated, they will discover that the use of structured techniques typically speeds the process.

- Many of the techniques, such as Key Assumptions Check, Circleboarding™, Inconsistencies Finder™, and Indicators Validation and Evaluation, take little time and substantially improve the rigor of the analysis.
- Some take a little more time to learn, but, once learned, often save analysts considerable time over the long run. Cluster Brainstorming, Analysis of Competing Hypotheses (ACH), and Red Hat Analysis are good examples of this phenomenon.
- Most Foresight Techniques, Premortem Analysis, and Structured Self-Critique take more time to perform but offer major rewards for discovering both “unknown unknowns” and errors in the original analysis that can be remedied.

When working on quick-turnaround items, such as a current situation report or an alert that must be produced the same day, one can credibly argue that it is not possible to take time to use a structured technique. When deadlines are short, gathering the right people in a small group to employ a structured technique can prove to be impossible.

The best response to this valid observation is to encourage analysts to practice using core structured techniques when deadlines are less pressing. In so doing, they ingrain new habits of thinking. If they, and their colleagues, practice how to apply the concepts embedded in the structured techniques when they have time, they will be more capable of applying these critical thinking skills instinctively when under pressure. The Five Habits of the Master Thinker are described in Figure 3.6.[4] Each habit can be mapped to one or more Structured Analytic Techniques.

Key Assumptions.

In a healthy work environment, challenging assumptions should be commonplace, ranging from “Why do you assume we all want pepperoni pizza?” to “Won’t higher oil prices force them to reconsider their export strategy?” If you expect your colleagues to challenge your key assumptions on a regular basis, you will become more sensitive to them yourself and will increasingly question if your assumptions are well-founded.

Alternative Explanations.

When confronted with a new development, the first instinct of a good analyst is to develop a hypothesis to explain what has occurred based on the available evidence and logic. A master thinker goes one step further and immediately asks whether any alternative explanations should be considered. If envisioning one or more alternative explanations is difficult, a master thinker will simply posit a single alternative that the initial or lead hypothesis is not true. Although at first glance these alternatives may appear much less likely, as new evidence surfaces over time, one of the alternatives may evolve into the lead hypothesis. Analysts who do not generate a set of alternative explanations at the start of a project but rather quickly lock on to a preferred explanation will often fall into the trap of Confirmation Bias—focusing on the data that are consistent with their explanation and ignoring or rejecting other data that are inconsistent.

Inconsistent Data.

Looking for inconsistent data is probably the hardest of the five habits to master, but it is the one that can reap the most benefits in terms of time saved when investigating or researching an issue. The best way to train your brain to look for inconsistent data is to conduct a series of ACH or Inconsistencies Finder™ exercises. Such practice helps analysts readily identify what constitutes compelling contrary evidence. If an analyst encounters an item of data that is compellingly inconsistent with one of the hypotheses (for example, a solid alibi), then that hypothesis can be quickly discarded. This will save the analyst time by redirecting his or her attention to more likely solutions.

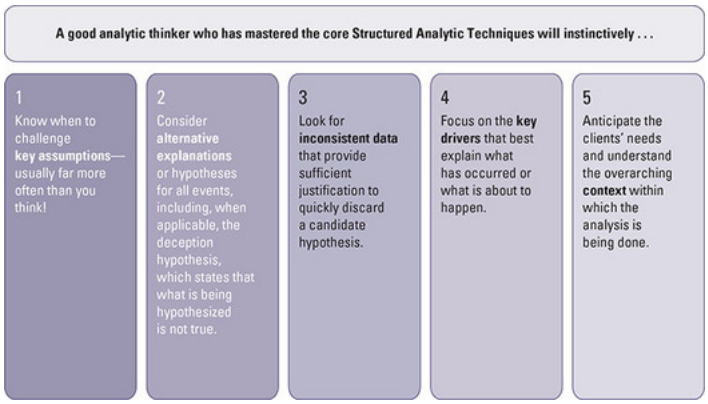


Figure 3.6 The Five Habits of the Master Thinker

Source: Pherson Associates, LLC, 2019.

Key Drivers.

Asking at the outset what key drivers best explain what has occurred or foretell what is about to happen is a key attribute of a master thinker. If analysts quickly identify key drivers, the chance of surprise will be diminished. An experienced analyst should know how to vary the weights of these key drivers (either instinctively or by using techniques such as Multiple Scenarios Generation or Quadrant Crunching™) to generate a set of credible alternative scenarios that capture the range of possible outcomes.

Context.

Analysts often get so engaged in collecting and sorting data that they miss the forest for the trees. Learning to stop and reflect on the overarching context for the analysis is a key habit to learn. Most analysis is done under considerable time pressure, and the tendency is to plunge in as soon as a task is assigned. If the analyst does not take time to reflect on what the client is really seeking, the resulting analysis could prove inadequate and much of the research a waste of time. Ask yourself: "What do they need from me," "How can I help them frame the issue," and "Do I need to place their question in a broader context?" Failing to do this at the outset can easily lead the analyst down blind alleys or require reconceptualizing an entire paper after it has been drafted. Key structured techniques for developing context include Starbursting, Mind Mapping, Outside-In Thinking, and Cluster Brainstorming.

Learning how to internalize the five habits will take a determined effort. Applying each core technique to three to five real problems should implant the basic concepts firmly in any analyst's mind. With every repetition, the habits will become more ingrained and, over time, will become instinctive. Few analysts can wish for more. If they master the habits, they will produce a superior product in less time.

NOTES

1. J. Scott Armstrong, “Combining Forecasts,” in *Principles of Forecasting*, ed. J. Scott Armstrong (New York: Springer Science+Business Media, 2001), 418–439.

2. The first three items in this list are from Craig S. Fleisher and Babette E. Bensoussan, *Strategic and Competitive Analysis: Methods and Techniques for Analyzing Business Competition* (Upper Saddle River, NJ: Prentice Hall, 2003), 22–23.

3. Abraham Maslow, *Psychology of Science* (New York: Harper & Row, 1966). A similar quote is attributed to Abraham Kaplan: “Give a child a hammer and he suddenly discovers that everything he encounters needs pounding.”

4. For a fuller discussion of this topic, see Randolph H. Pherson, “Five Habits of the Master Thinker,” *Journal of Strategic Security* 6, no. 3 (Fall 2013), http://scholarcommons.usf.edu/jss.

Descriptions of Images and Figures

Back to Figure

The four stages in a project are getting started, finding and assessing information, building an argument, and conveying the message. The types of exploration techniques used during the first and the third stages are simple brainstorming, cluster brainstorming, circleboarding, starbursting, mind maps, concept maps, and Venn analysis. The diagnostic techniques used during the first and the fourth stages are chronologies and timelines, and key assumptions check, and during the second and the third stages are key assumptions check, multiple hypothesis generation, diagnostic reasoning, analysis of competing hypotheses, inconsistencies finder, and deception detection. The reframing techniques used in the first stage are outside-in thinking and structured analogies; in the second and the third stages are classic quadrant crunching and red hat analysis; in the third stage are premortem analysis and structured self-critique, and in all the stages are high impact, low probability analysis, and what if analysis. The foresight techniques used in the first stage are key uncertainties finder and key drivers generation; and in the second, third, and the fourth stages are multiple scenarios generation, indicator generation, and validation and evaluation. The decision support techniques used in the third stage are opportunities incubator, SWOT analysis, impact matrix, and decision matrix; and in the third and the fourth stages are force field analysis, and pros-cons-faults-and-fixes.

CHAPTER 4 PRACTITIONER'S GUIDE TO COLLABORATION

4.1 Social Networks and Analytic Teams [49]

4.2 Dividing the Work [53]

4.3 Value of Collaborative Processes [55]

4.4 Common Pitfalls with Small Groups [56]

4.5 Benefiting from Diversity [57]

4.6 Advocacy versus Objective Inquiry [58]

4.7 Leadership and Training [60]

The rapid growth of social networks across organizational boundaries and the increased geographic distribution of their members are changing how analysis needs to be done within the intelligence profession and even more so in business. Analysis in the intelligence profession and other comparable disciplines is evolving from being predominantly an activity done by a single analyst to a collaborative group process. The increased use of Structured Analytic Techniques is one of several factors spurring this transition to more collaborative work products.

In this chapter, we identify three different groups that engage in analysis—two types of teams and a group described here as a "social network." We recommend that analysis be done in two phases: (1) an initial, divergent analysis phase often conducted by a geographically distributed social network and (2) a convergent analysis phase done by a smaller analytic team.

The chapter provides some practical guidance on how to take advantage of the collaborative environment while preventing or avoiding the many well-known problems associated with small-group processes. Many things change when the internal thought processes of analysts are externalized in a transparent manner so that evidence is shared early and differences of opinion are identified, refined, and easily critiqued by others. The chapter then identifies problems known to impair the performance of teams and small groups and concludes with some practical measures for limiting the occurrence of such problems.

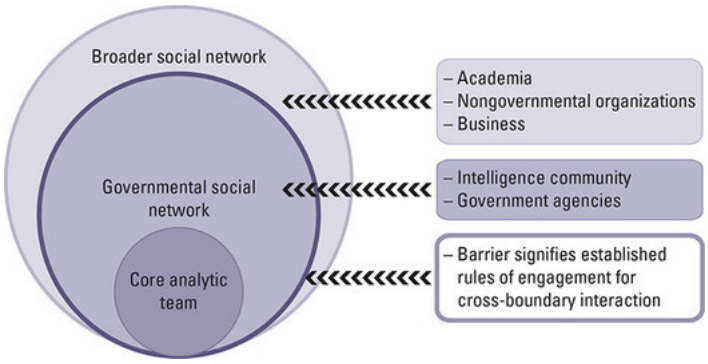
4.1 SOCIAL NETWORKS AND ANALYTIC TEAMS

Teams and groups can be categorized in several ways. When the purpose of the group is to generate an analytic product, it seems most useful to deal with three types: the traditional analytic team, the special project team, and teams supported by social networks. Traditional teams are usually co-located and focused on a specific task. Special project teams are most effective when their members are co-located or working in a synchronous virtual world. Teams supported by social networks can operate effectively in co-located, geographically distributed, and synchronous as well as asynchronous modes. These three types of groups differ in leadership, frequency of face-to-face and virtual-world meetings, breadth of analytic activity, and amount of time pressure under which they work.[1]

- **Traditional analytic team:** This is the typical work team assigned to perform a specific task. It has a leader appointed by a manager or chosen by the team, and all members of the team are collectively accountable for the team's product. The team may work jointly to develop the entire product, or each team member may be responsible for a specific section of the work. Historically, in the U.S. Intelligence Community, many teams were composed of analysts from a single agency, and involvement of other agencies was through coordination during the latter part of the production process rather than by collaborating from the beginning. This approach is now evolving because of changes in policy and easier access to secure interagency communications and collaborative software. Figure 4.1a shows how the traditional analytic team works. The core analytic team, with participants usually working at the same office, drafts a paper and sends it to other members of the community for comment and coordination. Ideally, the core team will alert other stakeholders in the community of their intent to write on a specific topic; but, too often, such dialogue occurs much later, when the author is seeking to coordinate the finished draft. In most cases, analysts must obtain specific permissions or follow established procedures to tap the knowledge of experts outside the office or outside the government.

- **Special project team:** Such a team is usually formed to provide decision makers with near real-time analytic support during a crisis or an ongoing operation. A crisis support task force or field-deployed interagency intelligence team that supports a military operation exemplifies this type of team. Members typically are in the same physical office space or are connected by video communications. There is strong team leadership, often with close personal interaction among team members. Because the team is created to deal with a specific situation, its work may have a narrower focus than a social network or regular analytic team, and its duration may be limited. There is usually intense time pressure, and around-the-clock operation may be required. Figure 4.1b is a diagram of a special project team.

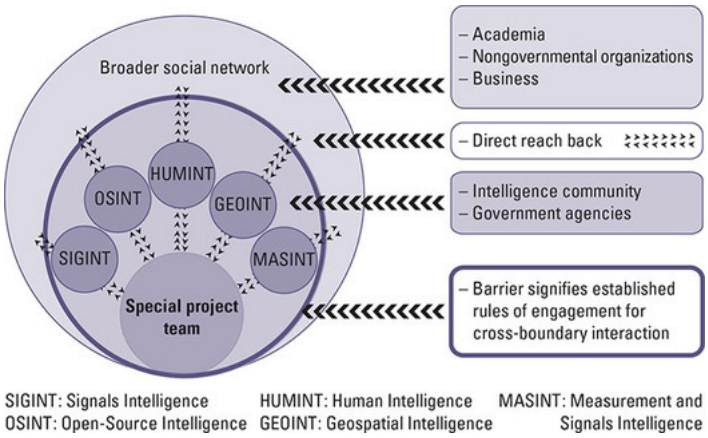
- **Social networks:** Experienced analysts have always had their own network of experts in their field or related fields with whom they consult from time to time and whom they may recruit to work with them on a specific analytic project. Social networks are critical to the analytic business. Members of the network do the day-to-day monitoring of events, produce routine products as needed, and may recommend the formation of a more formal analytic team to handle a specific project. This form of group activity is now changing dramatically with the growing ease of cross-agency secure communications and the availability of collaborative software. Social networks are expanding exponentially across organization boundaries. The term "social network," as used here, includes all analysts in government or business working anywhere in the world on any issue. It can be limited to a small group with special clearances or comprise a broad array of government, business, nongovernmental organization (NGO), and academic experts. The network can be in the same office, in different buildings in the same metropolitan area, or, increasingly, at multiple locations around the globe.



Description

Figure 4.1A Traditional Analytic Team

Source: Pherson Associates, LLC, 2019.



Description

Figure 4.1B Special Project Team

Source: Pherson Associates, LLC, 2019.

The key problem that arises with social networks is the geographic distribution of their members. For widely dispersed teams, air travel is often an unaffordable expense. Even within the Washington, D.C., metropolitan area, distance is a factor that limits the frequency of face-to-face meetings, particularly as traffic congestion becomes a growing nightmare. From their study of teams in diverse organizations, which included teams in the U.S. Intelligence Community, Richard Hackman and Anita Woolley came to this conclusion:

> Distributed teams do relatively well on innovation tasks for which ideas and solutions need to be generated but generally underperform face-to-face teams on decision-making tasks. Although decision-support systems can improve performance slightly, decisions made from afar still tend to take more time, involve less exchange of information, make error detection and correction more difficult, and can result in less participant satisfaction with the outcome than is the case for face-to-face teams.[2]

In sum, distributed teams are appropriate for many, but not all, team tasks. Using them well requires careful attention to team structure, a face-to-face launch when members initially come together, and leadership support throughout the life of the team to keep members engaged and aligned with collective purposes.[3]

Research on effective collaborative practices has shown that geographically and organizationally distributed teams are most likely to succeed when they satisfy six key imperatives of effective collaboration:

- **Mutual Trust.** Know and trust one another; this usually requires that they meet face to face at least once.
- **Mission Criticality.** Feel a personal need to engage with the group to perform a critical task.
- **Mutual Benefit.** Derive mutual benefits from working together.
- **Access and Agility.** Connect with one another virtually on demand and easily add new members.
- **Incentives.** Perceive incentives for participating in the group, such as saving time, gaining new insights from interaction with other knowledgeable analysts, or increasing the impact of their contribution.
- **Common Understanding.** Share a common lexicon and understanding of the problem with agreed lists of terms and definitions.[4]

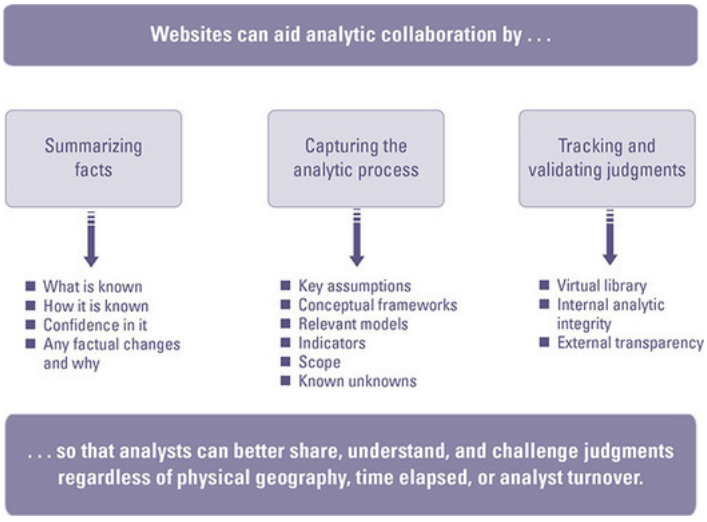
4.2 DIVIDING THE WORK

Managing the geographic distribution of the social network can be addressed by dividing the analytic task into two parts: (1) exploiting the strengths of the social network for divergent or creative analysis to identify ideas and gather information and (2) forming a smaller analytic team that employs convergent analysis to meld these ideas into an analytic product. When the draft is completed, it goes back for review to all members of the social network who contributed during the first phase of the analysis, and then back to the team to edit and produce the final paper.

Structured Analytic Techniques, web-based discussions, and other types of collaborative software facilitate this two-part approach to analysis. The use of Exploration Techniques to conduct divergent analysis early in the analytic process works well for a geographically distributed social network communicating online. The products of these techniques can provide a solid foundation for the smaller analytic team to do the subsequent convergent analysis. In other words, each type of group performs the type of task for which it is best qualified. This process is applicable to most analytic projects. Figure 4.2 shows the functions that collaborative websites can perform.

A project leader informs a social network of an impending project and provides a tentative project description, target audience, scope, and process to be followed. The leader also broadcasts the name and internet address of the collaborative virtual workspace to be used and invites interested analysts knowledgeable in that area to participate. Any analyst with access to the collaborative network is authorized to add information and ideas to it. Any of the following techniques may come into play during the divergent analysis phase as specified by the project leader:

- Collaboration in sharing and processing data using other techniques, such as timelines, sorting, networking, mapping, and charting, as described in chapters 5 and 6.
- Some form of brainstorming, as described in chapters 6 and 9, to generate a list of driving forces, variables, players, and so on.
- Ranking or prioritizing the list, as described in chapter 5.



Description

Figure 4.2 Functions of a Collaborative Website

Source: Pherson Associates, LLC, 2019.

- Putting the list into a Cross-Impact Matrix, as described in chapter 7, and then discussing and recording in the web discussion stream the relationship, if any, between each pair of driving forces, variables, or players in that matrix.
- Developing a list of alternative explanations or outcomes (hypotheses), as described in chapter 7.
- Developing a list of relevant information for consideration when evaluating generated hypotheses, as described in chapter 7.
- Doing a Key Assumptions Check, as described in chapter 7. This can take less time using a synchronous collaborative virtual setting than when done in a face-to-face meeting; conducting such a check can uncover the network's thinking about key assumptions.

Most of these steps involve making lists, which can be done quite effectively in a virtual environment. Making such input online in a chat room or asynchronous email discussion thread can be even more productive than a face-to-face meeting. Analysts have more time to think about and write up their thoughts. They can look at their contribution over several days and make additions or changes as new ideas come to them.

Ideally, a project leader should oversee and guide the process. In addition to providing a sound foundation for further analysis, this process enables the project leader to identify the best analysts for inclusion in the smaller team that conducts the project's second phase—making analytic judgments and drafting the report. The project lead should select second-phase team members to maximize the following criteria: level of expertise on the subject, level of interest in the outcome of the analysis, and diversity of opinions and collaboration styles among members of the group. The action then moves from the social network to a small, trusted team (preferably no larger than eight analysts) to complete the project, perhaps using other techniques, such as Analysis of Competing Hypotheses, Red Hat Analysis, or What If? Analysis. At this stage in the process, the use of virtual collaborative software is usually more efficient than face-to-face meetings. Software used for exchanging ideas and revising text should allow for privacy of deliberations and provide an audit trail for all work done.

The draft report is best done by a single person. That person can work from other team members' inputs, but the report usually reads better if it is crafted in one voice. As noted earlier, the working draft should be reviewed by those members of the social network who participated in the first phase of the analysis.

4.3 VALUE OF COLLABORATIVE PROCESSES

In our vision for the future, intelligence analysis increasingly becomes a collaborative enterprise, with the focus shifting “away from coordination of draft products toward regular discussion of data and hypotheses early in the research phase.”[5] This is a major change from the traditional concept of intelligence analysis as largely an individual activity with coordination as the final step in the process. In this scenario, instead of reading a static, hard copy paper, decision makers would obtain analysis of the topic of interest by accessing a web-based knowledge database that was continuously updated. The website might also include dropdowns providing lists of key assumptions, critical information gaps, or indicators; a Source Summary Statement; or a map showing how the analytic line has shifted over time.

In a collaborative enterprise, Structured Analytic Techniques are the *process* by which collaboration occurs. Just as these techniques provide structure to our individual thought processes, they can also structure the interaction of analysts within a small team or group. Because the thought process in these techniques is transparent, each step in the technique prompts discussion within the team. Such discussion can generate and evaluate substantially more divergent information and new information than can a group that does not use a structured process. When a team is dealing with a complex issue, the synergy of multiple minds using structured analysis is usually more effective than the thinking of a lone analyst. Structured Analytic Techniques when paired with collaborative software can provide a framework to guide interagency collaboration and coordination and connect team members in different offices, agencies, parts of traffic-congested metropolitan areas, and even around the world.

Team-based analysis can, of course, bring with it a new set of challenges equivalent to the cognitive biases and other pitfalls faced

by the individual analyst. However, using structured techniques that guide interaction among members of a team or group can minimize well-known group-process problems. A structured process helps keep discussions from getting sidetracked and facilitates the elicitation of alternative views from all team members.

Analysts have found that use of a structured process helps to depersonalize arguments when there are differences of opinion. This is discussed further in the review of Adversarial Collaboration techniques at the end of chapter 8. Moreover, today's information technology and social networking programs make structured collaboration much easier than in the past.

4.4 COMMON PITFALLS WITH SMALL GROUPS

As more analysis is done collaboratively, the quality of intelligence products is increasingly influenced by the success or failure of small-group processes. The various problems that afflict small-group processes have been the subject of considerable research.[6] One might reasonably be concerned that more collaboration will create more conflict and more interagency battles. However, as we explain here, it turns out that the use of Structured Analytic Techniques frequently helps analysts *avoid* many of the common pitfalls of the small-group process.

Some group-process problems are obvious to anyone who has tried to arrive at decisions or judgments in a group meeting. Guidelines for how to run meetings effectively are widely available, but many group leaders fail to follow them.[7] Key individuals are absent or late, and participants are unprepared. Senior members or those with strong personalities often dominate meetings, and some participants are reluctant to speak up or to express their true beliefs. Discussion can get stuck on several salient aspects of a problem, rather than covering all aspects of the subject. Decisions are hard to reach and, if reached, may not be implemented. Such problems are often magnified when the meeting is conducted virtually, over telephones or computers.

> *If you had to identify, in one word, the reason that the human race has not achieved, and never will achieve, its full potential, that word would be meetings.*
>
> Dave Barry, American humorist

Academic studies show that “the order in which people speak has a profound effect on the course of a discussion. Earlier comments are more influential, and they tend to provide a framework within which the discussion occurs.”[8] Once that framework is in place, discussion tends to center on that framework, to the exclusion of other options. This phenomenon is also easily observed when attending a panel discussion at a conference. Whoever asks the first question or two in the Q&A session often sets the agenda (or the analytic framework, depending on the astuteness of the question) for the remainder of the discussion.

Much research documents that the desire for consensus is an important cause of poor group decisions. Development of a group consensus is usually perceived as success but often indicates failure. Premature consensus is one of the more common causes of suboptimal group performance. It leads to failure to identify or seriously consider alternatives, failure to examine the negative aspects of the preferred position, and failure to consider the consequences that might follow if the preferred position is wrong.[9] This phenomenon is what is commonly called Groupthink.

Academic researchers have documented other problems that are less obvious, but no less significant. Often, some reasonably satisfactory solution is proposed on which all members can agree, and the discussion is ended without further search to see if there may be a better answer. Such a decision often falls short of the optimum that might be achieved with further inquiry; it is an example of the misapplied heuristic called Satisficing. Another phenomenon, known as group “polarization,” leads in certain predictable circumstances to a group decision that is more extreme than the average group member’s view prior to the discussion. “Social loafing” is the term used to describe the phenomenon that people working in a group will often expend less effort than if they were working to accomplish the same task on their own. In any of these situations, the result is often an inferior product that suffers from a lack of analytic rigor.

4.5 BENEFITING FROM DIVERSITY

Improvement of group performance requires an understanding of these problems and a conscientious effort to avoid or mitigate them. The literature on small-group performance is virtually unanimous in emphasizing that groups make better decisions when their members bring to the table a diverse set of ideas, opinions, and perspectives. What Premature Closure, Groupthink, Satisficing, and the polarization of group dynamics all have in common is a failure to recognize assumptions, to work from a common lexicon, and to adequately identify and consider alternative points of view.

Laboratory experiments have shown that even a single dissenting opinion, all by itself, makes a group's decisions more nuanced and its decision-making process more rigorous.[10] "The research also shows that benefits from dissenting opinions occur regardless of whether or not the dissenter is correct. The dissent stimulates a reappraisal of the situation and identification of options that otherwise would have gone undetected."[11] To be effective, however, dissent must be genuine—not generated artificially, a common pitfall in applying Team A/Team B Analysis or the Devil's Advocacy technique.[12]

Small, distributed asynchronous groups are particularly good at generating and evaluating lists of assumptions, indicators, drivers, potential explanations of current events, or potential outcomes. They are also good for making lists of pros and cons on a given subject. With the aid of distributed group-support software, the group can categorize items on a list and prioritize, score, rank, scale, or vote on them. For such tasks, a distributed, virtual asynchronous meeting may be more productive than a traditional face-to-face meeting. That is because analysts have more time to think about their input; they can reflect on their contribution over several hours or days and make additions or changes as additional ideas come to mind. If rank or

position of some group members is likely to have an undue influence, group members can provide their input anonymously.

Briefly, then, the route to better analysis is to create small groups of analysts who are strongly encouraged by their leader to speak up and express a wide range of ideas, opinions, and perspectives. The use of Structured Analytic Techniques—and silent brainstorming techniques in particular—will generally ensure that all participants contribute to the process. These techniques prod all participants to engage, and a more diverse set of ideas are put on the table. They guide the dialogue among analysts as they share evidence and alternative perspectives on the meaning and significance of the evidence. Each step in the technique prompts relevant discussion within the team. Such discussion can generate and evaluate substantially more divergent information and new ideas than can a group that does not use such a structured process.

The more heterogeneous the group, the lower the risk of Premature Closure, Groupthink, Satisficing, and polarization. Use of a structured technique also sets a clear step-by-step agenda for any meeting where that technique is used. This makes it easier for a group leader to keep a meeting on track to achieve its goal.[13]

The same procedures work either on classified systems or with outside experts on an unclassified network. Open-source information has rapidly come to play a larger role in intelligence analysis than in the past. Distributed asynchronous collaboration followed by distributed synchronous collaboration that uses some of the basic structured techniques is one of the best ways to tap the expertise of a group of knowledgeable individuals. The Delphi Method, discussed in chapter 8, is one well-known method for accomplishing the asynchronous phase, and virtual collaboration systems are showing increasing promise for optimizing work done in the synchronous phase.

4.6 ADVOCACY VERSUS OBJECTIVE INQUIRY

The desired diversity of opinion is, of course, a double-edged sword, as it can become a source of conflict that degrades group effectiveness.[14] It is not easy to introduce true collaboration and teamwork into a community with a history of organizational rivalry and mistrust. Analysts must engage in inquiry, not advocacy, and they must be critical of ideas but not people.

In a task-oriented team environment, advocacy of a specific position can lead to emotional conflict and reduced team effectiveness. Advocates tend to examine evidence in a biased manner, accepting at face value information that seems to confirm their own point of view and critically evaluating any contrary evidence. Advocacy is appropriate in a meeting of stakeholders that one is attending for the purpose of representing a specific interest. It is also "an effective method for making decisions in a courtroom when both sides are effectively represented, or in an election when the decision is made by a vote of the people."[15] However, it is not an appropriate method of discourse within a team "when power is unequally distributed among the participants, when information is unequally distributed, and when no clear rules of engagement exist—especially about how the final decision will be made."[16] An effective resolution may be found only through the creative synergy of alternative perspectives.

Figure 4.6 displays the differences between advocacy and the objective inquiry expected from a team member or a colleague.[17] When advocacy leads to emotional conflict, it can lower team effectiveness by provoking hostility, distrust, cynicism, and apathy among team members. Such tensions are often displayed when challenge techniques, such as Devil's Advocacy and Team A/Team B Analysis, are employed (a factor that argued strongly for dropping them from the third edition of this book). On the other hand, objective inquiry, which often leads to cognitive conflict, can lead to new and creative solutions to problems, especially when it occurs in an atmosphere of civility, collaboration, and common purpose. Several effective methods for managing analytic differences are described at the end of chapter 8.

	Advocacy	Inquiry
Concept of decision making	A contest	Collaborative problem solving
Purpose of discussion	Persuasion and lobbying	Testing and evaluation
Participants' role	Spokespeople	Critical thinkers
Pattern of behavior	Strive to persuade others Defend your position Downplay weaknesses	Present balanced arguments Remain open to alternatives Accept constructive criticism
Minority views	Discouraged or dismissed	Cultivated and valued
Outcome	Winners and losers	Collective ownership

Figure 4.6 Advocacy versus Inquiry in Small-Group Processes

Source: Pherson Associates, LLC, 2019.

We believe a team or group using Structured Analytic Techniques is less vulnerable to group-process traps than a comparable group doing traditional analysis because the techniques move analysts away from advocacy and toward inquiry. This idea has not yet been tested and demonstrated empirically, but the rationale is clear. These techniques work best when an analyst is collaborating with a small group of other analysts. Just as these techniques provide structure to our individual thought processes, they play an even stronger role in guiding the interaction of analysts within a small team or group.[18]

Some techniques, such as the Key Assumptions Check, Analysis of Competing Hypotheses (ACH), and Argument Mapping, help analysts gain a clear understanding of how and exactly why they disagree. For example, many CIA and FBI analysts report that they use ACH to gain a better understanding of the

differences of opinion between them and other analysts or between analytic offices. The process of creating an ACH matrix requires identification of the evidence and arguments being used and ascertaining the basis for labeling items and arguments as either consistent or inconsistent with the various hypotheses. Review of this matrix provides a systematic basis for identification and discussion of differences between two or more analysts.

CIA and FBI analysts also note that jointly building an ACH matrix helps to depersonalize arguments when differences of opinion emerge.[19] One side might suggest evidence that the other had not known about, or one side will challenge an assumption and a consensus will emerge that the assumption is unfounded. In other words, ACH can help analysts, operators, and decision makers learn from their differences rather than fight over them. Other structured techniques, including those discussed in the section on Adversarial Collaboration in chapter 8, do this as well.

4.7 LEADERSHIP AND TRAINING

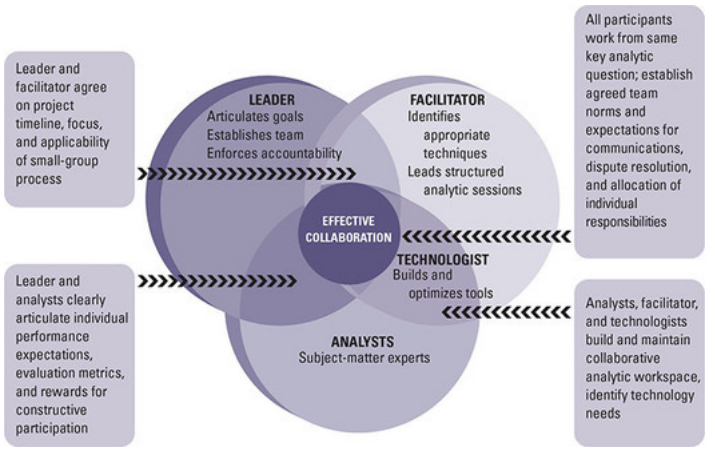
Considerable research on virtual teaming shows that leadership effectiveness is a major factor in the success or failure of a virtual team.[20] Although leadership usually is provided by a group's appointed leader, it can also emerge as a more distributed peer process. A trained facilitator can increase a team's effectiveness (see Figure 4.7). When face-to-face contact is limited, leaders, facilitators, and team members must compensate by paying more attention than they might otherwise devote to the following tasks:

- Articulating a clear mission, goals, specific tasks, and procedures for evaluating results.
- Defining measurable objectives with milestones and timelines for achieving them.
- Establishing a common lexicon.
- Identifying clear and complementary roles and responsibilities.
- Building relationships with and among team members and with stakeholders.
- Agreeing on team norms and expected behaviors.
- Defining conflict resolution procedures.
- Developing specific communication protocols and practices.[21]

As illustrated in Figure 4.7, the interactions among the various types of team participants—whether analyst, leader, facilitator, or technologist—are as important as the individual roles played by each. For example, analysts on a team will be most effective not only when they have subject-matter expertise or knowledge that lends a new viewpoint, but also when the rewards for their participation are clearly defined by their manager. Likewise, a facilitator's effectiveness is greatly increased when the goals, timeline, and general focus of the project are establishing with the leader in advance. When roles and interactions are explicitly defined and functioning, the group can more easily turn to the more challenging analytic tasks at hand.

As greater emphasis is placed on intra- and interoffice collaboration and more work is done through computer-mediated communications, it becomes increasingly important that analysts be trained in the knowledge, skills, and abilities required for facilitation and management of both face-to-face and virtual meetings, with a strong emphasis on using silent brainstorming techniques and Adversarial Collaboration during such meetings. Training is more effective when it occurs just before the skills and knowledge must be used. Ideally, it should be fully integrated into the work process and reinforced with mentoring. Good instructors should aspire to wear three different hats, acting in the roles of coaches, mentors, and facilitators.

Multi-agency or intelligence community–wide training programs of this sort could provide substantial support to interagency collaboration and the formation of virtual teams. Whenever a new interagency or virtual team or a distributed global project team is formed, all members should have benefited from training in understanding the pitfalls of group processes, performance expectations, standards of conduct, differing collaboration styles, and conflict resolution procedures. Standardization of this training across multiple organizations or agencies will accelerate the development of a shared analytic culture and reduce the start-up time needed when launching a new interagency project or orchestrating the work of a globally distributed group.



Description

Figure 4.7 Effective Small-Group Roles and Interactions

Source: Pherson Associates, LLC, 2019.

NOTES

1. This chapter was inspired by and draws on the research done by the Group Brain Project at Harvard University. That project was supported by the National Science Foundation and the CIA Intelligence Technology Innovation Center. See in particular J. Richard Hackman and Anita W. Woolley, “Creating and Leading Analytic Teams,” *Technical Report* 5 (February 2007), http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.456.4854&rep=rep1&type=pdf

2. Hackman and Woolley, “Creating and Leading Analytic Teams,” 8.

3. Ibid.

4. Randolph H. Pherson and Joan McIntyre, “The Essence of Collaboration: The IC Experience,” in *Scientific Underpinnings of “Collaboration” in the National Security Arena: Myths and Reality—What Science and Experience Can Contribute to Its Success*, ed. Nancy Chesser (Washington, DC: Strategic Multi-Layer Assessment Office, Office of the Secretary of Defense, Director of Defense Research and Engineering/Rapid Reaction Technology Office, June 2009).

5. *Vision 2015: A Globally Networked and Integrated Intelligence Enterprise* (Washington, DC: Director of National Intelligence, 2008), 13.

6. For example, Paul B. Paulus and Bernard A. Nijstad, *Group Creativity: Innovation through Collaboration* (New York: Oxford University Press, 2003).

7. J. Scott Armstrong, “How to Make Better Forecasts and Decisions: Avoid Face-to-Face Meetings,” *Foresight* 5 (Fall 2006).

8. James Surowiecki, *The Wisdom of Crowds* (New York: Doubleday, 2004), 184.

9. Charlan J. Nemeth and Brendan Nemeth-Brown, “Better Than Individuals? The Potential Benefits of Dissent and Diversity for Group Creativity,” in *Group Creativity,* eds. Paul B. Paulus and Bernard A. Nijstad (New York: Oxford University Press, 2003), 63–64.

10. Surowiecki, *The Wisdom of Crowds,* 183–184.

11. Nemeth and Nemeth-Brown, “Better Than Individuals?” 73.

12. Ibid., 76–78.

13. This paragraph and the previous paragraph express the authors’ professional judgment based on personal experience and anecdotal evidence gained in discussion with other experienced analysts. As discussed in chapter 11, there is a clear need for systematic research on this topic and other variables related to the effectiveness of Structured Analytic Techniques.

14. Frances J. Milliken, Caroline A. Bartel, and Terri R. Kurtzberg, “Diversity and Creativity in Work Groups,” in *Group Creativity,* eds. Paul B. Paulus and Bernard A. Nijstad (New York: Oxford University Press, 2003), 33.

15. Martha Lagace, “Four Questions for David Garvin and Michael Roberto,” *Working Knowledge: Business Research for Business Leaders* (Harvard Business School weekly newsletter), October 15, 2001, http://hbswk.hbs.edu/item/3568.html

16. Ibid.

17. The table is from David A. Garvin and Michael A. Roberto, “What You Don’t Know about Making Decisions,” *Working Knowledge: Business Research for Business Leaders* (Harvard Business School

weekly newsletter), October 15, 2001, http://hbswk.hbs.edu/item/2544.html.

18. This paragraph expresses our professional judgment based on personal experience and anecdotal evidence gained in discussion with other experienced analysts. As we discuss in chapter 11, there is a clear need for systematic research on this topic and other variables related to the effectiveness of Structured Analytic Techniques.

19. This information was provided by two senior educators in the U.S. Intelligence Community.

20. Jonathan N. Cummings, "Leading Groups from a Distance: How to Mitigate Consequences of Geographic Dispersion," in *Leadership at a Distance: Research in Technologically-Supported Work*, ed. Susan Weisband (New York: Routledge, 2007).

21. Sage Freechild, "Team Building and Team Performance Management." Originally online at www.phoenixrisingcoaching.com. This article is no longer available online.

Descriptions of Images and Figures

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The broader social network, such as academia, nongovernmental organizations, and business, includes governmental social network, such as intelligence communities and government agencies. The governmental social network includes the core analytic team. The barrier separating each network signifies established rules of engagement for cross-boundary interaction.

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The broader social network, such as academia, nongovernmental organizations, and business, includes intelligence community and governmental organizations. They are signals intelligence, open-source intelligence, human intelligence, geospatial intelligence, and measurement and signals intelligence. The intelligence community includes the special project team, and has direct reach back with the project team and the broader social network. The barrier between the networks signifies established rules of engagement for cross-boundary interaction.

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Websites can aid analytic collaboration by summarizing facts, capturing the analytic process, and tracking and validating judgments, so that analysts can better share, understand, and challenge judgments regardless of physical geography, time elapsed, or analyst turnover. Summarizing facts: What is known; How it is known; Confidence in it; Any factual changes and why. Capturing the analytic process: Key assumptions; Conceptual frameworks; Relevant models; Indicators; Scope; Known unknowns. Tracking and validating judgments: Virtual library; Internal analytic integrity; External transparency.

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Leader articulates goals, establishes team, and enforces accountability. Facilitator identifies appropriate techniques, and leads structured analytic sessions. Technologist builds and optimizes tools. Analysts are subject-matter experts. Leader and facilitator agree on project timeline, focus, and applicability of small-group process. Leader and analysts clearly articulate individual performance expectations, evaluation metrics, and rewards for constructive participation. Analysts, facilitator, and technologists build and maintain collaborative analytic workspace, identify technology needs. All participants work from same key analytic question; establish agreed team norms and expectations for communications, dispute resolution, and allocation of individual responsibilities.

CHAPTER 5 GETTING ORGANIZED

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A significant challenge analysts face is managing the large volume of data that must be processed and evaluated to develop an analytic line and generate a well-sourced, high-quality product. Most people can keep only a limited amount of information in the forefront of their minds. Imagine that a person must make a difficult decision, such as what car to buy or where to go on vacation. A good first step is to make a list of all the relevant information and arguments for or against taking an action. When it comes time to make the decision, however, the list may be so long that weighing all the pros against the cons at the same time becomes a daunting task. As a result, the person is likely to vacillate, focusing first on the pros and then on the cons, favoring first one decision and then the other. Suppose how much more difficult it would be for an analyst to think through a complex intelligence problem with large volumes of data and many interacting variables. The limitations of human thought make it difficult, if not impossible, to do error-free analysis without the

support of some external representation of the parts of the problem at hand.

Two common approaches for coping with this limitation of our working memory are as follows:

- **Decomposition**, which is breaking down the problem or issue into its component parts so that each part can be considered separately
- **Visualization**, which is capturing all the parts of the problem or issue in some organized manner, often a visual representation, that is designed to facilitate understanding how the various parts interrelate

All Structured Analytic Techniques employ these approaches, as the externalization of one's thinking is part of the definition of structured analysis. For some of the simpler techniques, however, decomposing an issue to present the data in an organized manner is the principal contribution they make to producing more effective analysis.

The use of a simple checklist can be extremely productive in getting organized at the start of a project.[1] In *Critical Thinking for Strategic Intelligence*, Pherson and Pherson discuss how the use of checklists and critical-thinking mnemonics such as the Knowing Your Client Checklist, Getting Started Checklist, AIMS (**A**udience, **I**ssue, **M**essage, and **S**toryline), and Issue Redefinition can aid the process.[2] These techniques can be combined to help analysts conceptualize and launch a new project. Critical time can be saved if an analyst can start off in the right direction and avoid having to change course later.

In this chapter, we describe five basic approaches to organizing your data and getting started with your analysis.

Analysis is breaking information down into its component parts. Anything that has parts also has a structure that relates these parts to each other. One of the first steps in doing analysis is to determine an appropriate structure for the analytic problem, so that one can then identify the various parts and begin assembling information on them. Because there are many different kinds of analytic problems, there are also many different ways to structure analysis.

—Richards J. Heuer Jr., *Psychology of Intelligence Analysis* (1999)

OVERVIEW OF TECHNIQUES

Sorting is a basic technique for organizing data in a manner that often yields new insights. It is particularly effective during initial data gathering and hypothesis generation.

Ranking, Scoring, and Prioritizing techniques are used to organize items on any list according to the item's importance, desirability, priority, value, or probability of happening.

Matrices are generic analytic tools for sorting and organizing data in a manner that facilitates comparison and analysis. They are used to analyze the relationships among any two sets of variables or the interrelationships among a single set of variables. A matrix consists of a grid with as many cells as needed for the problem under study. Matrices are used so frequently to analyze a problem that we have included several distinct techniques in this book.

Process Maps are used to identify and diagram each step in a complex process. Many different versions exist, including Event Flow Charts, Activity Flow Charts, and Value Stream Maps. Analysts can use the techniques to track the progress of plans or projects undertaken by a business competitor, foreign government, a criminal or terrorist group, or any other non-state actor.

Gantt Charts are a specific type of Process Map that uses a matrix to chart the progression of a multifaceted process over a specific time period. Process Maps and Gantt Charts were developed primarily for use in business and the military, but they are also useful to intelligence analysts.

Other comparable techniques for organizing and presenting data include various types of graphs, diagrams, and trees. We did not discuss them in this book because they are well covered in other works, and it was necessary to draw a line on the number of techniques included here.

5.1 SORTING

Sorting is a basic technique for organizing a large body of data in a manner that often yields new insights.

When to Use It

Sorting is effective when information elements can be broken out into categories or subcategories for comparison with one another, most often by using a computer program, such as a spreadsheet. This technique is particularly useful during the initial data-gathering and hypothesis-generation phases of analysis.

Value Added

Sorting large amounts of data into relevant categories that are compared with one another can provide analysts with insights into trends, similarities, differences, or abnormalities that otherwise would go unnoticed. When you are dealing with transactional data in particular (for example, geospatial information or transfers of goods or money), it is helpful—if not essential—to sort the data first.

The Method

Follow these steps:

- Review the categories of information to determine which category or combination of categories might show trends or abnormalities that would provide insight into the problem you are studying. Use a structured brainstorming technique, such as Cluster Brainstorming or Outside-In Thinking, to ensure you have generated a comprehensive list of categories.
- Place the data into a spreadsheet or a database using as many fields (columns) as necessary to differentiate among the data types (dates, times, locations, people, activities, amounts, etc.).
- List each of the facts, pieces of information, or hypotheses involved in the problem that are relevant to your sorting schema. (Use paper, whiteboard, movable self-stick notes, or other means for this.)
- Review the listed facts, information, or hypotheses in the database or spreadsheet to identify key fields that may allow you to uncover possible patterns or groupings. Those patterns or groupings then illustrate the schema categories that deserve the most attention. For example, if an examination of terrorist activity shows that most attacks occur in hotels and restaurants but that the time of day of the attack varies, “Location” and “Time of Day” become key categories.
- Choose a category and sort the data within that category. Look for any insights, trends, or oddities. Good analysts notice trends; great analysts notice anomalies.
- Review (or ask others to review) the sorted facts, information, or hypotheses to see if there are alternative ways to sort them. List

any alternative sorting schema for your problem. One of the most useful applications for this technique is to sort according to multiple schemas and examine results for correlations between data and categories. But remember that correlation is not the same as causation.

Examples

Example 1: Are a foreign adversary's military leaders pro-United States, anti-United States, or neutral on their attitudes toward U.S. policy in the Middle East? To answer this question, analysts sort the leaders by various factors that might give insight into the issue, such as birthplace, native language, religion, level of professional education, foreign military or civilian/university exchange training (where/when), field/command assignments by parent service, political influences in life, and political decisions made. Then analysts review the information to see if any parallels exist among the categories.

Example 2: Analysts review the data from cell-phone communications among five conspirators to determine the frequency of calls, patterns that show who is calling whom, changes in patterns of frequency of calls prior to a planned activity, dates and times of calls, and subjects discussed.

Example 3: Analysts are reviewing all information related to an adversary's weapons of mass destruction (WMD) program. Electronic intelligence reporting shows more than 300,000 emitter transmissions were collected over the past year alone. The analysts' sorting of the data by type of emitter, dates of emission, and location shows varying increases and decreases of emitter activity with some minor trends identifiable. The analysts filter out all collections except those related to air defense. The unfiltered information is sorted by type of air defense system, location, and dates of activity.

Of note is a period when there is an unexpectedly large increase of activity in the air defense surveillance and early warning systems. The analysts review relevant external events and find that a major opposition movement outside the country held a news conference where it detailed the adversary's WMD activities, including locations of the activity within the country. The air defense emitters for all

suspected locations of WMD activity, including several not included in the press conference, increased to a war level of surveillance within four hours of the press conference. The analysts reviewed all air defense activity locations that showed the increase assumed to be related to the press conference and the WMD program and found two locations showing increased activity but not previously listed as WMD-related. These new locations were added to collection planning to determine what relationship, if any, they had to the WMD program.

Potential Pitfalls

Improper sorting can hide valuable insights as easily as it can illuminate them. Standardizing the data being sorted is imperative. Working with an analyst who has experience in sorting can help you avoid this pitfall.

Origins of This Technique

Sorting is a long-established procedure for organizing data. The description in this chapter is from Military Intelligence training materials.

5.2 RANKING, SCORING, AND PRIORITIZING

This section provides guidance for using three different ranking techniques—Ranked Voting, Paired Comparison, and Weighted Ranking. Combining an Exploration Technique, such as Cluster Brainstorming, with a ranking technique is an effective way for an analyst to start a new project. Brainstorming techniques are helpful in developing lists of driving forces, variables for consideration, indicators, possible scenarios, important players, historical precedents, sources of information, questions to be answered, and so forth. Such lists are even more useful once they are ranked, scored, or prioritized to determine which items are most important, most useful, most likely, or should be at the top of the priority list.

When to Use It

A ranking technique is often the next step following the use of a structured brainstorming technique, such as Cluster Brainstorming, Mind Maps, or Nominal Group Technique (see chapter 6). A ranking technique is appropriate whenever there are too many items to rank easily just by looking at the list, the ranking has significant consequences and must be done as accurately as possible, or it is useful to aggregate the opinions of a group of analysts.

Value Added

A Getting Organized technique is often used to develop lists of critical events, key factors, variables to be considered, or important players. By ranking, scoring, and prioritizing such lists, analysts can determine which items are most important, most useful, most probable, and require immediate action. Combining a brainstorming technique with a ranking technique is an excellent way for an analyst to provide a foundation for collaboration within or external to an office.

The Method

Of the three methods discussed here, Ranked Voting is the easiest and quickest to use, and it is often good enough. However, it is not as accurate after you get past the top two or three ranked items, because the group usually has not thought as much (and may not care as much) about the lower-ranked items. Ranked Voting also provides less information than either Paired Comparison or Weighted Ranking. Ranked Voting shows only that one item is ranked higher or lower than another; it does not show how much higher or lower. Paired Comparison does provide this information; Weighted Ranking provides even more information. It specifies the criteria used in making the ranking, and weights are assigned to those criteria for each of the items in the list.

5.2.1 The Method: Ranked Voting

In a Ranked Voting exercise, members of the group individually rank each item in order according to the member's preference or what the member regards as the item's importance. Depending upon the number of items or the specific analytic needs, the group can decide to rank all the items or only the top three to five. The group leader or facilitator passes out simple ballots listing all the items to be voted on. Each member votes his or her order of preference. If a member views two items as being of equal preference, the votes can be split between them. For example, if two items are tied for second place, each receives a 2.5 ranking (by taking the average of 2 and 3). Any items that are not voted on fall to the bottom of the ranking list. After members of the group have voted, the votes are added up. The item with the lowest number is ranked number 1.

5.2.2 The Method: Paired Comparison

Paired Comparison compares each item against every other item, and the analyst can assign a score to show how much more important, preferable, or probable one item is than the others. This technique provides more than a simple ranking, as it shows the degree of importance or preference for each item. The list of items can then be ordered along a dimension, such as importance or preference, using an interval-type scale.

Follow these steps to use the technique:

- List the items to be compared. Assign a letter to each item.
- Create a table with the letters across the top and down the left side, as in Figure 5.2a. The results of the comparison of each pair of items are marked in the cells of this table. Note the diagonal line of darker-colored cells. These cells are not used, as each item is never compared with itself. The cells below this diagonal line are not used because they would duplicate a comparison in the cells above the diagonal line. If you are working in a group, distribute a blank copy of this table to each participant.
- Looking at the cells above the diagonal row of darkened cells, compare the item in the row with the one in the column. For each cell, decide which of the two items is more important (or preferable or probable). Write the letter of the winner of this comparison in the cell, and score the degree of difference on a scale from 0 (no difference) to 3 (major difference), as in Figure 5.2a.

	A	B	C	D	E	F	Score	%
A		**B, 3**	C, 1	A, 1	A, 1	F, 2	2	10
B			**B, 1**	D, 1	**B, 2**	**B, 1**	**7**	35
C				D, 1	E, 1	F, 1	1	5
D					D, 2	D, 1	5	25
E						F, 1	1	5
F							4	20

Description

Figure 5.2A Paired Comparison Matrix

- Consolidate the results by adding up the total of all the values for each letter and put this number in the “Score” column. For example, in Figure 5.2a, item B has one 3 in the first row, plus one 2 and two 1s in the second row, for a score of 7.
- Finally, it may be desirable to convert these values into a percentage of the total score. To do this, divide the total number of scores (20 in the example) by the score for each individual item. Item B, with a score of 7, is ranked most important or most preferred. Item B received a score of 35 percent (7 divided by 20), as compared with 25 percent for item D and only 5 percent each for items C and E, which received only one vote each. This example shows how Paired Comparison captures the degree of difference between each ranking.
- To aggregate rankings received from a group of analysts, simply add the individual scores for each analyst.

5.2.3 The Method: Weighted Ranking

In Weighted Ranking, a specified set of criteria is used to rank items. The analyst creates a table with items to be ranked listed across the top row and criteria for ranking these items listed down the far-left column (see Figure 5.2b). There are a variety of valid ways to conduct this ranking. We have chosen to present a simple version of Weighted Ranking here because analysts usually are making subjective judgments rather than dealing with hard numbers. As you read the following steps, refer to Figure 5.2b:

- Create a table with one column for each item. At the head of each column, write the name of an item or assign it a letter to save space.
- Add two more blank columns on the left side of this table. Count the number of selection criteria, and then adjust the table so that it has that number of rows plus three more, one at the top to list the items and two at the bottom to show the raw scores and percentages for each item. In the first column on the left side, starting with the second row, write in all the selection criteria down the left side of the table. There is some value in listing the criteria roughly in order of importance, but that is not critical. Leave the bottom two rows blank for the scores and percentages.
- Now work down the second column, assigning weights to the selection criteria based on their relative importance for judging the ranking of the items. Depending on how many criteria are listed, take either 10 points or 100 points and divide these points among the selection criteria based on what the analysts believe to be their relative importance in ranking the items. In other words, decide what percentage of the decision should be based on each of these criteria. Be sure that the weights for all the selection criteria combined add up to either 10 or 100, whichever is selected. The criteria should be phrased in such a way that a higher weight is more desirable. For example, a proper phrase would be “ability to adapt to changing conditions,” and an improper phrase would be “sensitivity to changing conditions,” which does not indicate whether the entity reacts well or poorly.
- Work across the rows to write the criterion weight in the left side of each cell.
- Next, work across the matrix one row (selection criterion) at a time to evaluate the relative ability of each of the items to satisfy that selection criteria. Use a ten-point rating scale, where 1 = low and 10 = high, to rate each item separately. (Do not spread the ten points proportionately across all the items as was done to assign weights to the criteria.) Write this rating number after the criterion weight in the cell for each item.
- Again, work across the matrix one row at a time to multiply the criterion weight by the item rating for that criterion, and enter this number for each cell, as shown in Figure 5.2b.

	Items						
Criteria	Weight	A	B	C	D	E	F
1	3	3 × 7 = 21	3 × 8 = 24	3 × 8 = 24	3 × 5 = 15	3 × 6 = 18	3 × 7 = 21
2	3	3 × 5 = 15	3 × 8 = 24	3 × 9 = 27	3 × 7 = 21	3 × 4 = 12	3 × 5 = 15
3	2	2 × 8 = 16	2 × 9 = 18	2 × 3 = 6	2 × 2 = 4	2 × 3 = 6	2 × 7 = 14
4	1	1 × 6 = 6	1 × 3 = 3	1 × 8 = 8	1 × 6 = 6	1 × 9 = 9	1 × 7 = 7
5	1	1 × 7 = 7	1 × 9 = 9	1 × 7 = 7	1 × 8 = 8	1 × 6 = 6	1 × 8 = 8
Totals	10	65	78	72	54	51	65
%	100%	16.9%	20.3%	18.7%	14%	13.2%	16.9%

Figure 5.2B Weighted Ranking Matrix

- Now add the columns for all the items. The result will be a ranking of the items from highest to lowest score. To gain a better understanding of the relative ranking of one item as compared with another, convert these raw scores to percentages. To do this, first add together all the scores in the "Totals" row to get a total number. Then divide the score for each item by this total score to get a percentage ranking for each item. All the percentages together must add up to 100 percent. In Figure 5.2b, it is apparent that item B has the number one ranking (with 20.3 percent), while item E has the lowest (with 13.2 percent).

Potential Pitfalls

When any of these techniques is used to aggregate the opinions of a group of analysts, the rankings provided by each group member are totaled and averaged. This means that the opinions of the outliers, whose views are quite different from the others, are blended into the average. As a result, the ranking does not show the range of different opinions that might be present in a group. In some cases, the identification of outliers with a minority opinion can be of great value. Further research might show that the outliers are correct.

Relationship to Other Techniques

Some form of ranking, scoring, or prioritizing is commonly used with Cluster Brainstorming, Mind Mapping, Nominal Group Technique, and the Decision Matrix, all of which generate ideas that should be evaluated or prioritized. Applications of the Delphi Method may also generate ideas from outside experts that need to be evaluated or prioritized.

Origins of This Technique

Ranking, Scoring, and Prioritizing are common analytic processes in many fields. All three forms of ranking described here are based largely on internet sources. For Ranked Voting, we referred to http://en.wikipedia.org/wiki/Voting_system; for Paired Comparison, http://www.mindtools.com; and for Weighted Ranking, www.ifm.eng.cam.ac.uk/dstools/choosing/criter.html.

5.3 MATRICES

A matrix is an analytic tool for sorting and organizing data in a manner that facilitates comparison and analysis. It consists of a simple grid with as many cells as needed for the problem being analyzed.

Some analytic topics or problems that use a matrix occur so frequently that they are handled in this book as separate techniques. For example:

- Gantt Charts (this chapter) use a matrix to analyze the relationships between tasks to be accomplished and the time period for those tasks.
- Paired Comparisons (this chapter) uses a matrix to record the relationships between pairs of items.
- Weighted Ranking (this chapter) uses a matrix to analyze the relationships between specific items and criteria for judging those items.
- Analysis of Competing Hypotheses and the Inconsistencies Finder™ (chapter 7) use a matrix to analyze the relationships between relevant information and hypotheses.
- Cross-Impact Matrix (chapter 7) uses a matrix to analyze the interactions among variables or driving forces that will determine an outcome. Such a Cross-Impact Matrix is part of Complexity Manager (chapter 10).
- Indicators Evaluation (chapter 9) uses a matrix to evaluate the uniqueness or diagnostic power of indicators when compared across scenarios.

- Opportunities Incubator™ (chapter 10) uses a matrix to inform decision makers of which actions would be most effective in preventing a negative scenario from occurring or fostering the emergence of a good scenario.

- Decision Matrix (chapter 10) uses a matrix to analyze the relationships between goals or preferences and decision options.

- The Impact Matrix (chapter 10) uses a matrix to chart the impact a new policy or decision is likely to have on key players and how best to manage that impact.

When to Use It

Matrices are used to analyze the relationships between any two sets of variables or the interrelationships between a single set of variables. Among other things, matrices enable analysts to

- compare one type of information with another,
- compare pieces of information of the same type,
- categorize information by type,
- identify patterns in the information,
- separate elements of a problem.

A matrix is such an easy and flexible tool to use that it should be one of the first tools analysts think of when dealing with a large body of data. One limiting factor in the use of matrices is that information must be organized along only two dimensions.

Value Added

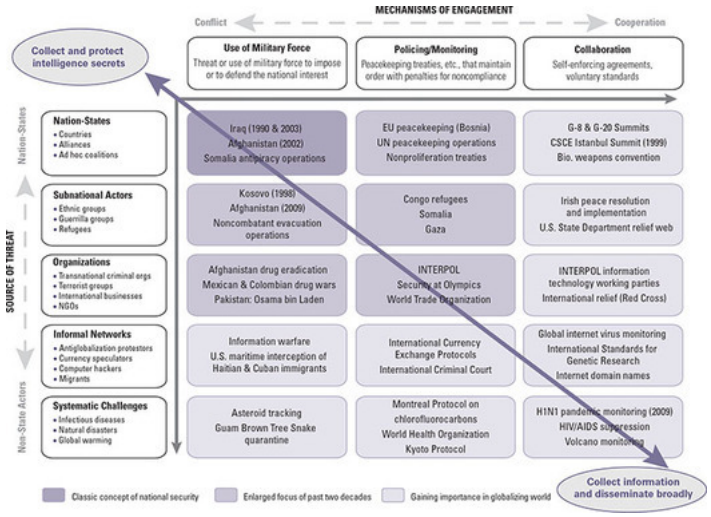
Matrices provide a visual representation of a complex set of data. By presenting information visually, a matrix enables analysts to deal effectively with more data than they could manage by juggling various pieces of information in their head. The analytic problem is broken down into component parts so that each part (that is, each cell in the matrix) can be analyzed separately, while ideally maintaining the context of the problem in its entirety.

A matrix can also help establish an analytic framework for understanding a problem, to suggest a more rigorous structure for explaining a phenomenon, or to generate a more comprehensive set of alternatives.

The Method

A matrix can be used in many different ways and for many different purposes. What matrices have in common is that each has a grid with columns and rows for entering two sets of data for comparison. Organize the category headings for each set of data in some logical sequence before entering the headings for one set of data in the top row and the headings for the other set in the far-left column. Then enter the data in the appropriate cells.

Figure 5.3, "Rethinking the Concept of National Security: A New Ecology," is an example of a complex matrix that not only organizes data but also tells its own analytic story.[3] It shows how the concept of national security has evolved over recent decades and suggests that the way we define national security will continue to expand in the coming years. In this matrix, threats to national security are arrayed along the vertical axis, beginning at the top with the most traditional actor, the nation-state. At the bottom end of the spectrum are systemic threats, such as infectious diseases or threats that "have no face." The top row of the matrix presents the three primary mechanisms for dealing with threats: military force, policing and monitoring, and collaboration. The cells in the matrix provide historic examples of how the three different mechanisms of engagement have dealt with the five different sources of threats. The top-left cell (dark color) presents the classic case of using military force to resolve nation-state differences. In contrast, at the bottom-right corner, various actors deal with systemic threats, such as the outbreak of a pandemic, by collaborating with one another.



Description

Figure 5.3 Rethinking the Concept of National Security: A New Ecology

Source: Pherson Associates, LLC, 2019.

Classic definitions of national security focus on the potential for conflicts involving nation-states. The top-left cell lists three military operations. In recent decades, the threat has expanded to include threats posed by subnational actors as well as terrorist and other criminal organizations. Similarly, the use of peacekeeping and international policing has become more common than in the past. This shift to a broader use of the term "national security" is represented by the other five cells (medium color) in the top left of the matrix. The remaining cells (light color) to the right and at the bottom of the matrix represent how the concept of national security is continuing to expand as the world becomes increasingly globalized.

By using a matrix to present the expanding concept of national security in this way, one sees that patterns relating to how key players collect intelligence and share information vary along the two primary dimensions. In the upper left of Figure 5.3, the practice of nation-states is to seek intelligence on their adversaries, classify it, and protect it. As one moves diagonally across the matrix to the lower right, this practice reverses. In the lower right of this figure, information is usually available from unclassified sources and the imperative is to disseminate it to everyone as soon as possible. This dynamic can create serious tensions at the midpoint, for example, when those working in the homeland security arena must find ways to share sensitive national security information with state and local law enforcement officers.

Origins of This Technique

The description of this basic and widely used technique is from Pherson Associates, LLC, training materials. The national security matrix was developed by Randolph H. Pherson.

5.4 PROCESS MAPS

Process Mapping is an umbrella term that covers a variety of procedures for identifying and depicting the steps in a complex procedure. It includes Flow Charts of various types (Activity Flow Charts, Commodity Flow Charts, Causal Flow Charts), Relationship Maps, and Value Stream Maps commonly used to assess and plan improvements for business and industrial processes. Process Maps or Flow Charts are diagrams that analysts use to track the step-by-step movement of events or commodities to identify key pathways and relationships involved in a complex system or activity. They usually contain various types of boxes connected by lines. The boxes are connected by arrows to illustrate the flow direction of a process.

When to Use It

Flow Charts can track the flow of money and other commodities, the movement of goods through production and delivery, the sequencing of events, or a decision-making process. They help analysts document, study, plan, and communicate complex processes with simple, easy-to-understand diagrams. In law enforcement and intelligence, they are used widely to map criminal and terrorist activity.

Value Added

Flow Charts can identify critical pathways and choke points and discover unknown relationships. In law enforcement, they help analysts probe the meaning of various activities, identify alternative ways a task can be accomplished, better understand how events are related to one another, and focus attention on the most critical elements of the process under study or investigation.

The Method

The process is straightforward.

- Compile a list of specific activities, steps, or events related to the event under study.
- Determine which must precede others, which must follow others, and which can operate independently.
- Draw a chart using circles or boxes to show activities and arrows to illustrate sequencing.
    - Different shapes of boxes can designate different types of activities. For example, activities are often represented by a rectangular box, decisions by a diamond, and input/output by a parallelogram.[4]
    - The thickness of the arrows can illustrate the volume of information moving from one activity to another.

In a Process Map, the steps in the process are diagrammed sequentially with various symbols. Diagrams can be created with readily available software such as Microsoft Visio. When constructing or evaluating a Flow Chart, ask yourself whether it makes complex issues easier to understand, is valid and appropriately sourced, and provides titles and labels that are accurate and clear.

Example

Figure 5.4 shows the process that drug traffickers use to launder their profits from the drugs they distribute. The drug network leader provides the $1 million he receives from users to a drug mule who deposits it in an offshore bank account. The money is deposited in the bank account of a foreign corporation, which takes its 15 percent cut for laundering the money. The remaining $850,000 then is transmitted back to the drug network leader.

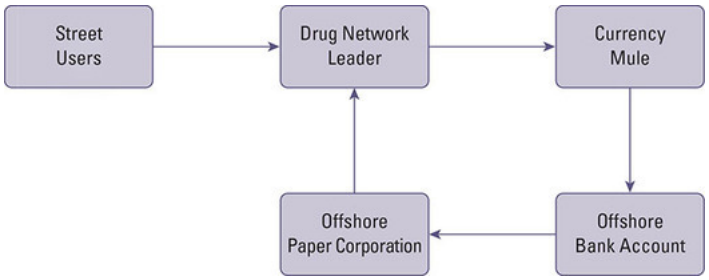


Figure 5.4 Commodity Flow Chart of Laundering Drug Money

Origins of This Technique

The first-known “flow process charts” were presented to the American Society of Mechanical Engineers in 1921.[5] They quickly became a tool of industrial engineering and were adopted by computer programmers beginning in the mid-century to describe computer algorithms. Information on how to use various types of Process Mapping is available in Richard Damelio, *The Basics of Process Mapping* (Florence, KY: Productivity Press, 2006). For user-friendly software to create your own Process Map, visit https://www.lucidchart.com/pages/process-mapping.

5.5 GANTT CHARTS

A Gantt Chart is a specific type of Process Map that was developed to facilitate the planning, scheduling, and management of complex industrial projects.

When to Use It

Intelligence analysts use Gantt Charts to track, understand, and monitor the progress of activities of intelligence interest undertaken by a foreign government, a criminal or terrorist group, or any other non-state actor. For example, a Gantt Chart can be used for the following:

- Monitor progress in developing a new weapons system, preparations for a major military action, or the execution of any other major plan that involves a sequence of observable steps.
- Identify and describe the modus operandi of a criminal or terrorist group, including the preparatory steps that such a group typically takes prior to a major action.
- Describe and monitor the process of radicalization by which a normal youth may be transformed over time into a terrorist.
- Trace how information or a report flows through an intelligence community's collection and processing system until it arrives at the desk of the analyst—and how it might have been corrupted by a bad translation or an overgeneralization when the actual event or initial statement was inaccurately summarized along the way.

Value Added

The process of constructing a Gantt Chart helps analysts think clearly about what someone else needs to do to complete a complex project. When an adversary's plan or process is understood well enough to be diagrammed or charted, analysts can then answer questions such as the following: What are they doing? How far along are they? What do they still need to do? What resources will they need to do it? How much time do we have before they have this capability? Is there any vulnerable point in this process for stopping or slowing activity?

The Gantt Chart is a visual aid for communicating this information to the client. If there is sufficient information, the analyst's understanding of the process will lead to a set of indicators that can be used to monitor the status of an ongoing plan or project.

The Method

A Gantt Chart is a matrix that lists tasks in a project or steps in a process down the far-left column, with the estimated time period for accomplishing these tasks or steps in weeks, months, or years across the top row. For each task or step, a horizontal line or bar shows the beginning and ending of the time period for that task or step. Professionals working with Gantt Charts use tools such as Microsoft Project to draw the chart. Gantt Charts can also be made with Microsoft Excel or by hand on graph paper.

Detailed guidance on creating a Gantt Chart is readily available from the sources described under “Origins of This Technique.”

Example

The U.S. Intelligence Community has considerable experience monitoring terrorist groups. This example describes how an analyst would create a Gantt Chart of a generic terrorist attack–planning process (see Figure 5.5). The analyst starts by making a list of all the tasks that terrorists must complete, estimating the schedule for when each task will start and finish, and determining what resources are needed for each task. Some tasks need to be performed in a sequence, with each task somewhat completed before the next activity can begin. These are called sequential, or linear, activities. Other activities are not dependent upon completion of any other tasks. These may be done at any time before or after a stage occurs. These are called nondependent, or parallel, tasks.

Note whether each terrorist task is sequential or parallel. It is this sequencing of dependent and nondependent activities that is critical in determining how long a project or process will take. The more activities worked in parallel, the greater the chances of a project being completed on time. The more tasks done sequentially, the greater the chances of a single bottleneck delaying the entire project.

When entering tasks into the Gantt Chart, enter the sequential tasks first in the required sequence. Ensure that those tasks don't start until the tasks on which they depend are completed. Then enter the parallel tasks in an appropriate time frame toward the bottom of the matrix so that they do not interfere with the sequential tasks on the critical path to completion of the project.

Gantt Charts that map a generic process can also track data about a more specific process as it is received. For example, the Gantt Chart depicted in Figure 5.5 can be used as a template over which new information about a specific group's activities could be layered using a different color or line type. Layering in the specific data allows an analyst to compare what is expected with the actual data. The chart

can then identify and narrow gaps or anomalies in the data and even identify and challenge assumptions about what is expected or what is happening. The analytic significance of considering such possibilities can mean the difference between anticipating an attack and wrongly assuming a lack of activity means a lack of intent. The matrix illuminates the gap and prompts the analyst to consider various explanations.

Origins of This Technique

The first Gantt Chart was devised in the mid-1890s by Karol Adamiecki, a Polish engineer who ran a steelworks in southern Poland.[6] Some fifteen years later, Henry Gantt, an American engineer and project management consultant, created his own version of the chart. His chart soon became popular in Western countries, and Henry Gantt's name became associated with this type of chart. Gantt Charts were a revolutionary advance in the early 1900s. During the period of industrial development, they were used to plan industrial processes and still are in common use today. Information on how to create and use Gantt Charts is available at www.ganttchart.com and https://www.projectmanager.com/gantt-chart.



Description

Figure 5.5 Gantt Chart of Terrorist Attack Planning

Source: Based on "Gantt Chart" by Richard Damelio, *The Basics of Process Mapping* (Florence, KY: Productivity Press, 2006), www.ganttchart.com.

NOTES

1. Atul Gawande, “The Checklist,” *New Yorker*, December 10, 2007, www.newyorker.com/reporting/2007/12/10/071210fa_fact_gawande. Also see Marshall Goldsmith, “Preparing Your Professional Checklist,” *Business Week*, January 15, 2008, https://www.marshallgoldsmith.com/articles/preparing-your-professional-checklist/

2. Katherine Hibbs Pherson and Randolph H. Pherson, “Part I: How Do I Get Started?” *Critical Thinking for Strategic Intelligence*, 2nd ed. (Washington, DC: CQ Press/SAGE, 2017).

3. A fuller discussion of the matrix can be found in Randolph H. Pherson, “Rethinking National Security in a Globalizing World: A New Ecology,” *Revista Română de studii de intelligence* (*Romanian Journal of Intelligence Studies*), 1–2 (December 2009).

4. “ISO 5807:1985,” *International Organization for Standardization* (February 1985), https://en.wikipedia.org/wiki/Flowchart#cite_note-16

5. Frank Bunker Gilbreth and Lillian Moller Gilbreth, “Process Charts” (presentation, American Society of Mechanical Engineers, 1921), https://en.wikipedia.org/wiki/Flowchart#cite_note-2

6. Gantt.com (2019), last accessed November 6, 2019, https://www.gantt.com/

Descriptions of Images and Figures

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The cells in each row show the impact of the variable, represented by that row, on each of the variables listed across the top of the matrix. The cells in each column show the impact of each variable, listed down the left side of the matrix, on the variable represented by the column.

The matrix consists of eight columns and six rows. The columns are as follows: A, B, C, D, E, F, Score, and percentage. The rows are as follows: A, B, C, D, E, and F.

The corresponding paired values for Row A columns A, B, C, D, E, F, Score, and percentage are as follows: nil; B,3; C,1; A,1; A,1; F,2; 2; and 10.

The corresponding paired values for Row B columns A, B, C, D, E, F, Score, and percentage are as follows: nil; nil; B,1; D,1; B,2; B,1; 7; and 35.

The corresponding paired values for Row C columns A, B, C, D, E, F, Score, and percentage are as follows: nil; nil; nil; D,1; E,1; F,1; 1; and 5.

The corresponding paired values for Row D columns A, B, C, D, E, F, Score, and percentage are as follows: nil; nil; nil; nil; D,2; D,1; 5; and 25.

The corresponding paired values for Row E columns A, B, C, D, E, F, Score, and percentage are as follows: nil; nil; nil; nil; nil; F,1; 1; and 5.

The corresponding paired values for Row F columns A, B, C, D, E, F, Score, and percentage are as follows: nil; nil; nil; nil; nil; nil; 4; and 20.

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The mechanisms of engagement, ranging from conflict to cooperation are use of military force, policing or monitoring, and collaboration. Use of military force: Threat or use of military force to impose or to defend the national interest. Policing or monitoring: Peacekeeping treaties etcetera that maintain order with penalties for noncompliance. Collaboration: Self-enforcing agreements, voluntary standards. The source of threat, ranging from nation states to non-state actors are nation stations, subnational actors, organizations, informal networks, and systematic challenges. Nation States: Countries, alliances, and ad hoc coalitions. Subnational actors: Ethnic groups, guerrilla groups, and refugees. Organizations: Transnational criminal organization, terrorist groups, international businesses, and NGOs. Informal networks: Antiglobalization protestors, currency speculators, computer hackers, and migrants. Systematic Challenges: Infectious diseases, natural disasters, and global warming.

Use of military force by nation states: Iraq in 1990 and 2003, Afghanistan in 2002, and Somalia antipiracy operations. Use of military force by subnational actors: Kosovo in 1998, Afghanistan in 2009, and noncombatant evacuation operations. Use of military force by organizations: Afghanistan drug eradication, Mexican and Colombian drug wars, and Osama bin laden in Pakistan. Use of military force by informal networks: Information warfare, and U.S. maritime interception of Haitian and Cuban immigrants. Use of military force by systematic challenges: Asteroid tracking, and Guam Brown Tree Snake quarantine.

Policing and monitoring by nation states: EU peacekeeping in Bosnia, UN peacekeeping operations, and nonproliferation treaties. Policing and monitoring by subnational actors: Congo refugees, Somalia, and Gaza. Policing and monitoring by organizations: INTERPOL, security at Olympics, and World Trade Organization. Policing and monitoring by informal networks: International currency, exchange protocols, and international criminal court. Policing and

monitoring by systematic challenges: Montreal Protocol on CFCs, World Health Organizations, and Kyoto Protocols.

Collaboration by nation states: G-8 and G-20 summits, CSCE Istanbul Summit in 1999, and bio weapons convention. Collaboration by subnational actors: Irish peace resolution and implementation, and US state department relief web. Collaboration by organization: INTERPOL information technology working parties and international relief such as Red Cross. Collaboration by informal networks: Global internet virus monitoring, international standards for genetic research, and internet domain names. Collaboration by systematic challenges: H1N1 pandemic monitoring in 2009, HIV AIDS suppression, and volcano monitoring.

A spectrum ranges from collecting and protecting intelligence secrets by nation states, to collecting information and disseminating broadly by collaboration. Use of military force by nation states is a classic concept of national security. Use of military force by subnational actors and organization, and policing and monitoring by nation states, subnational actors, and organization are in enlarged focus of the past two decades. The rest are gaining importance in globalizing world.

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The gantt chart shows bars across different time periods before the day of attack for different activities. Intent, such as conceiving the idea, meetings, and deciding to act, takes place two years before attack. Planning, such as gathering information, surveilling, recruiting, and making bombs, takes place between two years to one year before the day of attack. The time period for various activities associated with preparation is as follows. Training: One year to six months before the day of attack. Surveilling: Six months before the day of attack to the day. Assembling the material: Six months to eight to four weeks before the day of attack. Issuing attack order: On the day of attack. Attack, such as positioning and detonating the bomb, takes place on the day of the attack. The aftermath, such as

fleeing the scene and claiming credit, takes place on the day of the attack or on the day after.

CHAPTER 6 EXPLORATION TECHNIQUES

6.1 Simple Brainstorming [92]

6.2 Cluster Brainstorming [95]

6.3 Nominal Group Technique [98]

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6.6 Mind Maps and Concept Maps [106]

6.7 Venn Analysis [112]

6.8 Network Analysis [118]

New ideas, and the combination of old ideas in new ways, are essential elements of effective analysis. Some structured techniques are specifically intended for the purpose of exploring concepts and eliciting ideas at various stages of a project, and they are the topic of this chapter. Exploration Techniques help analysts create new approaches and transform existing ideas, knowledge, and insights into something novel but meaningful. They help analysts identify potential new sources of information or reveal gaps in data or thinking and provide a fresh perspective on long-standing issues.

> *Imagination is more important than knowledge. For while knowledge defines all we currently know and understand, imagination points to all we might yet discover and create.*
>
> —Albert Einstein

A continuing debate in the field of intelligence analysis is who makes the “best” analyst: an individual with subject-matter expertise or a creative generalist with good critical thinking skills. The reality is that both do, but specialists with deep knowledge of a given subject tend to focus primarily on their domain, and generalists, who often move from one subject to another throughout their careers, can come across as “facile.” Yet both types of analysts are called upon to generate new or different thoughts, create new processes and procedures, and help clients avoid surprise.

In one sense, all Structured Analytic Techniques are Exploration Techniques when used in collaborative group processes. A structured process helps identify and explore differences in perspective and different assumptions among team or group members, and thus stimulates learning and new ideas. A group or team using a Structured Analytic Technique is almost always more effective than a single individual in generating new ideas and in synthesizing divergent ideas.

All the Exploration Techniques embrace brainstorming as part of their process. The goal of brainstorming is to be innovative and generate new ideas, but even this avowedly creative process requires structure to be effective. People sometimes say they are brainstorming when they sit with a few colleagues and try to come up with new ideas, but such a freewheeling process rarely generates the creative breakthroughs the group is seeking. Brainstorming is most effective when it is structured. Experience has shown that analysts should follow eight basic rules to optimize the value of a brainstorming session:

- Be specific about the purpose and the topic of the brainstorming session. Announce the topic beforehand and ask participants to come to the session with some ideas or to forward them to the facilitator before the session. Begin the session by writing down everyone’s initial inputs on a whiteboard or easel.

- Never criticize an idea, no matter how weird, unconventional, or improbable it might sound. Instead, try to figure out how the idea might be applied to the task at hand.

- Allow only one conversation at a time; ensure that everyone has an opportunity to speak.

- Allocate enough time to complete the brainstorming session. It often takes one hour to set the rules of the game, get the group comfortable, and exhaust the conventional wisdom on the topic. Only then do truly creative ideas begin to emerge.

- Engage all participants in the discussion; sometimes this might require “silent brainstorming” techniques, such as asking everyone to be quiet for a few minutes to write down their key ideas and then discuss as a group what everyone wrote down.

- Include one or more “outsiders” in the group to avoid Groupthink and stimulate divergent thinking. One practical definition of an “outsider” is someone who is not processing the same information or information from the same generic sources as the members of the core group.

- Write it down! Track the discussion for everyone to see by using a whiteboard, an easel, or self-stick notes.

- Summarize key findings. Ask the participants to write down their key takeaway or the most important thing they learned on an index card as they depart the session. Then prepare a short summary and distribute the list to the participants (who may add items to the list) and to others interested in the topic (including supervisors and those who could not attend).

Exploration Techniques are helpful in combating many cognitive biases, which Daniel Kahneman says occur when analysts lack precision while making continuous assessments to supply quick answers to difficult problems.[1] They are particularly effective in

countering the impulse to answer complicated questions rapidly (Mental Shotgun) and to select the first answer that seems adequate (Satisficing), as distinct from assessing multiple options to find the optimal or best answer. The term Satisficing was coined by Nobel Prize winner Herbert Simon by combining the words *satisfy* and *suffice*.[2] The "satisficer" who does seek out additional information may look only for information that supports the initial answer. A better course of action is to use structured techniques to look broadly at all the possibilities.

Exploration Techniques help analysts avoid the intuitive traps of assuming the same dynamic is in play when something appears to be in accord with past experiences (Projecting Past Experiences). They also help guard against failing to factor something into the analysis because the analyst lacks an appropriate category or "bin" for that item of information (Lacking Sufficient Bins).

OVERVIEW OF TECHNIQUES

Simple Brainstorming is one of the most widely used analytic techniques. It is usually conducted in small groups but can also be done as an individual exercise.

Cluster Brainstorming is a form of silent brainstorming that uses self-stick notes, follows specific rules and procedures, and requires a facilitator. It is often used to develop a comprehensive picture or map of all the forces, factors, events, and players that relate to a given topic or issue. It requires little training, and it is one of the most frequently used structured techniques in the U.S. Intelligence Community.

Nominal Group Technique serves much the same function as Cluster Brainstorming but uses a quite different approach. It is the preferred technique when there is concern that a senior member or outspoken member of the group may dominate the meeting, that junior members may be reluctant to speak up, or that the meeting may lead to heated debate. Nominal Group Technique encourages equal participation by requiring participants to present ideas one at a time in round-robin fashion until all participants feel that they have run out of ideas.

Circleboarding™ is a method for capturing the journalist's list of Who, What, How, When, Where, and Why to develop a comprehensive picture of a topic. The technique adds a final question, So What, to spur analysts to assess the impact of the development and implications for the client.

Starbursting is a form of brainstorming that focuses on generating questions rather than answers. To help in defining the parameters of a research project, use Starbursting to identify the questions that need to be answered. Questions start with the words Who, What, How, When, Where, and Why. Brainstorm each of these words, one

at a time, to generate as many questions as possible about the research topic.

Venn Analysis is a visual technique that helps analysts explore the logic of arguments and illustrate sets of relationships in analytic arguments. It is a powerful tool for showing the relative significance of change over time and for illustrating large volumes of data in an easily digested format.

Network Analysis is used to illustrate associations among individuals, groups, businesses, or other entities; the meaning of those associations to the people involved; and the degrees and ways in which those associations can be strengthened or weakened. It has been highly effective in helping analysts identify and understand patterns of organization, authority, communication, travel, and financial transactions.

6.1 SIMPLE BRAINSTORMING

Simple Brainstorming is an individual or group process designed to generate new ideas and concepts. A brainstorming session usually exposes an analyst to a greater range of ideas and perspectives than the analyst could generate alone. This broadening of views typically results in a better analytic product. To be successful, brainstorming must focus on a specific issue and the results captured in a final written product.

When to Use It

Analysts most often use Simple Brainstorming at the beginning of a project to identify a list of relevant variables, key drivers, alternative scenarios, key players or stakeholders, available evidence or sources of information, possible solutions to a problem, potential outcomes or scenarios, or all the forces and factors relevant to a given situation. Later in the process, it can be used to help break the team out of an analytic rut, stimulate new investigative leads, generate new research or collection requirements, and design new lines of argument or theories of a case. In most instances, a brainstorming session can be followed with Cross-Impact Analysis to examine the relationship between each of the variables, players, or other factors identified by the brainstorming.

Value Added

The goal of any type of brainstorming session is to generate as many ideas as possible to expand the range of ideas and perspectives to consider. Brainstorming can involve any number of processes designed to enhance creativity but is most productive when it is structured. Intelligence analysts have found brainstorming particularly effective in helping mitigate the intuitive traps of giving too much weight to first impressions, lacking an appropriate category or bin for an item of information, allowing firsthand information to have too much impact, and expecting change to be only marginal or incremental.

The Method

Brainstorming is conducted in many different ways (see Figure 6.1 for an example of one technique). The facilitator or group leader should present the focal question, explain and enforce the ground rules, keep the meeting on track, stimulate discussion by asking questions, record the ideas, and summarize the key findings. Participants should be encouraged to express every idea that pops into their heads. Even ideas that are outside the realm of the possible may stimulate other ideas that are more feasible. The group should have at least four and no more than twelve participants. Five to seven is an optimal number; if there are more than twelve people, the group should be split into two sections to conduct parallel brainstorming exercises. The following discussion describes several techniques you can use to engage in individual or group brainstorming.

Word or Visual Storming.

This method consists of selecting a random word or picture—related to the issue or not—and using that word or visual to "trigger" thoughts. Ideally, settle on a word or picture not related to the topic or issue because the "word" may force you to stretch your mind. An easy way to select a word is to open a dictionary or magazine and point your finger at the open page. Where your finger lands, that's the word, or the picture on the page you opened; you could also pick a word or picture on the previous or next page. After you select a word or picture, answer the following questions:

- What is the meaning of the word or what words come to mind when you look at the picture?
- What is the word or picture associated with?
- What is happening in the picture?
- How is the word used or what is a synonym for the word?

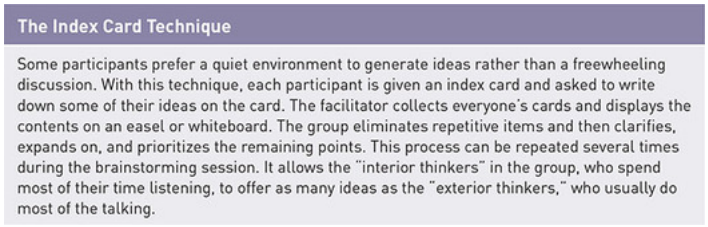


Figure 6.1 Engaging All Participants Using the Index Card Technique

Ask yourself how the word or picture could be related to the issue or problem. For example, when considering who a newly-elected prime minister or president might appoint to a particularly tough Cabinet job, the word "basketball" or a picture of a basketball court might generate ideas such as team game, team player, assigned position, coaching, player development, winning, hoops and balls, time outs, periods of play, or winners and losers. Each of those terms could trigger subsequent ideas about the type of official who would be "ideal" for the job.

A freewheeling, informal group discussion session will often generate new ideas, but a structured group process is more likely to succeed in helping analysts overcome existing mindsets, "empty the bottom of the barrel of the obvious," and come up with fresh insights and ideas.

Paper Recording.

Paper Recording is a silent technique that is a variant of Nominal Group Technique (discussed later in this chapter). This group method requires each participant to write down one to four ideas on the topic on a piece of paper initially distributed by the facilitator or organizer.

- After jotting down their ideas, participants place their papers in a central “pick-up point.” They select a piece of paper (not their own) from the “pick-up point” and add to the ideas on the paper.
- The process continues until participants run out of ideas. Participants can hold up or “play” a colored card to note when they have exhausted their ideas.
- A facilitator harvests and records the ideas.

Relationship to Other Techniques

Any form of brainstorming is commonly combined with a wide variety of other techniques. It is often an early step in analytic projects used to identify ideas, variables, evidence, possible outcomes, suspects, or hypotheses that are then processed by using other structured techniques. Other forms of brainstorming described in this chapter include Nominal Group Technique, Circleboarding™, Mind Maps, and Venn Analysis.

Origins of This Technique

Brainstorming was a creativity technique used by advertising agencies in the 1940s. It was popularized in a book by advertising manager Alex Osborn, *Applied Imagination: Principles and Procedures of Creative Problem Solving* (New York: Scribner's, 1953). There are many versions of brainstorming. The techniques described in this book are a combination of information in the *Handbook of Analytic Tools and Techniques,* 5th ed. (Tysons, VA: Pherson Associates, LLC, 2019) and training materials used throughout the global intelligence community.

6.2 CLUSTER BRAINSTORMING

Cluster Brainstorming is a systematic, multistep process for conducting group brainstorming that employs silent brainstorming and self-stick notes. It allows group members to alternate between divergent and convergent ideas, generating comprehensive lists of new ideas. Cluster Brainstorming requires a facilitator, in part because participants cannot talk during the brainstorming session.

In previous editions of this book, Cluster Brainstorming was referred to as Structured Brainstorming. The authors chose to change the name of the technique for this edition because all forms of brainstorming—ranging from Simple Brainstorming to Mind Maps to Outside-In Thinking—require structure to be effective.

When to Use It

Cluster Brainstorming is used widely in the intelligence community and increasingly in the private sector at the beginning of a project. Many will also employ it later in the analytic process to pull the team out of an analytic rut and to stimulate new thinking.

Value Added

The stimulus for creativity comes from two or more analysts bouncing ideas off each other. A Cluster Brainstorming session usually exposes an analyst to a greater range of ideas and perspectives than the analyst could generate alone, and this broadening of views typically results in a better analytic product. The technique can help mitigate the impact of Groupthink, Premature Closure, and accepting evidence as true because it helps create a coherent picture (Evidence Acceptance Bias).

In addition, analysts have found it effective in helping them overcome the intuitive traps of failing to factor something into the analysis because the analyst lacks an appropriate category or “bin” for that item of information (Lacking Sufficient Bins), focusing on a narrow range of alternatives representing only modest change (Expecting Marginal Change), and continuing to hold to a judgment when confronted with a mounting list of contradictory evidence (Rejecting Evidence).

The Method

Many versions of Cluster Brainstorming are in common usage. The following process has worked well in intelligence and law enforcement communities to generate key drivers for Multiple Scenarios Generation, a set of alternative hypotheses when investigating a situation, or a list of key factors to explain a behavior. The process is divided into two phases: a divergent thinking (creative) phase when ideas are presented, and a convergent thinking (analytic) phase when these ideas are evaluated.

- Pass out self-stick notes and marker-type pens to all participants. A group of ten to twelve contributors works best. Tell those present that no one can speak except the facilitator during the initial collection phase of the exercise.
- Write the question you are brainstorming on a whiteboard or easel. The objective is to make the question as open-ended as possible. For example, Cluster Brainstorming focal questions often begin with “What are all the (things/forces and factors/circumstances) that would help explain . . .?”
- Ask the participants to write down their responses to the question on self-stick notes. Participants are asked to capture the concept with a few key words that will fit on the self-stick note. The facilitator then collects the self-stick notes from the participants.
- After an initial quiet time of two minutes, the facilitator begins to read the self-stick notes out loud. The quiet time allows participants time to reflect and process before the facilitator starts talking again. The facilitator puts all the self-stick notes on the wall or a whiteboard as he/she reads them aloud (see Figure 6.2). All ideas are treated the same. Participants are urged to listen to and build on one another’s ideas.
- Usually there is an initial spurt of ideas followed by pauses as participants contemplate the question. After five or ten minutes, expect a long pause of a minute or so. This slowing down suggests that the group has “emptied the barrel of the obvious” and is now on the verge of coming up with some fresh insights and ideas. Facilitators should not talk during this pause, even if the silence is uncomfortable.
- After a couple of long pauses, facilitators conclude this divergent stage of the brainstorming process. They then ask a subset of the group to go up to the board and silently arrange the self-stick notes into affinity groups (basically grouping the ideas by like concept). The group should arrange the self-stick notes in clusters, not in rows or columns. The group should avoid putting the self-stick notes into obvious groups like “economic” or “political.” Group members cannot talk while they are doing this. If one self-stick note seems to “belong” in more than one group, make a copy and place one self-stick note in each affinity group.
- If the group has many members, those who are not involved in arranging the self-stick notes should be asked to perform a different task. For example, the facilitator could make copies of several of the self-stick notes that were considered outliers because the group at the board has not fit them into any obvious group or the items evoked laughter when read aloud. One of these outliers is given to each table or to each smaller group of participants, who then are asked to explain how that outlier relates to the primary task.
- When the group at the board seems to slow down organizing the notes, ask a second small group to go to the board and review how the first group arranged the self-stick notes. The second group cannot speak, but members are encouraged to continue to rearrange the notes into more coherent groups. Usually the exercise should generate five to ten affinity groupings on the board.
- When all the self-stick notes have been arranged, members of the group at the board can converse among themselves to pick a word or phrase that best describes each affinity grouping.

- Pay attention to outliers or self-stick notes that do not belong in a particular group. Such an outlier could either be useless noise or, more likely, contain a gem of an idea that deserves further elaboration as a theme. If outlier self-stick notes were distributed earlier in the exercise, ask each group to explain how that outlier is relevant to the issue.
- To identify the potentially most useful ideas, the facilitator or group leader should establish up to five criteria for judging the value or importance of the ideas. If so desired, then use the Ranking, Scoring, and Prioritizing technique, described in chapter 5, for voting on or ranking or prioritizing ideas. Another option is to give each participant ten votes. Tell them to come up to the whiteboard or easel with a marker and place their votes. They can place ten votes on a single self-stick note or affinity group label, one vote each on ten self-stick notes or affinity group labels, or any combination in between. Tabulate the votes.
- Assess what you have accomplished and what areas will need more work or more brainstorming. Then ask the group, “What do you see now that you did not see before?” Review the key ideas or concepts as well as new areas that need more work or further brainstorming.
- Set priorities based on the voting results, decide on the next steps for analysis, and develop an action plan.



Figure 6.2 Cluster Brainstorming in Action

Source: Pherson Associates, LLC, 2019.

Relationship to Other Techniques

Cluster Brainstorming is also called Structured Brainstorming and Divergent/Convergent Thinking. The authors prefer the term Cluster Brainstorming because any brainstorming technique should be structured to be effective.

Origins of This Technique

The description of Cluster Brainstorming is taken from the discussion of “Cluster Brainstorming,” in *Handbook of Analytic Tools and Techniques*, 5th ed. (Tysons, VA: Pherson Associates, LLC, 2019), and training materials used throughout the global intelligence community.

6.3 NOMINAL GROUP TECHNIQUE

Nominal Group Technique (NGT) is a process for generating and evaluating ideas. It is a form of brainstorming, but NGT has always had its own identity as a separate technique. The goals of Nominal Group Technique and other forms of brainstorming are the same—the generation of good, innovative, and viable ideas. NGT, however, differs from Simple Brainstorming in several ways. Most importantly, ideas are presented one at a time in round-robin fashion.

When to Use It

NGT prevents the domination of a discussion by a single person. Use it whenever concerns arise that a senior officer or executive or an outspoken member of the group or perhaps even experts in the field will control the direction of the meeting by speaking before anyone else. It is also appropriate to use NGT rather than other structured brainstorming techniques if there is concern that some members may not speak up, or the issue under discussion is controversial and may provoke a heated debate. The index card technique is another way to accomplish these objectives.

NGT is also effective when coordinating the initial conceptualization of a problem before the research and writing stages begin. Like brainstorming, NGT is commonly used to identify ideas (assumptions, hypotheses, drivers, causes, variables, important players) that can then be incorporated into other methods.

Value Added

NGT can be used both to generate ideas and to provide backup support in a decision-making process where all participants are asked to rank or prioritize the ideas generated. If it seems desirable, all ideas and votes can be anonymous. Compared with Simple Brainstorming, which usually seeks to generate the greatest possible number of ideas—no matter how far out they may be—NGT may focus on a limited list of carefully considered opinions.

The technique allows participants to focus on each idea as it is presented, rather than having to think simultaneously about preparing their own ideas and listening to what others are proposing —a situation that often happens with Simple or Cluster Brainstorming. NGT encourages piggybacking on ideas that have already been presented—in other words, combining, modifying, and expanding others' ideas.

The Method

An NGT session starts with the facilitator asking an open-ended question such as “What factors will influence . . . ?” “How can we learn if . . . ?” “In what circumstances might . . . happen?” “What should be included or not included in this research project?” The facilitator answers any questions and then gives participants a few minutes to work privately to jot down their initial responses to the focal question on index cards. The process then proceeds according to these steps:

- The facilitator calls on one person at a time to present one idea. As each participant presents his or her idea, the facilitator writes a summary description on a flip chart or whiteboard. This process continues in a round-robin fashion until all ideas have been exhausted. If individuals have run out of ideas, they “pass” when called upon for an idea, but they can participate again later if they have another idea when their turn comes up again. The facilitator can also be an active participant, announcing and then writing down his or her own ideas. There is no discussion until all ideas are presented; however, the facilitator can clarify ideas to avoid duplication.

- When no new ideas are forthcoming, the facilitator initiates a group discussion to ensure there is a common understanding of what each idea means. The facilitator asks about each idea, one at a time, in the order presented, but does not allow any argument for or against the idea. At this time, the participants can expand or combine ideas, but no change can be made to an idea without the approval of the original presenter of the idea.

- Voting to rank or prioritize the ideas as discussed in chapter 5 is optional, depending upon the purpose of the meeting. If adopted, voting is best done by secret ballot, although various

voting procedures may be used depending upon the number of ideas and the number of participants. It usually works best to employ a ratio of one vote for every three ideas presented. For example, if the facilitator lists twelve ideas, each participant has four votes. The group can also decide to let participants give one idea more than one vote. In this case, someone could give three votes to one idea and another idea only one vote.

- An alternative procedure is for each participant to write what he or she considers the best four ideas on an index card. One might rank the four ideas by giving 4 points for the best idea, 3 points for the next best, 2 points for the next best, and 1 point for the least favored idea. The cards are then passed to the facilitator for tabulation and announcement of the scores. In such circumstances, a second round of voting may be needed to rank the top ideas.

Relationship to Other Techniques

Analysts should consider other forms of brainstorming as well as Nominal Group Technique to determine which technique is most appropriate for the conditions in which it will be used.

Origins of This Technique

Nominal Group Technique was developed by A. L. Delbecq and A. H. Van de Ven and first described in "A Group Process Model for Problem Identification and Program Planning," *Journal of Applied Behavioral Science* VII (July–August, 1971): 466–491. The discussion of NGT here is a synthesis of several sources: James M. Higgins, *101 Creative Problem Solving Techniques: The Handbook of New Ideas for Business,* rev. ed. (Winter Park, FL: New Management Publishing Company, 2006); "What Is Nominal Group Technique?" American Society for Quality, http://www.asq.org/learn-about-quality/idea-creation-tools/overview/nominal-group.html; "Nominal Group Technique," http://syque.com/quality_tools/toolbook/NGT/ngt.htm; and "Nominal Group Technique," www.mycoted.com/Nominal_Group_Technique.

6.4 CIRCLEBOARDING™

Circleboarding™ captures the Who, What, How, When, Where, Why, and So What of a topic. It visually depicts the known information about differing aspects of a topic of concern or interest. Circleboarding™ focuses on exploring the answers to the journalist's classic five W's and H but adds a final question: So What? The So What? question spurs the analyst to consider the impact of the event or the implications of the topic and helps focus on the key message to deliver to the client.

When to Use it

Use Circleboarding™ at the start of a project to gain a thorough, group-wide understanding of a topic. After deciding on the topic, assemble all researchers, investigators, or analytic contributors and use Circleboarding™ to determine what is already known about each aspect of the subject. A facilitator must marshal the group through the process.

Circleboarding™ is also effective in generating indicators or a set of scenarios. Questions to consider when creating indicators include

- Who could potentially emit an indicator?
- What indicator would they emit?
- How would this indicator manifest? How might we miss it?
- When would we be most likely to see this indicator?
- Where would we be most likely to see this indicator?
- Why is this indicator important?
- What do we want the indicators to tell us as a set?

Value Added

Circleboarding™ provides a systematic overview of a topic or issue. The brainstorming process helps promote widespread, collaborative understanding of the topic for all those involved in the project, regardless of their specific area of research focus. The cooperative approach of Circleboarding™ also encourages investigators to combine ideas in new or different ways to imbue the analysis with increased rigor.

The technique can stimulate discussion beyond just consolidating known information by identifying gaps or weak points in the group's knowledge and encouraging discussion of stated and unstated assumptions and what further collection and research is needed to fill the gaps. Circleboarding™ can be a powerful tool for mitigating the impact of misapplied heuristics, including the tendency to provide quick and easy answers to difficult questions (Mental Shotgun), predict rare events based on weak evidence or evidence that easily comes to mind (Associative Memory), and select the first answer that appears "good enough" (Satisficing). Use of the technique can also diminish the impact of intuitive traps, such as Overinterpreting Small Samples, Ignoring the Absence of Information, and Projecting Past Experiences.

Circleboarding™ promotes thorough investigation of a topic and well-informed analysis. Detailed graphics can present the results of an exhaustive investigation in a crisp and easily digestible format.

The Method

- **Setup.** Draw a circle and write the following words around the circle: Who, What, How, When, Where, and Why (see Figure 6.4). The order follows how a declarative sentence is written in English (who did what, for what reason). The What and the How are next to each other because they often overlap conceptually. In the middle of the circle, write “So What?”
- **Define the Topic.** Begin by asking the group to validate the discussion topic and agree on the objectives of the session.
- **Seek Answers.** Systematically work through each question asking the group to “shout out” what they know about the topic as it relates to each question. Write down the answers.

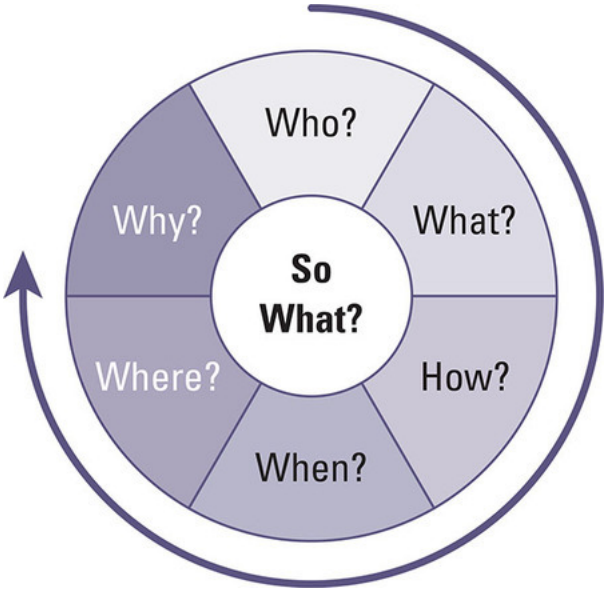


Figure 6.4 The Circleboarding™ Technique

- **Reflect.** After going around the circle, ask the group to reflect on their responses and suggest which of the questions appears most important to the analysis.
- **Prioritize Results.** In some cases, highlight or prioritize the responses to the most important questions.
- **So What?** Initiate a final discussion to explore the So What? question in the center of the circle.
- **Final Product.** Capture all the input on a single graphic and distribute it to participants and others interested in the topic for comment.

Relationship to Other Techniques

Circleboarding™ is a simpler version of Starbursting (presented next in this chapter) that focuses on exploring the answers to—rather than generating questions related to—the journalist's classic list of queries: Who, What, How, When, Where, and Why. Ranking, Scoring, and Prioritizing (chapter 5) can be helpful in prioritizing the clusters of answers that result.

Origins of This Technique

Circleboarding™ was developed by Pherson Associates as an alternative to Starbursting. The technique can be particularly helpful for analysts working in law enforcement, medicine, and financial intelligence investigating money laundering, who focus mostly on generating tactical analytic products and are often pressed for time.

6.5 STARBURSTING

Starbursting is a form of brainstorming that focuses on generating questions rather than eliciting ideas or answers. It uses the six questions commonly asked by journalists: Who? What? How? When? Where? and Why?

When to Use It

Use Starbursting to help define your research requirements and identify information gaps. After deciding on the idea, topic, or issue to be analyzed, brainstorm to identify the questions that need to be answered by the research. Asking the right questions is a common prerequisite to finding the right answer.

Value Added

Starbursting uses questions commonly asked by journalists (Who, What, How, When, Where, and Why) to spur analysts and analytic teams to ask the questions that will inevitably arise as they present their findings or brief their clients. In thinking about the questions, analysts will often discover new and different ways of combining ideas.

Starbursting is useful in combating cognitive limitations analysts often experience, including focusing attention on a vivid scenario while ignoring other possibilities (Vividness Bias), the tendency to provide quick and easy answers to difficult questions (Mental Shotgun), and predicting rare events based on weak evidence or evidence that easily comes to mind (Availability Heuristic). It also can help analysts reduce the effect of several intuitive traps, including Relying on First Impressions, Assuming a Single Solution, and Projecting Past Experiences.

The Method

The term “Starbursting” comes from the image of a six-pointed star. To create a Starburst diagram, begin by writing one of the following six words at each point of the star: Who, What, How, When, Where, and Why. Then start the brainstorming session, using one of these words at a time to generate questions about the topic. Usually it is best to discuss each question in the order provided, in part because the order also approximates how English sentences are constructed. The What and the How are next to each other because they often overlap conceptually.

Often only three or four of the words are directly relevant to the intelligence question. In cyber analysis, the Who is often difficult to define. For some words (for example, When or Where), the answer may be a given and not require further exploration.

Do not try to answer the questions as they are identified; just focus on developing as many questions as possible. After generating questions that start with each of the six words, ask the group either to prioritize the questions to be answered or to sort the questions into logical categories. Figure 6.5 is an example of a Starbursting diagram. It identifies questions to be asked about a terrorist group that launched a biological attack in a subway.

Relationship to Other Techniques

This Who, What, How, When, Where, and Why approach can be combined effectively with the Issue Redefinition and Getting Started Checklist methods mentioned in the introduction to chapter 5 and described more fully in *Critical Thinking for Strategic Intelligence*.[3] Ranking, Scoring, and Prioritizing (chapter 5) is helpful in prioritizing the questions to be worked on. Starbursting is also directly related to several Diagnostic Techniques discussed in chapter 7, such as the Key Assumptions Check. In addition, it can be used to order the analytic process used in Indicators Validation in chapter 9.



Description

Figure 6.5 Starbursting Diagram of a Lethal Biological Event at a Subway Station

Source: A basic Starbursting diagram can be found at the MindTools website: https://www.mindtools.com/pages/article/newCT_91.htm. The starburst in Figure 6.5 was created by the authors.

Origins of This Technique

Starbursting is one of many techniques developed to stimulate creativity. The basic idea for the design of Figure 6.5 comes from the MindTools website: www.mindtools.com/pages/article/newCT_91.htm. Tips on when to use this technique and help creating your own Starbursting diagram can be found at https://www.designorate.com/starbursting-method/ and https://business.tutsplus.com/tutorials/starbursting-how-to-use-brainstorming-questions-to-evaluate-ideas--cms-26952.

6.6 MIND MAPS AND CONCEPT MAPS

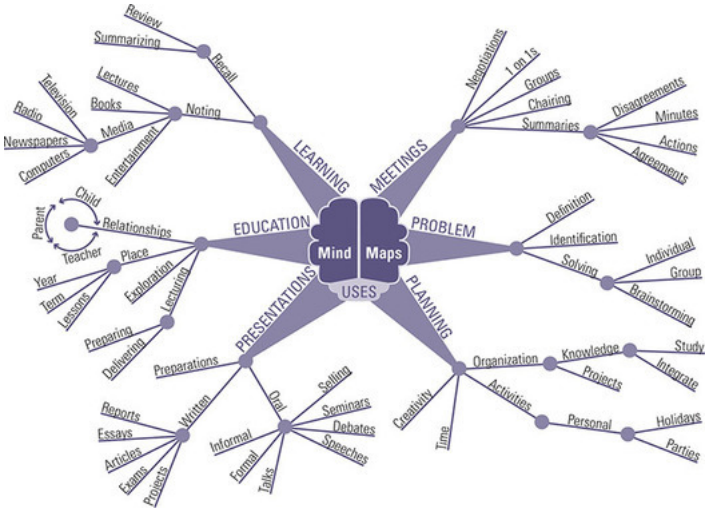
Mind Maps and Concept Maps are visual representations of how an individual or a group thinks about a topic of interest. Such a diagram has two basic elements: the ideas that are judged relevant to whatever topic one is thinking about, and the lines that show and briefly describe the connections among these ideas. The two dominant approaches to creating such diagrams are Mind Mapping and Concept Mapping (see Figures 6.6a and 6.6b). Other approaches include cognitive, causal, and influence mapping as well as idea mapping. There are many commercial and freely available software products that create meaningful diagrams used by diverse groups within the intelligence community.[4]

When to Use It

Whenever analysts think about a problem, develop a plan, or consider making even a simple decision, they are putting a series of thoughts together. That series of thoughts can be represented visually with words or images connected by lines that represent the nature of the relationships among them. Any type of thinking, whether about a personal decision or analysis of an intelligence issue, can be diagrammed in this manner. Such mapping is usually done for either of two purposes:

- By an individual or a group to help sort out ideas and achieve a shared understanding of key concepts. By getting the ideas down on paper or a computer screen, the individual or group is better able to remember, critique, and modify them.
- To facilitate the communication to others of a complex set of relationships. Examples are an intelligence report, a briefing or graphic prepared by an analyst for prosecutors to use in a jury trial, or notes jotted while in class.

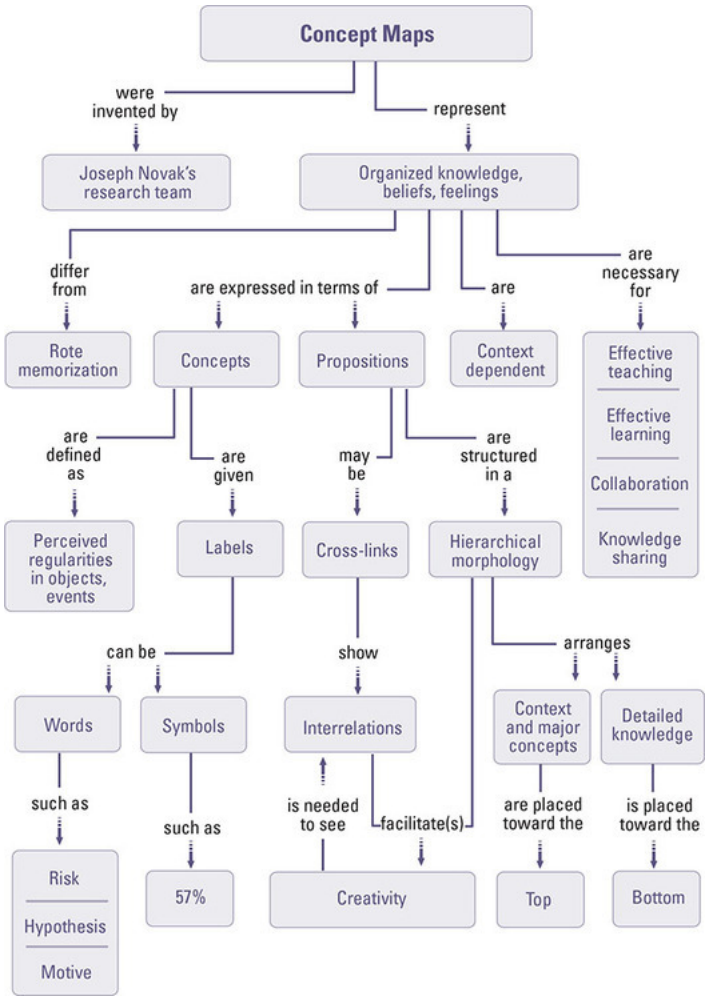
Mind Maps can help analysts brainstorm the various elements or key players involved in an issue and how they might be connected. The technique stimulates analysts to ask questions such as, Are there additional categories or "branches on the tree" that we have not considered? Are there elements of this process or applications of this technique that we have failed to capture? Does the Mind Map suggest a different context for understanding the problem?



Description

Figure 6.6A Mind Map of Mind Mapping

Source: Illumine Training, "Mind Map," www.mind-mapping.co.uk. Reproduced with permission of Illumine Training. With changes by Randolph H. Pherson.



Description

Figure 6.6B Concept Map of Concept Mapping

Source: R. R. Hoffman and J. D. Novak (Pensacola, FL: Institute for Human and Machine Cognition, 2009). Reproduced with permission of the authors.

Analysts and students find that Mind Maps and Concept Maps are useful tools for taking notes during an oral briefing or lecture. By developing a map as the lecture proceeds, the analyst or student can chart the train of logic and capture all the data presented in a coherent map with all key elements on a single page. The map also provides a useful vehicle for explaining to someone else in an organized way what was presented in the briefing or lecture.

Concept Maps are also frequently used as teaching tools. Most recently, they have been effective in developing “knowledge models,” in which large sets of complex Concept Maps are created and hyperlinked together to represent analyses of complex domains or problems.

Value Added

Mapping facilitates the presentation or discussion of a complex body of information. It is useful because it presents a considerable amount of information that can generally be seen at a glance. Creating a visual picture of the basic structure of a complex problem helps analysts be as clear as possible in stating precisely what they want to express. Diagramming skills enable analysts to stretch their analytic capabilities.

Mind Maps and Concept Maps vary greatly in size and complexity depending on how and why they are used. When used for structured analysis, a Mind Map or a Concept Map is typically larger, sometimes much larger, than the examples shown in this chapter.

Like any model, such a map is a simplification of reality. It does not necessarily try to capture all the nuances of a complex system of relationships. Instead, it provides an outline picture of the overall structure of a system of variables, showing which variables are relevant to a given problem or issue and how they are related to one another. Once you have this information, you are well on the way toward knowing what further research needs to be done and perhaps even how to organize the written report. For some projects, the diagram can be the analytical product or a key part of it.

When a group creates a Mind Map or Concept Map, its principal value may be the process the group went through to construct the map, not the map itself. When a group gets together to identify all the parts of a complex system and figure out how the parts relate to one another, the process often elicits new ideas, clarifies concepts, identifies relevant bodies of knowledge, and brings to the surface—and often resolves—differences of opinion at an early stage of a project before anything is put in writing. Although such a map may be a bare skeleton, the discussion will have revealed a great deal more information than can be shown in a single map.

The mapping process gives the group a shared experience and a common basis for further discussion. Creating a map ensures that the initial effort reflects the group's definition of the problem, not something done by one member of the group and then presented after the fact for coordination by the others. Some mapping software supports virtual collaboration so that analysts at different locations can work on a map simultaneously and see one another's work as it progresses.[5]

After having defined the problem, the group should be better able to identify what further research needs to be done and able to parcel out additional work among the best-qualified members of the group. The group should also be better able to prepare a report that represents as fully as possible the collective wisdom of the group.

Mind Maps and Concept Maps help mitigate the impact of several cognitive biases and misapplied heuristics, including the tendency to provide quick and easy answers to difficult questions (Mental Shotgun), to predict rare events based on weak evidence or evidence that easily comes to mind (Associative Memory), and to select the first answer that appears "good enough" (Satisficing). They can also provide an antidote to intuitive traps such as Overinterpreting Small Samples, Ignoring the Absence of Information, Confusing Causality and Correlation, and overrating the role of individual behavior and underestimating the importance of structural factors (Overestimating Behavioral Factors).

The Method

Start a Mind Map or Concept Map with an inclusive question that focuses on defining the issue or problem. Then follow these steps:

- Make a list of concepts that relate in some way to the focal question.
- Starting with the first dozen or so concepts, sort them into groupings within the diagram space in some logical manner. These groups may be based on things they have in common or on their status as either direct or indirect causes of the matter being analyzed.
- Begin making links among related concepts, starting with the most general concepts. Use lines with arrows to show the direction of the relationship. The arrows may go in either direction or in both directions.
- Choose the most appropriate words for describing the nature of each relationship. The lines might be labeled with words such as “causes,” “influences,” “leads to,” “results in,” “is required by,” or “contributes to.” Selecting good linking phrases is often the most difficult step.
- While building all the links among the concepts and the focal question, look for and enter cross-links among concepts.
- Don’t be surprised if, as the map develops, you discover that you are now diagramming on a different focus question from the one with which you started. This can be a good thing. The purpose of a focus question is not to lock down the topic but to get the process going.

- Finally, reposition, refine, and expand the map structure as appropriate.

Mind Mapping and Concept Mapping can be done manually, but mapping software makes movement of concepts and creation of links much easier and faster. Many different software programs are available for various types of mapping, and each has strengths and weaknesses. These products are usually variations of the main contenders: Mind Mapping and Concept Mapping. The two leading techniques differ in the following ways:

- Mind Mapping has only one main or central idea, and all other ideas branch off from it radially in all directions. The central idea is preferably shown as an image rather than in words, and images are used throughout the map. Around the central word, draw the five or ten main ideas that relate to that word. Then take each of these first-level words and again draw the five or ten second-level ideas that relate to each of the first-level words.[6]

- A Concept Map has a more flexible form. It can have multiple hubs and clusters. It can also be designed around a central idea, but it does not have to be and often is not designed that way. It does not normally use images. A Concept Map is usually shown as a network, although it too can be shown as a hierarchical structure like Mind Mapping when that is appropriate. Concept Maps can be very complex and are often meant to be viewed on a large-format screen.

Relationship to Other Techniques

Mind and Concept Mapping can be used to present visually the results generated by other techniques, especially the various types of brainstorming and/or Cross-Impact Analysis, described in chapters 6 and 7.

Origins of This Technique

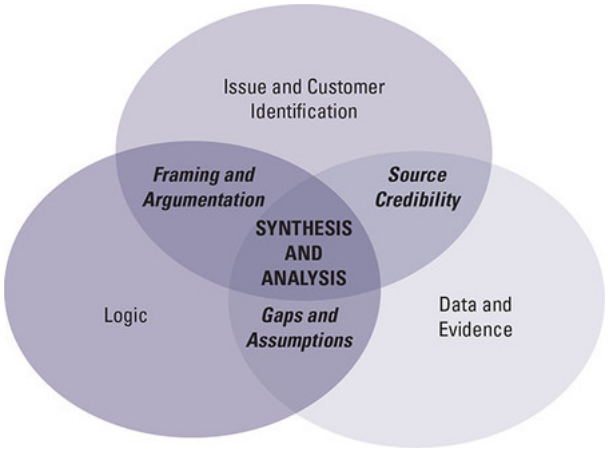
Mind Mapping was originally developed as a fast and efficient way to take notes during briefings and lectures. Concept Mapping was originally developed as a means of mapping students' emerging knowledge about science; it has a foundation in the constructivist theory of learning, which emphasizes that "meaningful learning involves the assimilation of new concepts and propositions into existing cognitive structures."[7]

Mind Maps and Concept Maps have been given new life by the development of software that makes them more useful and easier to use. For information on Mind Mapping, see Tony and Barry Buzan, *The Mind Map Book* (Essex, England: BBC Active, 2006). Information on Concept Mapping is available at http://cmap.ihmc.us/conceptmap.html. For an introduction to mapping in general, visit http://www.inspiration.com/visual-learning/mind-mapping.

6.7 VENN ANALYSIS

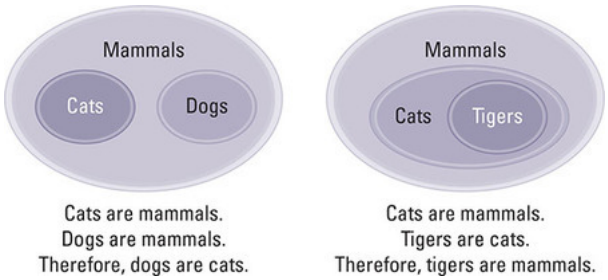
Venn Analysis is a visual technique that analysts can use to explore the logic of arguments. Venn diagrams consist of overlapping circles and are commonly used to teach set theory in mathematics. Each circle encompasses a set of objects; objects that fall within the intersection of circles are members of both sets. A simple Venn diagram typically shows the overlap between two sets. Circles can also be nested within one another, showing that one thing is a subset of another in a hierarchy. Figure 6.7a is an example of a Venn diagram. It describes the various components of critical thinking and how they combine to produce synthesis and analysis.

Venn diagrams can illustrate simple sets of relationships in analytic arguments; we call this process Venn Analysis. When applied to argumentation, it can reveal invalid reasoning. For example, in Figure 6.7b, the first diagram shows the flaw in the following argument: Cats are mammals, dogs are mammals; therefore, dogs are cats. As the diagram shows, dogs are not subsets of cats, nor are any cats subsets of dogs; therefore, they are distinct subsets, but both belong to the larger set of mammals. Venn Analysis can also validate the soundness of an argument. For example, the second diagram in Figure 6.7b shows that the argument that cats are mammals, tigers are cats, and therefore tigers are mammals is true.



Description

Figure 6.7A Venn Diagram of Components of Critical Thinking



Description

Figure 6.7B Venn Diagram of Invalid and Valid Arguments

When to Use It

Intelligence analysts use this technique to organize their thinking, look for gaps in logic or data, and examine the quality of an argument. The tool is also effective in determining how to satisfy a narrow set of conditions when multiple variables must be considered —for example, in determining the best time to launch a satellite. Venn Analysis is also useful when an argument involves a portion of something that is being compared with other portions or subsets.

One other application is to use Venn Analysis as a brainstorming tool to see if new ideas or concepts are needed to occupy every subset in the diagram. The technique can be done individually but works better when done in groups.

Value Added

Venn Analysis helps analysts determine if they have put like things in the right groups and correctly identified what belongs in each subset. The technique makes it easier to visualize arguments, often revealing flaws in reasoning or spurring analysts to examine their assumptions by making assumptions explicit when constructing the diagram. Examining the relationships between the overlapping areas of a Venn diagram helps put things in perspective and often prompts new research or deeper inquiry. Care should be taken, however, not to make the diagrams too complex by adding levels of precision that may not be justifiable.

Venn Analysis protects analysts against seeing patterns in random events as systematic and part of a coherent world (Desire for Coherence and Uncertainty Reduction), accepting data as true because the data help create a more coherent story (Evidence Acceptance Bias), and offering quick and easy answers to difficult questions (Mental Shotgun). Venn Analysis also helps mitigate the impact of several intuitive traps, particularly Ignoring Inconsistent Evidence, Presuming Patterns, and failing to factor something into the analysis because the analyst lacks an appropriate category or “bin” for that item of information (Lacking Sufficient Bins).

The Method

Venn Analysis is an agile tool that can be applied in various ways. It is a simple process but can spark prolonged debate. The following steps show how Venn Analysis is useful when examining the validity of an argument:

- Represent the elements of a statement or argument as circles. Use large circles for large concepts or quantities.
- Examine the boundaries of the circles. Are they well defined or “fuzzy”? How are these things determined, measured, or counted?
- Consider the impact of time. Are the circles growing or shrinking? This is especially important when looking at trends.
- Check the relative size and relationships between the circles. Are any assumptions being made?
- Ask whether there are elements within the circles that should be added.
- Examine and compare overlapping areas. What is found in each zone? What is significant about the size of each zone? Are these sizes likely to change over time?

Example

Consider this analytic judgment: “The substantial investments state-owned companies in the fictional country of Zambria are making in U.S. port infrastructure projects pose a threat to U.S. national security.”

Using Venn Analysis, the analyst would first draw a large circle to represent the autocratic state of Zambria, a smaller circle within it representing state-owned enterprises, and small circles within that circle to represent individual state-owned companies. A mapping of all Zambrian corporations would include more circles to represent other private-sector companies as well as a few that are partially state-owned (see Figure 6.7c). Simply constructing this diagram raises several questions, such as What percentage of companies are state-owned, partially state-owned, or privately owned? Do the percentages correspond to the size of the circles? What is the definition of “state-owned”? What does “state-owned” imply politically and economically in a nondemocratic state like Zambria? Do these distinctions even matter? The answer to this last question would determine whether Zambrian companies should be represented by one, two, or three circles.

The diagram should prompt the analyst to examine several assumptions implicit in the questions:

- Does state-owned equate to state-controlled?
- Should we assume that state-owned enterprises would act contrary to U.S. interests?
- Would private-sector companies be less hostile or even supportive of free enterprise and U.S. interests?

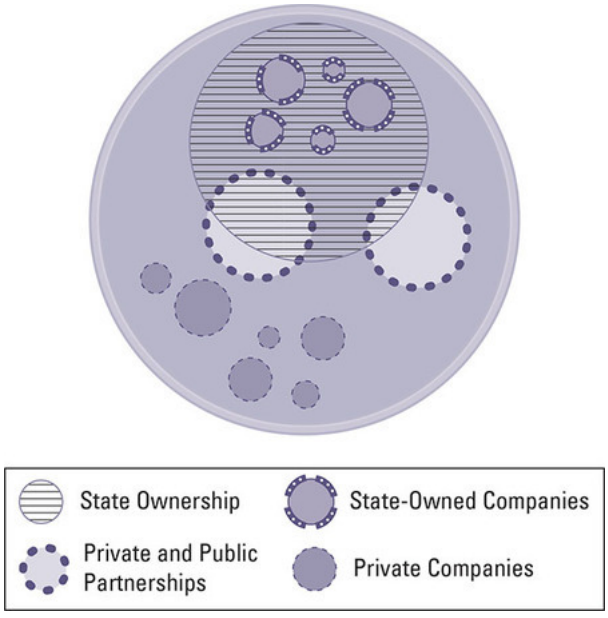


Figure 6.7C Venn Diagram of Zambrian Corporations

Each of these assumptions, made explicit by the Venn diagram, can now be challenged. For example, the original statement may have oversimplified the problem. Perhaps the threat may be broader than

just state-owned enterprises. Could Zambria exert influence through its private companies or private-public partnerships?

The original statement refers to investment in U.S. port infrastructure projects by companies in Zambria. The overlap in the two circles in Figure 6.7d depicts which of these companies are investing in U.S. port infrastructure projects. The Venn diagram shows that only private Zambrian companies and one private-public partnership are investing in U.S. port infrastructure projects. Additional circles could be added showing the level of investment in U.S. port infrastructure improvement projects by companies from other countries. The large circle enveloping all the smaller circles would represent the entirety of foreign investment in all U.S. infrastructure projects. By including this large circle, readers get a sense of what percentage of total foreign investment in U.S. infrastructure is targeted on port improvement projects.

Figure 6.7d, however, raises several additional questions:

- Can we assume Zambrian investors are the biggest investors in U.S. port infrastructure projects? Who would be their strongest competitors? How much influence does their share of the investment pie give them?
- Can we estimate the overall amount of Zambrian investment in infrastructure projects and where it is directed? If Zambrian state-owned companies are investing in other U.S. projects, are the investments related only to companies doing work in the United States or also overseas?
- Do we know the relative size of current port infrastructure improvement projects in the United States as a proportion of all port improvement investments being made globally? What percentage of foreign companies are working largely overseas in projects to improve port infrastructure or critical infrastructure as more broadly defined? What percentage of these companies are functioning as global enterprises or as state-owned or state-controlled companies?

Many analytic arguments highlight differences and trends, but it is important to put these differences into perspective before becoming too engaged in the argument. By using Venn Analysis to examine the relationships between the overlapping areas of the Venn diagram, analysts have a more rigorous base from which to organize and develop their arguments. In this case, if the relative proportions are correct, the Venn Analysis would reveal a more important national security concern: Zambria's position as an investor in U.S. port infrastructure improvement projects could give it significant economic as well as military advantage.

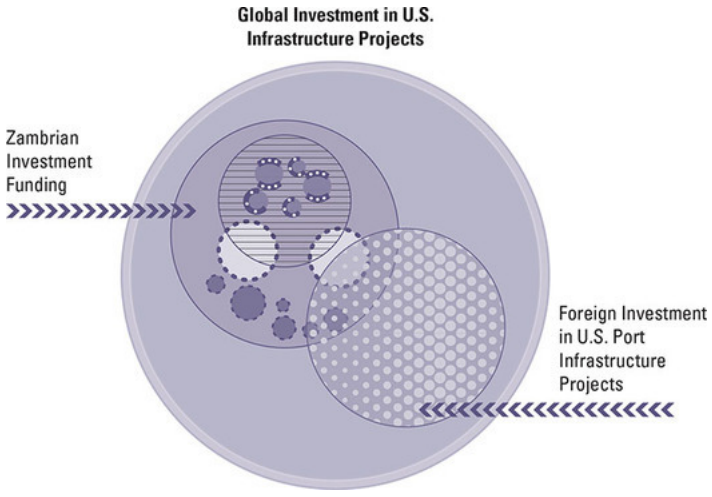


Figure 6.7D Zambrian Investments in Global Port Infrastructure Projects

Relationship to Other Techniques

Venn Analysis is like other decomposition and visualization techniques discussed in chapter 5. It is also useful as a graphical way to conduct a Key Assumptions Check or assess whether alternative hypotheses are mutually exclusive—two techniques described in chapter 7.

Origins of This Technique

This application of Venn diagrams as a tool for intelligence analysis was developed by John Pyrik for the Government of Canada. The materials are used with the permission of the Canadian government. For more discussion of this concept, see Peter Suber, Earlham College, “Symbolic Logic,” at http://legacy.earlham.edu/~peters/courses/log/loghome.htm; and Lee Archie, Lander University, “Introduction to Logic,” at http://philosophy.lander.edu/logic.

6.8 NETWORK ANALYSIS

Network Analysis is the review, compilation, and interpretation of data to determine the presence of associations among individuals, groups, businesses, or other entities; the meaning of those associations to the people involved; and the degrees and ways in which those associations can be strengthened or weakened.[8] It is the best method available to help analysts understand and identify opportunities to influence the behavior of a set of actors about whom information is sparse. In the fields of law enforcement and national security, information used in Network Analysis usually comes from informants or from physical or technical surveillance. These networks are most often clandestine and therefore not visible to open source collectors. Although software has been developed to help collect, sort, and map data, it is not essential to many of these analytic tasks. Social Network Analysis, which involves measuring associations, does require software.

Analysis of networks is broken down into three stages, and analysts can stop at the stage that answers their questions:

- **Network Charting** is the process of and associated techniques for identifying people, groups, things, places, and events of interest (nodes) and drawing connecting lines (links) between them according to various types of association. The product is often referred to as a Link Chart.
- **Network Analysis** is the process and techniques that strive to make sense of the data represented by the chart by grouping associations (sorting) and identifying patterns in and among those groups.
- **Social Network Analysis** (SNA) is the mathematical measuring of variables related to the distance between nodes and the

types of associations to derive even more meaning from the chart, especially about the degree and type of influence one node has on another.

When to Use It

Network Analysis is used extensively in law enforcement, counterterrorism analysis, and analysis of transnational issues, such as narcotics and weapons proliferation, to identify and monitor individuals who may be involved in illegal activity. It is often the first step in an analysis as it helps the analyst map who is involved in an issue, how much each individual matters, and how individuals relate to one another. Network Charting (or Link Charting) is used literally to “connect the dots” between people, groups, or other entities of intelligence or criminal interest. Network Analysis puts these dots in context, and Social Network Analysis helps identify hidden associations and degrees of influence between the dots.

Value Added

Network Analysis is effective in helping analysts identify and understand patterns of organization, authority, communication, travel, financial transactions, or other interactions among people or groups that are not apparent from isolated pieces of information. It often identifies key leaders, information brokers, or sources of funding. It can identify additional individuals or groups who need to be investigated. If done over time, it can help spot change within the network. Indicators monitored over time may signal preparations for offensive action by the network or may reveal opportunities for disrupting the network.

SNA software helps analysts accomplish these tasks by facilitating the retrieval, charting, and storage of large amounts of information. Software is not necessary for this task, but it is enormously helpful. The Social Network Analysis software included in many Network Analysis packages is essential for measuring associations.

The Method

Analysis of networks attempts to answer the question, “Who is related to whom and what is the nature of their relationship and role in the network?” The basic Network Analysis software identifies key nodes and shows the links between them. SNA software measures the frequency of flow between links and explores the significance of key attributes of the nodes. We know of no software that does the intermediate task of grouping nodes into meaningful clusters, though algorithms do exist and are used by individual analysts. In all cases, however, you must interpret what is represented, looking at the chart to see how it reflects organizational structure, modes of operation, and patterns of behavior.

Network Charting.

The key to good Network Analysis is to begin with a good chart. An example of such a chart is Figure 6.8a, which shows the terrorist network behind the attacks of September 11, 2001. It was compiled by networks researcher Valdis E. Krebs using data available from news sources on the internet in early 2002.

Several tried and true methods for making good charts will help the analyst to save time, avoid unnecessary confusion, and arrive more quickly at insights. Network charting usually involves the following steps:

- Identify at least one reliable source or stream of data to serve as a beginning point.
- Identify, combine, or separate nodes within this reporting.
- List each node in a database, association matrix, or software program.



Description

Figure 6.8A Social Network Analysis: The September 11 Hijackers

Source: Valdis Krebs, “Connecting the Dots: Tracking Two Identified Terrorists,” Figure 3, Orgnet.com, last modified 2008, www.orgnet.com/tnet.html. Reproduced with permission of the author.

- Identify interactions among individuals or groups.

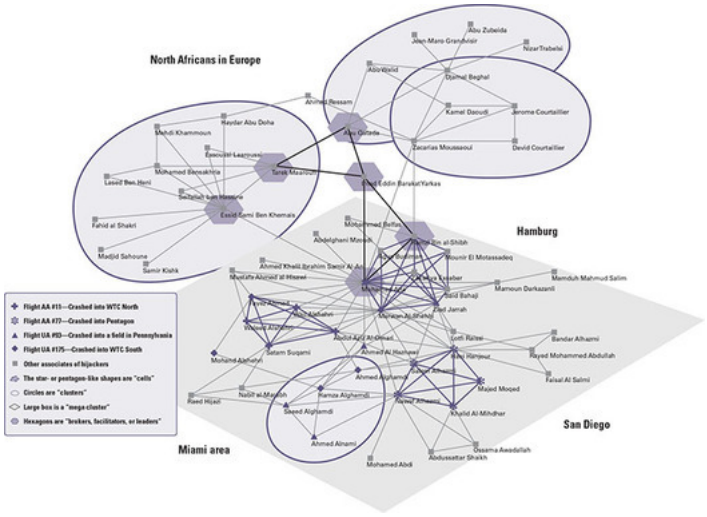
- List interactions by type in a database, association matrix, or software program.
- Identify each node and interaction by some criterion that is meaningful to your analysis. These criteria often include frequency of contact, type of contact, type of activity, and source of information.
- Draw the connections between nodes—connect the dots—on a chart by hand, using a computer drawing tool, or using Network Analysis software. If you are not using software, begin with the nodes that are central to your intelligence question. Make the map more informative by presenting each criterion in a different color or style or by using icons or pictures. A complex chart may use all these elements on the same link or node. The need for additional elements often happens when the intelligence question is murky (for example, when “I know something bad is going on, but I don’t know what”); when the chart is being used to answer multiple questions; or when a chart is maintained over a long period of time.
- Work out from the central nodes, adding links and nodes until you run out of information from the good sources.
- Add nodes and links from other sources, constantly checking them against the information you already have. Follow all leads, whether they are people, groups, things, or events, regardless of source. Make note of the sources.
- Stop in these cases: When you run out of information, when all the new links are dead ends, when all the new links begin to turn in and start connecting with one another like a spider’s web, or when you run out of time.
- Update the chart and supporting documents regularly as new information becomes available, or as you have time. Just a few minutes a day will pay enormous dividends.
- Rearrange the nodes and links so that the links cross over one another as little as possible. This is easier if you are using software. Many software packages can rearrange the nodes and links in various ways.
- Cluster the nodes. Do this by looking for “dense” areas of the chart and relatively “empty” areas.
- Draw shapes around the dense areas. Use a variety of shapes, colors, and line styles to denote different types of clusters, your relative confidence in the cluster, or any other criterion you deem important.
- “Cluster the clusters,” if you can, using the same method.
- Label each cluster according to the common denominator among the nodes it contains. In doing this, you will identify groups, events, activities, and/or key locations. If you have in mind a model for groups or activities, you may be able to identify gaps in the chart by what is or is not present that relates to the model.
- Look for “cliques”—a group of nodes in which every node is connected to every other node in the group, though not to many nodes outside the group. These groupings often look like stars or pentagons. In the intelligence world, they often turn out to be clandestine cells.
- Look in the empty spaces for nodes or links that connect two clusters. Highlight these nodes with shapes or colors. These nodes are brokers, facilitators, leaders, advisers, media, or some other key connection that bears watching. They also point where the network is susceptible to disruption.
- Chart the flow of activities between nodes and clusters. You may want to use arrows and time stamps. Some software applications will allow you to display dynamically how the chart has changed over time.

- Analyze this flow. Does it always go in one direction or in multiple directions? Are the same or different nodes involved? How many different flows are there? What are the pathways? By asking these questions, you can often identify activities, including indications of preparation for offensive action and lines of authority. You can also use this knowledge to assess the resiliency of the network. If one node or pathway were removed, would there be alternatives already built in?

- Continually update and revise as nodes or links change.

Network Analysis.

Figure 6.8b is a modified version of the 9/11 hijacker network depicted in Figure 6.8a. It identifies the different types of clusters and nodes discussed under Network Analysis. Cells are star-like or pentagon-like line configurations, potential cells with star-like or pentagon-like line configurations are circled, and the large diamond surrounds a cluster of cells. Brokers are shown as nodes overlaid with small hexagons. Note the broker in the center. This node has connections to all but one of the other brokers. This is a senior leader: Al-Qaeda's former head of operations in Europe, Imad Eddin Barakat Yarkas.



Description

Figure 6.8B Social Network Analysis: September 11 Hijacker Key Nodes

Source: Based on Valdis Krebs, "Connecting the Dots: Tracking Two Identified Terrorists," Figure 3, Orgnet.com, last modified 2008, www.orgnet.com/tnet.html. Reproduced with permission of the author. With revisions by Cynthia Storer.

Social Network Analysis.

Social Network Analysis requires a specialized software application. It is important, however, for analysts to familiarize themselves with the basic process and measures and the specialized vocabulary used to describe position and function within the network. The following three types of centrality are illustrated in Figure 6.8c:

- Degree centrality: This is measured by the number of direct connections that a node has with other nodes. In the network depicted in Figure 6.8c, Deborah has the most direct connections. She is a "connector" or a "hub" in this network.

- Betweenness centrality: Helen has fewer direct connections than does Deborah, but she plays a vital role as a "broker" in the network. Without her, Ira and Janice would be cut off from the rest of

the network. A node with high “betweenness” has great influence over what flows—or does not flow—through the network.

- Closeness centrality: Frank and Gary have fewer connections than does Deborah, yet the pattern of their direct and indirect ties allows them to access all the nodes in the network more quickly than anyone else. They are in the best position to monitor all the information that flows through the network.

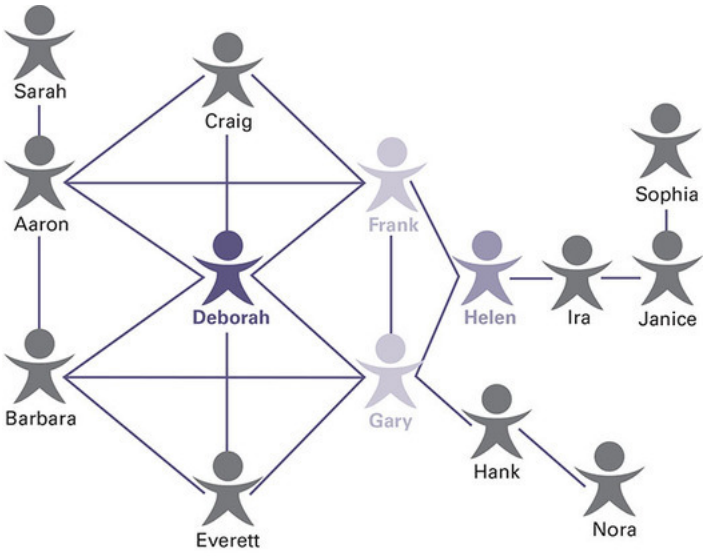
Potential Pitfalls

This method is extremely dependent upon having at least one good source of information. It is hard to know when information may be missing, and the boundaries of the network may be fuzzy and constantly changing, in which case it is difficult to determine whom to include. The constantly changing nature of networks over time can cause information to become outdated. You can be misled if you do not constantly question the data being entered, update the chart regularly, and look for gaps and consider their potential significance.

You should never rely blindly on the SNA software but strive to understand how the application works. As is the case with any software, different applications measure different things in different ways, and the devil is always in the details.

Origins of This Technique

This is an old technique transformed by the development of sophisticated software programs for organizing and analyzing large databases. Each of the following sources has made significant contributions to the description of this technique: Valdis E. Krebs, “Social Network Analysis, An Introduction,” www.orgnet.com/sna.html; Krebs, “Uncloaking Terrorist Networks,” *First Monday* 7, no. 4 (April 1, 2002), https://firstmonday.org/ojs/index.php/fm/article/view/941/863%22%3B%3E%3BNetwork; Robert A. Hanneman, “Introduction to Social Network Methods,” Department of Sociology, University of California, Riverside, http://faculty.ucr.edu/~hanneman/nettext/C1_Social_Network_Data.html#Populations; Marilyn B. Peterson, Defense Intelligence Agency, “Association Analysis,” unpublished manuscript, n.d., used with permission of the author; Cynthia Storer and Averill Farrelly, Pherson Associates, LLC; and Pherson Associates training materials.



Type of Centrality	Example
Degree	Deborah
Betweenness	Helen
Closeness	Frank and Gary

Description

Figure 6.8C Social Network Analysis

Source: Pherson Associates, LLC, 2019.

NOTES

1. Daniel Kahneman, *Thinking: Fast and Slow* (New York: Farrar, Straus and Giroux, 2011), 95–96.

2. Herbert A. Simon, “A Behavioral Model of Rational Choice,” *Quarterly Journal of Economics* LXIX (February 1955): 99–101.

3. Katherine Hibbs Pherson and Randolph H. Pherson, *Critical Thinking for Strategic Intelligence* (Washington, DC: CQ Press/SAGE), 25–26, 41–42.

4. See www.mind-mapping.org for a comprehensive compendium of information on all types of software that supports knowledge management and information organization in graphic form. Many of these software products are available at no cost.

5. Tanja Keller, Sigmar-Olaf Tergan, and John Coffey, “Concept Maps Used as a ‘Knowledge and Information Awareness’ Tool for Supporting Collaborative Problem Solving in Distributed Groups,” *Proceedings of the Second International Conference on Concept Mapping*, San José, Costa Rica, September 5–8, 2006.

6. Tony Buzan, *The Mind Map Book,* 2nd ed. (London: BBC Books, 1995).

7. Joseph D. Novak and Alberto J. Canas, *The Theory Underlying Concept Maps and How to Construct and Use Them,* Technical Report IHMC Cmap Tools 2006-01 (Pensacola, FL: Florida Institute for Human and Machine Cognition, 2006).

8. Marilyn B. Peterson, Defense Intelligence Agency, “Association Analysis,” unpublished manuscript, n.d., used with the permission of the author.

Descriptions of Images and Figures

Back to Figure

Who? Has any group threatened such an attack? Could it have occurred by accident?

What? Exactly what agent was used? Was it lethal enough to cause that many casualties?

How? How was the agent dispersed? Did the perpetrators have to be present?

Where? Does the choice of this site send a particular message? Did the location help in dispersing the agent?

When? Was the time of day significant? Was the date on a particular anniversary?

Why? What was the intent? To incite terror, cause mass casualties, or cause economic disruption? Did the attack help advance a political agenda?

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Mind maps are used in learning, meetings, education, problem, planning, presentations, and education. Learning: Recall, such as reviewing and summarizing. Noting, such as lectures, books, entertainment, and in media such as television, radio, newspapers, and computers. Meetings: Negotiations. 1 on 1s. Groups. Chairing. Summaries, such as disagreements, minutes, actions, and agreements. Education: Relationships. Place, such as year, term, and lessons. Exploration. Lecturing, such as preparing and delivering. Problem: Definition. Identification. Solving individually, in a group, and brainstorming. Planning: Creativity. Time. Personal activities, such as holidays and parties. Organization of knowledge, such as study and integrate, and projects. Presentation:

Preparations. Written, such as reports, essays, articles, exams, and projects. Oral, such as informal, formal, talks, speeches, debates, seminars, and selling.

Back to Figure

Concept maps were invented by Joseph Novak's research team, and represent organized knowledge, beliefs, and feelings. They differ from rote memorization, and are expressed in the terms of concepts and propositions. They are context dependent, and are necessary for effective teaching, effective learning, collaboration, and knowledge sharing. Concepts are defined as perceived regularities in objects and events, and are given as labels, that can be words, such as risk, hypothesis, and motive, and symbols, such as 57 percent. Propositions may be cross-links to show interrelations. They are structured in a hierarchical morphology. Interrelations and hierarchical morphology facilitate creativity, which is needed to see interrelations. Hierarchical morphology arranges context and major concepts at the top, and detailed knowledge at the bottom.

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The Venn diagram consists of three intersecting ellipses, labeled logic, data and evidence, and issue and customer identification. The intersection of logic, and issue and customer identification is framing and argumentation. The intersection of logic, and data and evidence is gaps and assumptions. The intersection of data and evidence, and issue and customer identification is source credibility. The intersection of all the ellipses is synthesis and analysis.

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In the first diagram, two ellipses, labeled cats and dogs, are within a large ellipse, labeled mammals. Text reads, "Cats are mammals. Dogs are mammals. Therefore, dogs are cats."

In the second diagram, an ellipse, labeled tigers, is within another ellipse, labeled cats, which in turn is within a larger ellipse, labeled

mammals. Text reads, “Cats are mammals. Tigers are cats. Therefore, tigers are mammals.”

Back to Figure

The interconnections are among the hijackers in flight AA number 11 that crashed into WTC north, flight AA number 77 that crashed into Pentagon, flight UA number 93 that crashed into a field in Pennsylvania, flight UA number 175 that crashed into WTC south, and their associates.

Back to Figure

The interconnections are among the hijackers in flight AA number 11 that crashed into WTC north, flight AA number 77 that crashed into Pentagon, flight UA number 93 that crashed into a field in Pennsylvania, flight UA number 175 that crashed into WTC south, and their associates. They are grouped into four small clusters, three mega clusters, cells, and brokers, facilitators, or leaders.

Back to Figure

Deborah is connected to Aaron, Craig, Barbara, Everett, Gary, and Frank. Aaron is connected to Sarah, Craig, Frank, and Barbara. Craig is connected to Frank. Barbara is connected to Gary and Everett. Everett is connected to Gary. Gary is connected to Frank, Helen, and Hank. Frank is connected to Helen and Hank. Hank is connected to Nora. Helen is connected to Ira, who in turn is connected to Janice. Accompanying table shows the type of centrality with example. Degree: Deborah. Betweenness: Helen. Closeness: Frank and Gary.

CHAPTER 7 DIAGNOSTIC TECHNIQUES

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7.9 Argument Mapping [174]

Analysis conducted by the intelligence, law enforcement, and business communities will never achieve the accuracy and predictability of a true science because the information with which analysts must work is typically incomplete, ambiguous, and

potentially deceptive. The analytic process can, however, benefit from the lessons of science and adapt some of the elements of scientific reasoning.

The scientific process involves observing, categorizing, formulating hypotheses, and then testing those hypotheses. Generating and testing hypotheses is a core function of structured analysis. A possible explanation of the past or a judgment about the future is a hypothesis that needs to be tested by collecting and presenting evidence. This chapter focuses on several key techniques that support the Diagnostic Reasoning process, including challenging key assumptions about what the information reveals, developing Chronologies and Timelines, generating alternative hypotheses, and testing the validity of hypotheses and the quality of argumentation. Practice in using three of the techniques—Key Assumptions Check, Multiple Hypothesis Generation, and Analysis of Competing Hypotheses—will help analysts become proficient in the first three of the Five Habits of the Master Thinker (see chapter 3): challenging assumptions, generating alternative explanations, and identifying inconsistent evidence.

The generation and testing of hypotheses is a skill, and its subtleties do not come naturally. It is a form of reasoning that people can learn to use for dealing with high-stakes situations. What does come naturally is drawing on our existing body of knowledge and experience (mental model) to make an intuitive judgment.[1] In most circumstances in our daily lives, this is an efficient approach that works most of the time. For intelligence analysis, however, it is not adequate, because intelligence issues are generally so complex, and the risk and cost of error are too great. Also, the situations are often novel, so the intuitive judgment shaped by past knowledge and experience may well be wrong.

Good analysis of a complex issue must start with a set of alternative hypotheses. Another practice that the experienced analyst borrows from the scientist's toolkit involves the testing of alternative hypotheses. The truth of a hypothesis can never be proven beyond

doubt by citing only evidence that is *consistent* with the hypothesis, because the same evidence may be and often is consistent with more than one hypothesis. Science often proceeds by refuting or disconfirming hypotheses. A hypothesis that cannot be refuted should be taken just as seriously as a hypothesis that seems to have a lot of evidence in favor of it. A single item of evidence that is shown to be inconsistent with a hypothesis can be grounds for rejecting that hypothesis. The most tenable hypothesis is often the one with the least evidence against it.

Analysts often test hypotheses by using a form of reasoning known as abduction, which differs from the two better known forms of reasoning, deduction and induction. Abductive reasoning starts with a set of facts. One then develops hypotheses that, if true, would provide the best explanation for these facts. The most tenable hypothesis is the one that best explains the facts. Because of the uncertainties inherent in intelligence analysis, conclusive proof or refutation of hypotheses is the exception rather than the rule.

Use of Diagnostic Techniques can provide a strong antidote to several cognitive biases. It can reduce the influence of Confirmation Bias by exposing analysts to new ideas and multiple permutations, and mitigate the impact of Evidence Acceptance Bias, which is accepting data as true because it helps create a more coherent story. Diagnostic Techniques also protect analysts against falling into the intuitive traps of Relying on First Impressions, Ignoring Inconsistent Evidence, and Projecting Past Experiences.

The first part of this chapter describes techniques for challenging key assumptions, establishing analytic baselines, and identifying the relationships among the key variables, drivers, or players that may influence the outcome of a situation. These and similar techniques allow analysts to imagine new and alternative explanations for their subject matter.

The second section describes three techniques for generating hypotheses. Other chapters include additional techniques for generating hypotheses, but which also have a variety of other

purposes. These include Cluster Brainstorming, Nominal Group Technique, and Venn Analysis (chapter 6); the Delphi Method and Classic Quadrant Crunching™ (chapter 8); various forms of Foresight analysis (chapter 9); and Critical Path Analysis and Decision Trees (chapter 10).

This chapter concludes with a discussion of five techniques for testing hypotheses, detecting deception, and evaluating the strength of an argument. These techniques spur the analyst to become more sensitive to the quality of the data and the strength of the logic and to look for information that not only confirms but can disconfirm the hypothesis. One of these, Analysis of Competing Hypotheses (ACH), was developed by Richards J. Heuer Jr. specifically for use in intelligence analysis.

OVERVIEW OF TECHNIQUES

Key Assumptions Check is one of the most important and frequently used techniques. Analytic judgment is always based on a combination of evidence and assumptions—or preconceptions—that influence how the evidence is interpreted. The Key Assumptions Check is a systematic effort to make explicit and question the assumptions (i.e., mental model) that guide an analyst's thinking.

Chronologies and Timelines are used to organize data on events or actions. They are used whenever it is important to understand the timing and sequence of relevant events or to identify key events and gaps.

Cross-Impact Matrix is a technique that can be used after any form of brainstorming that identifies a list of variables relevant to an analytic project. The results of the brainstorming session are put into a matrix, which is used to guide a group discussion that systematically examines how each variable influences all other variables to which it is related in a particular problem context. The group discussion is often a valuable learning experience that provides a foundation for further collaboration. Results of cross-impact discussions should be retained for future reference as a cross-check after the analysis is completed.

Multiple Hypothesis Generation can be accomplished in many ways. This book describes three techniques—Simple Hypotheses, Quadrant Hypothesis Generation, and the Multiple Hypothesis Generation. Simple Hypotheses is the easiest to use but not always the best selection. Quadrant Hypothesis Generation is used to identify a set of hypotheses when the outcome is likely to be determined by just two driving forces. Multiple Hypothesis Generation is used to identify a large set of possible hypotheses. The latter two techniques are particularly useful in identifying sets of

Mutually **E**xclusive and **C**omprehensively **E**xhaustive (MECE) hypotheses.

Diagnostic Reasoning applies hypothesis testing to the evaluation of significant new information. Such information is evaluated in the context of all plausible explanations of that information, not just in the context of the analyst's well-established mental model. The use of Diagnostic Reasoning reduces the risk of surprise, as it ensures that an analyst will have considered some alternative conclusions. Diagnostic Reasoning differs from the ACH technique in that it evaluates a single item of evidence; ACH deals with an entire issue involving multiple pieces of evidence and a more complex analytic process.

Analysis of Competing Hypotheses is the application of Karl Popper's philosophy of science to the field of intelligence analysis.[2] Popper was one of the most influential philosophers of science of the twentieth century. He is known for, among other things, his position that scientific reasoning should start with multiple hypotheses and proceed by rejecting or eliminating hypotheses, tentatively accepting only those hypotheses that cannot be refuted. This process forces an analyst to recognize the full uncertainty inherent in most analytic situations. ACH helps the analyst sort and manage relevant information to identify paths for reducing that uncertainty.

The Inconsistencies Finder™ is a simplified version of ACH that helps analysts evaluate the relative credibility of a set of hypotheses based on the amount of identified disconfirming information. It provides a quick framework for identifying inconsistent data and discovering the hypotheses that are most likely to be correct.

Deception Detection employs a set of checklists analysts can use to determine when to anticipate deception, how to determine if one is being deceived, and what to do to avoid being deceived. It is also useful for detecting the presence of Digital Disinformation or "Fake News." The possibility of deception by a foreign intelligence service, economic competitor, or other adversary organization is a distinctive

type of hypothesis that can be included in any ACH analysis. Information identified through the Deception Detection technique can then be entered as relevant information in an ACH matrix.

Argument Mapping is a method that can be used to put a single hypothesis to a rigorous logical test. The structured visual representation of the arguments and evidence makes it easier to evaluate any analytic judgment. Argument Mapping is a logical follow-on to an ACH analysis. It is a detailed presentation of the arguments for and against a single hypothesis; ACH is a more general analysis of multiple hypotheses. The successful application of Argument Mapping to the hypothesis favored by the ACH analysis would increase confidence in the results of both analyses.

7.1 KEY ASSUMPTIONS CHECK

Analytic judgment is always based on a combination of evidence and assumptions, or preconceptions, which influences how the evidence is interpreted.[3] The Key Assumptions Check is a systematic effort to make explicit and question the assumptions (the mental model) that guide an analyst's interpretation of evidence and reasoning about a problem. Such assumptions are usually necessary and unavoidable as a means to fill gaps in the incomplete, ambiguous, and sometimes deceptive information with which the analyst must work. They are driven by the analyst's education, training, and experience, plus the organizational context in which the analyst works.

> *An organization really begins to learn when its most cherished assumptions are challenged by counterassumptions. Assumptions underpinning existing policies and procedures should therefore be unearthed, and alternative policies and procedures put forward based upon counterassumptions.*
>
> —Ian I. Mitroff and Richard O. Mason, *Creating a Dialectical Social Science: Concepts, Methods, and Models* (1981)

The Key Assumptions Check is one of the most common techniques used by intelligence analysts because they typically need to make assumptions to fill information gaps. In the intelligence world, these assumptions are often about another country's intentions or capabilities, the way governmental processes usually work in that country, the relative strength of political forces, the trustworthiness or accuracy of key sources, the validity of previous analyses on the same subject, or the presence or absence of relevant changes in the context in which the activity is occurring. Assumptions are often difficult to identify because many sociocultural beliefs are held

unconsciously or so firmly that they are assumed to be truth and not subject to challenge.

When to Use It

Any explanation of current events or estimate of future developments requires the interpretation of evidence. If the available evidence is incomplete or ambiguous, this interpretation is influenced by assumptions about how things normally work in the country or company of interest. These assumptions should be made explicit early in the analytic process.

If a Key Assumptions Check is not done at the outset of a project, it can still prove extremely valuable if done during the coordination process or before conclusions are presented or delivered. When a Key Assumptions Check is done early in the process, it is often desirable to review the assumptions again later—for example, just before or just after drafting the report. The task is to determine whether the assumptions still hold true or should be modified.

When tracking the same topic or issue over time, analysts should consider reassessing their key assumptions on a periodic basis, especially following a major new development or surprising event. If, on reflection, one or more key assumptions no longer appear to be well-founded, analysts should inform key policymakers or corporate decision makers working that target or issue that a foundational construct no longer applies or is at least doubtful.

Value Added

Preparing a written list of one's working assumptions at the beginning of any project helps the analyst do the following:

- Identify the specific assumptions that underpin the basic analytic line.
- Achieve a better understanding of the fundamental dynamics at play.
- Gain a better perspective and stimulate new thinking about the issue.
- Discover hidden relationships and links among key factors.
- Identify what developments would call a key assumption into question.
- Avoid surprises should new information render old assumptions invalid.

A Key Assumptions Check helps analysts mitigate the impact of heuristics that, when misapplied, can impede analytic thinking, including the tendency to accept a given value of an assumption or something unknown as a proper starting point for generating an assessment (Anchoring Effect), reaching an analytic judgment before sufficient information is collected and proper analysis performed (Premature Closure), and judging the frequency of an event by the ease with which instances come to mind (Availability Heuristic). It also safeguards an analyst against several classic mental mistakes, including the tendency to overdraw conclusions when presented with only a small amount of data (Overinterpreting Small Samples), assume the same dynamic is in play when

something appears to be in accord with past experiences (Projecting Past Experiences), and failing to factor something into the analysis because the analyst lacks an appropriate category or “bin” for that item of information (Lacking Sufficient Bins).

Conducting a Key Assumptions Check gives analysts a better understanding of the suppositions underlying their key judgments or conclusions. Doing so helps analysts establish how confident they should be in making their assessment and disseminating their key findings.

The Method

The process of conducting a Key Assumptions Check is relatively straightforward in concept but often challenging to put into practice. One challenge is that participating analysts must be open to the possibility that they could be wrong. It helps to involve several well-regarded analysts who are generally familiar with the topic but have no prior commitment to any set of assumptions about the issue in the process. Engaging a facilitator is also highly recommended. Keep in mind that many “key assumptions” turn out to be “key uncertainties.” Randolph Pherson’s extensive experience as a facilitator of analytic projects indicates that approximately one in every four key assumptions collapses on careful examination.

The following are steps in conducting a Key Assumptions Check:

- Gather a small group of individuals who are working the issue along with a few “outsiders.” The primary analytic unit already is working from an established mental model, so the “outsiders” are needed to bring a different perspective.

- Ideally, the facilitator should notify participants about the topic beforehand and ask them to bring to the meeting a list of assumptions they make about the topic. If they do not do this beforehand, start the meeting with a silent brainstorming session by asking each participant to write down several assumptions on an index card.

- Collect the cards and list the assumptions on a whiteboard or easel for all to see.

- Elicit additional assumptions. Work from the prevailing analytic line to identify additional arguments that support it. Use various devices to help prod participants’ thinking:

- Ask the standard journalistic questions. Who: Are we assuming that we know who all the key players are? What: Are we assuming that we know the goals of the key players? How: Are we assuming that we know how they are going to act? When: Are we assuming that conditions have not changed since our last report or that they will not change in the foreseeable future? Where: Are we assuming that we know where the real action is going to be? Why: Are we assuming that we understand the motives of the key players?

- Use of phrases such as “will always,” “will never,” or “would have to be” suggests that an idea is not being challenged. Perhaps it should be.

- Use of phrases such as “based on” or “generally the case” suggests the presence of a challengeable assumption.

- When the flow of assumptions starts to slow down, ask, “What else seems so obvious that one would not normally think about challenging it?” If no one can identify more assumptions, then there is an assumption that they do not exist, which itself is an assumption subject to challenge.

- After identifying a full set of assumptions, critically examine each assumption and ask,

    - Why am I confident that this assumption is correct?

    - In what circumstances might this assumption be untrue?

    - Could it have been true in the past but not any longer?

    - How much confidence do I have that this assumption is valid?

    - If it turns out to be invalid, how much impact would this have on the analysis?

- Place each assumption in one of three categories:

    - Basically solid (S)
    - Correct with some caveats (C)
    - Unsupported or questionable—the “key uncertainties” (U)

- Refine the list. Delete assumptions that do not hold up to scrutiny and add new ones that emerge from the discussion. If an assumption generates a lot of discussion, consider breaking it into two assumptions or rephrasing it to make the statement more explicit. Above all, emphasize those assumptions that would, if wrong, lead to changing the analytic conclusions.
- Consider whether key uncertainties should be converted into intelligence collection requirements or research topics.

When concluding the analysis, remember that the probability of your analytic conclusion being accurate cannot be greater than the weakest link in your chain of reasoning. Review your assumptions, assess the quality of evidence and reliability of sources, and consider the overall difficulty and complexity of the issue. Then make a rough estimate of the probability that your analytic conclusion will turn out to be wrong. Use this number to calculate the rough probability of your conclusion turning out to be accurate. For example, a three in four chance (75 percent) of being right equates to a one in four chance (25 percent) of being wrong. This focus on how and why we might be wrong is needed to offset the natural human tendency toward reluctance to admit we might be wrong.

Figure 7.1 shows apparently flawed assumptions made in the Wen Ho Lee espionage case during the 1990s and what further investigation showed about these assumptions. A Key Assumptions Check could have identified weaknesses in the case against Lee much earlier.

Relationship to Other Techniques

The Key Assumptions Check is frequently paired with other techniques because assumptions play an important role in all structured analytic efforts. It is important to get them right. For example, when an assumption is critical to an analysis, and questions remain about the validity of that assumption, it may be desirable to follow the Key Assumptions Check with a What If? Analysis. Imagine a future (or a present) in which the assumption is wrong. What could have happened to make it wrong, how could that have happened, and what are the consequences?

U.S. scientists in the 1990s observed that China had made rapid advances in nuclear warhead miniaturization and that the new design closely resembled a U.S. design. The discovery occurred at a time when the United States sought to expand relations with China, and Chinese espionage against U.S. technology targets—especially nuclear weapons data at national laboratories—was receiving widespread publicity in the media. U.S. Department of Energy investigators opened an inquiry that focused on individuals who held special Top Secret clearances for work on nuclear data in the national labs, who dealt with visiting delegations from China, and who had traveled to China between 1984 and 1988. Investigators quickly narrowed their focus to Wen Ho Lee, a Taiwanese-American nuclear weapons specialist at Los Alamos National Laboratory in New Mexico. These and several other assumptions led investigators to seek Lee's indictment on fifty-nine counts of illegally removing highly classified information from Los Alamos. He ultimately pled guilty to only one count of mishandling a controlled document, was sentenced to time served, and was released in September 2000.

Assumption	Assessment
China is developing good access to U.S. scientists.	**Solid.** In the post–Cold War environment, the United States was emphasizing the value of developing strategic partnerships with former adversaries.
China has an aggressive program to collect information and intelligence from U.S. scientists.	**Solid.** The Chinese have an extensive network of scientific colleagues and informants to gather data both openly and covertly.
A Taiwanese American would spy for China.	**Caveated.** Taiwan and China are rivals, and which country to spy for would be influenced by where one's close relatives resided and by past loyalties.
Lee passed secret information.	**Caveated.** The information was not classified. It was protected as restricted data.
Lee is the spy.	**Unsupported.** Lee did not have access to the actual information allegedly passed. In fact, the information included revisions made to the design after he lost access to it.
China could have made rapid advances only with the help of stolen secrets; the Chinese could not have pieced together information from open sources or through sanctioned scientific contacts.	**Unsupported.** Almost all the information was in the public domain.
The stolen data was unique to Los Alamos; individuals at other locations were unlikely to have provided the information.	**Unsupported.** The information could also have been obtained from other labs. It also could have come from thirty-six other Chinese employees working at the labs or from thirty-six other Chinese employees working at the labs or from Russian scientists.

Figure 7.1 Key Assumptions Check: The Case of Wen Ho Lee

Source: Pherson Associates, LLC, 2019.

There is a particularly noteworthy interaction between Key Assumptions Check and ACH. Key assumptions need to be included as "evidence" in an ACH matrix to ensure that the matrix is an accurate reflection of the analyst's thinking. Assumptions often emerge during a discussion of relevant information while filling out an ACH matrix. This happens when an analyst assesses the consistency or inconsistency of an item of evidence with a hypothesis and concludes that the designation is dependent upon something else—usually an assumption. Classic Quadrant Crunching™ (chapter 8) and Simple Scenarios, the Cone of Plausibility, and Reversing Assumptions (chapter 9) all use assumptions and their opposites to generate multiple explanations or outcomes.

Origins of This Technique

Although assumptions have been a topic of analytic concern for a long time, the idea of developing a specific analytic technique to focus on assumptions did not occur until the late 1990s. The discussion of Key Assumptions Check in this book is from Randolph H. Pherson, *Handbook of Analytic Tools and Techniques*, 5th ed. (Tysons, VA: Pherson Associates, LLC, 2019).

7.2 CHRONOLOGIES AND TIMELINES

A Chronology is a list that places events or actions in the order in which they occurred, usually in narrative or bulleted format. A Timeline is a graphic depiction of those events put in context of the time of the events and the time between events. Both are used to identify trends or relationships among the events or actions and, in the case of a Timeline, among the events and actions as well as other developments in the context of the overarching intelligence problem.

When to Use It

Chronologies and Timelines aid in organizing events or actions. The techniques are useful whenever analysts need to understand the timing and sequence of relevant events. They can also reveal significant events or important gaps in the available information. The events may or may not have a cause-and-effect relationship.

Chronologies and Timelines are usually developed at the onset of an analytic task to ascertain the context of the activity under review. They can be used in postmortems to break down the stream of reporting, find the causes for analytic failures, and highlight significant events after an intelligence or business surprise. Chronologies and Timelines are also useful for organizing information in a format that can be readily understood in a briefing or when presenting evidence to a jury.

Value Added

Chronologies and Timelines help analysts identify patterns and correlations among events. Analysts can use them to relate seemingly disconnected events to the big picture; to highlight or identify significant changes; or to assist in the discovery of trends, developing issues, or anomalies. They can serve as a catchall for raw data when the meaning of the data is not yet clear. Multiple-level Timelines allow analysts to track concurrent events that may affect one another.

The activities on a Timeline can lead an analyst to hypothesize the existence of previously unknown events. In other words, the series of known events may make sense only if other previously unknown events had occurred. The analyst can then look for other indicators of those missing events.

Chronologies and Timelines are useful tools analysts can use to counter the impact of cognitive biases and heuristics, including accepting data as true without assessing its credibility because it helps “make the case” (Evidence Acceptance Bias), seeing patterns in random events as systematic and part of a coherent story (Desire for Coherence and Uncertainty Reduction), and providing quick and easy answers to difficult problems (Mental Shotgun). It can also mitigate the impact of several intuitive traps, including giving too much weight to first impressions or initial data that attracts our attention at the time (Relying on First Impressions), not paying sufficient attention to the impact of the absence of information (Ignoring the Absence of Information), and discarding or ignoring information that is inconsistent with what one would expect to see (Ignoring Inconsistent Evidence).

The Method

Chronologies and Timelines are effective yet simple ways to order incoming information when processing daily message traffic. A Microsoft Word document or an Excel spreadsheet can log the results of research and marshal evidence. Tools such as the Excel drawing function or Analysts' Notebook can be helpful in drawing the Timeline. Follow these steps:

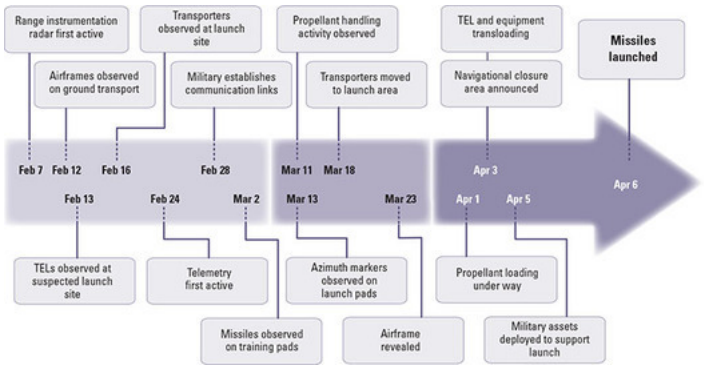
- When researching the problem, ensure that the relevant information is listed with the date or order in which it occurred. It is important to properly reference the data to help uncover potential patterns or links. Be sure to distinguish between the date the event occurred and the date the report was received.
- Review the Chronology or Timeline by asking the following questions:
    - What are the temporal distances between key events? If "lengthy," what caused the delay? Are there missing pieces of data that may fill those gaps that should be collected?
    - Was information overlooked that may have had an impact on or be related to the events?
    - Conversely, if events seem to have happened more rapidly than expected or if some of the events do not appear to be related, is it possible that the analyst has information related to multiple event Timelines?
    - Does the Timeline have all the critical events that are necessary for the outcome to occur?

    - When did the information become known to the analyst or a key player?
    - Are there information or intelligence gaps?
    - Are there any points along the Timeline when the target is particularly vulnerable to the collection of intelligence or information or countermeasures?
    - What events outside this Timeline could have influenced the activities?

- If preparing a Timeline, synopsize the data along a horizontal or vertical line. Use the space on both sides of the line to highlight important analytic points. For example, place facts above the line and points of analysis or commentary below the line. Alternatively, contrast the activities of different groups, organizations, or streams of information by placement above or below the line. If multiple actors are involved, you can use multiple lines, showing how and where they converge. For example, multiple lines could be used to show (1) the target's activities, (2) open source reporting about the events, (3) supplemental classified or proprietary information, and (4) analytic observations or commentary.
- Look for relationships and patterns in the data connecting persons, places, organizations, and other activities. Identify gaps or unexplained time periods, and consider the implications of the absence of evidence.
- Prepare a summary chart detailing key events and key analytic points in an annotated Timeline.

Potential Pitfalls

In using Timelines, analysts may assume, incorrectly, that events following earlier events were *caused* by the earlier events. Also, the value of this technique may be reduced if the analyst lacks imagination in identifying contextual events that relate to the information in the Chronology or Timeline.



Description

Figure 7.2 Timeline Estimate of Missile Launch Date

Source: Pherson Associates, LLC, 2019.

Note: A TEL is a transporter, erector, and launcher for missiles.

Example

A team of analysts working on strategic missile forces knows what steps are necessary to prepare for and launch a nuclear missile. (See Figure 7.2.) The analysts have been monitoring a country they believe is close to testing a new variant of its medium-range surface-to-surface ballistic missile. They have seen the initial steps of a test launch in mid-February and decide to initiate a concentrated watch of the primary and secondary test launch facilities. Observed and expected activities are placed into a Timeline to gauge the potential dates of a test launch. The analysts can thus estimate when a possible missile launch may occur and make decision makers aware of indicators of possible activity.

Origins of This Technique

Chronologies and Timelines are well-established techniques used in many fields. The information here is from M. Jones, “Sorting, Chronologies, and Timelines,” *The Thinker’s Toolkit* (New York: Three Rivers Press, 1998), chapter 6; and from Pherson Associates training materials.

7.3 CROSS-IMPACT MATRIX

The Cross-Impact Matrix helps analysts deal with complex problems when “everything is related to everything else.” By using this technique, analysts and decision makers can systematically examine how each factor in a context influences all other factors to which it appears related.

When to Use It

The Cross-Impact Matrix is useful early in a project when a group is still in a learning mode trying to sort out a complex situation. Whenever a brainstorming session or other meeting is held to identify all the variables, drivers, or players that may influence the outcome of a situation, the next logical step is to use a Cross-Impact Matrix to examine the interrelationships among each of these variables. A group discussion of how each pair of variables interacts can be an enlightening learning experience and a good basis on which to build ongoing collaboration. How far one goes in completing the matrix and producing a description of the effects associated with each variable may vary depending upon the nature and significance of the project. At times, just the discussion is adequate.

Analysis of cross-impacts is useful when the following occurs:

- A situation is in flux, and analysts need to understand all the factors that might influence the outcome. This requires understanding how all the factors relate to one another, and how they might influence one another.
- A situation is stable, and analysts need to identify and monitor all the factors that could upset that stability. This, too, requires understanding how the various factors might interact to influence one another.
- A significant event has just occurred, and analysts need to understand the implications of the event. What other significant forces are influenced by the event, and what are the implications of this influence?

Value Added

When analysts are estimating or forecasting future events, they consider the dominant forces and potential future events that might influence an outcome. They then weigh the relative influence or likelihood of these forces or events, often considering them individually without regard to potentially important interactions. The Cross-Impact Matrix provides a context for the discussion of these interactions. This discussion often reveals that variables or issues once believed to be simple and independent are interrelated. The sharing of information during a discussion of each potential cross-impact can provide an invaluable learning experience. For this reason alone, the Cross-Impact Matrix is a useful tool that can be applied at some point in almost any study that seeks to explain current events or forecast future outcomes.

The Cross-Impact Matrix provides a structure for managing the complexity that makes most analysis so difficult. It requires that analysts clearly articulate all assumptions about the relationships among variables. Doing so helps analysts defend or critique their conclusions by tracing the analytical argument back through a path of underlying premises.

Use of the Cross-Impact Matrix is particularly effective in helping analysts avoid being influenced by heuristics such as stopping the search for a cause when a seemingly satisfactory answer is found (Premature Closure), selecting the first answer that appears “good enough” (Satisficing), and seeing patterns in random events as systematic and part of a coherent world (Desire for Coherence and Uncertainty Reduction). It can also provide a powerful antidote to several intuitive pitfalls, including overinterpreting conclusions from a small sample of data (Overinterpreting Small Samples), giving too much weight to first impressions or initial data that appears important at the time (Relying on First Impressions), and continuing to hold to a

judgment when confronted with additional or contradictory evidence (Rejecting Evidence).

The Method

Assemble a group of analysts knowledgeable on various aspects of the subject. The group brainstorms a list of variables or events that would likely have some effect on the issue being studied. The project coordinator then creates a matrix and puts the list of variables or events down the left side of the matrix and the same variables or events across the top.

The group then fills out the matrix, considering, and then recording, the relationship between each variable or event and every other variable or event. For example, does the presence of Variable 1 increase or diminish the influence of Variables 2, 3, 4, and so on? Or does the occurrence of Event 1 increase or decrease the likelihood of Events 2, 3, 4, and so forth? If one variable does affect the other, the positive or negative magnitude of this effect can be recorded in the matrix by entering a large or small + or a large or small – in the appropriate cell (or by making no marking at all if there is no significant effect). The terminology used to describe the relationship between each pair of variables or events is based on whether it is “enhancing,” “inhibiting,” or “unrelated.”

The matrix shown in Figure 7.3 has six variables, with thirty possible interactions. Note that the relationship between each pair of variables is assessed twice, as the relationship may not be symmetric. That is, the influence of Variable 1 on Variable 2 may not be the same as the impact of Variable 2 on Variable 1. It is not unusual for a Cross-Impact Matrix to have substantially more than thirty possible interactions, in which case careful consideration of each interaction can be time-consuming.

	Variable 1	Variable 2	Variable 3	Variable 4	Variable 5	Variable 6
Variable 1			+		–	
Variable 2			-	+	+	+
Variable 3	+	-		+		-
Variable 4		+			+	-
Variable 5	–	+		+		
Variable 6	-	+	–	-	-	

Variables 2 and 4 in the Cross-Impact Matrix above have the greatest effect on the other variables, while Variable 6 has the most negative effect.

Direction and magnitude of the effect:
+ strong positive
+ positive
neutral
- negative
– strong negative

Description

Figure 7.3 Cross-Impact Matrix

Analysts should use the Cross-Impact technique to focus on significant interactions between variables or events that may have been overlooked, or combinations of variables that might reinforce one another. Combinations of variables that reinforce one another can lead to surprisingly rapid changes in a predictable direction. On the other hand, recognizing that there is a relationship among variables and the direction of each relationship may be sufficient for some problems.

The depth of discussion and the method used for recording the results are discretionary. Each depends upon how much you are learning from the discussion, which will vary from one application of this matrix to another. If the group discussion of the likelihood of these variables or events and their relationships to one another is a productive learning experience, keep it going. If key relationships are identified that are likely to influence the analytic judgment, fill in all cells in the matrix and take good notes. If the group does not seem to be learning much, cut the discussion short.

As a collaborative effort, team members can conduct their discussion—and periodically review—their key findings online. As time permits, analysts can enter new information or edit previously entered information about the interaction between each pair of variables. This record will serve as a point of reference or a memory jogger throughout the project.

Relationship to Other Techniques

Matrices as a generic technique with many types of applications are discussed in chapter 5. The use of a Cross-Impact Matrix as described here frequently follows some form of brainstorming at the start of an analytic project. Elicit the assistance of other knowledgeable analysts in exploring all the relationships among the relevant factors identified in the brainstorming session. Analysts can build on the discussion of the Cross-Impact Matrix by developing a visual Mind Map or Concept Map of all the relationships.

See also the discussion of the Complexity Manager technique in chapter 10. An integral part of the Complexity Manager technique is a form of Cross-Impact Analysis that takes the analysis a step further toward an informed conclusion.

Origins of This Technique

The Cross-Impact Matrix technique was developed in the 1960s as one element of a quantitative futures analysis methodology called Cross-Impact Analysis. Richards J. Heuer Jr. became familiar with it when the CIA was testing the Cross-Impact Analysis methodology. He started using it as an intelligence analysis technique, as described here, more than forty years ago. For simple instructions for using the Cross-Impact Matrix and printable templates, go to http://discoveryoursolutions.com/toolkit/cross_impact_matrix.html.

7.4 MULTIPLE HYPOTHESIS GENERATION

In broad terms, a hypothesis is a potential explanation or conclusion that is to be tested by collecting and analyzing evidence. It is a declarative statement that has not been established as true—an "educated guess" based on observation to be supported or refuted by more observation or through experimentation.

A good hypothesis should satisfy the following criteria represented by the mnemonic STOP:

- **S**tatement, not a question.
- **T**estable and falsifiable.
- **O**bservation—and knowledge-based.
- **P**redicts anticipated results clearly.

Hypothesis Generation should be an integral part of any rigorous analytic process because it helps the analyst think broadly and creatively about a range of possibilities and avoid being surprised when common wisdom turns out to be wrong. The goal is to develop a list of hypotheses that can be scrutinized and tested over time against existing relevant information as well as new data that may become available in the future. Analysts should strive to make the hypotheses mutually exclusive and the list as comprehensively exhaustive as possible—thereby satisfying the imperative that hypotheses should be **M**utually **E**xclusive and **C**omprehensively **E**xhaustive (MECE).

There are many techniques used to generate hypotheses, including techniques discussed elsewhere in this book, such as Venn

Analysis, Cluster Brainstorming, several forms of Foresight analysis, Classic Quadrant Crunching™, Starbursting, Delphi Method, and Decision Trees. This section discusses techniques developed specifically for hypothesis generation and then presents the method for three different techniques: Simple Hypotheses, Quadrant Hypothesis Generation, and the Multiple Hypotheses Generator®.

When to Use It

Gaining confidence in a hypothesis is not a function solely of accumulating evidence in its favor but in showing that situations that could establish its falsity do not, in fact, happen. Analysts should develop multiple hypotheses at the start of a project when the following occurs:

- the importance of the subject matter requires a systematic analysis of all alternatives,
- many factors or variables are involved in the analysis,
- a high level of uncertainty exists about the outcome,
- analysts or decision makers hold competing views.

Simple Hypotheses is often used to broaden the spectrum of plausible hypotheses. It utilizes Cluster Brainstorming to create potential hypotheses based on affinity groups. Quadrant Hypothesis Generation works best when the problem has two key drivers. In these circumstances, a 2-×-2 matrix is adequate for creating hypotheses that reflect the situations posited in each quadrant. The Multiple Hypotheses Generator® is particularly helpful when there is a reigning lead hypothesis.

Value Added

Multiple Hypothesis Generation provides a structured way to generate a comprehensive set of mutually exclusive hypotheses. This can increase confidence that an important hypothesis has not been overlooked. It can also help reduce cognitive biases, such as seeking only the information that is consistent with the lead hypothesis (Confirmation Bias), accepting a given value of something or a lead hypothesis as a proper—or the only—starting point for conducting an analysis (Anchoring Effect), stopping the search for a cause when a seemingly satisfactory answer is found before sufficient information and proper analysis can be performed (Premature Closure), and seeing patterns in random events as systematic and part of a coherent story (Desire for Coherence and Uncertainty Reduction). When the techniques are used properly, choosing a lead hypothesis becomes much less critical than making sure that analysts have considered all possible explanations.

The techniques are particularly useful in helping intelligence analysts overcome some classic intuitive traps, such as the following:

- **Assuming a Single Solution.** Most analysts quickly develop an initial lead hypothesis to explain the topic at hand and continue to test the initial hypothesis as new information appears. A good analyst will simultaneously consider a few alternatives. This helps ensure that no diagnostic information is ignored because it does not support the lead hypothesis. For example, when individuals move large amounts of money from China to other countries, financial analysts are likely to suspect that ill-begotten monies are being laundered. On some occasions, however, the funds could have been obtained through legitimate means; this alternative hypothesis should be in play until it can be disproven by the facts of the case.

- **Overinterpreting Small Samples.** Analysts frequently are pressed to “make a call” when there is insufficient data to support the assessment. In such cases, a preferred strategy is to offer several possible alternatives. The U.S. Intelligence Community—and the world as a whole—would have been better served if the National Intelligence Council in its Iraq WMD National Intelligence Estimate had proffered three (and not just the first two) hypotheses that (1) Iraq had a substantial WMD program and the intelligence community had not yet found the evidence, (2) Iraq had a more modest program but could readily accelerate production in areas that had fallen fallow, or (3) Iraq had no WMD program and reporting to the contrary was deception.

- **Projecting Past Experiences.** When under pressure, analysts can select a hypothesis primarily because it avoids a previous error or replicates a past success. A prime example of this was the desire not to repeat the mistake of underestimating Saddam Hussein’s WMD capabilities in the run-up to the second U.S. war with Iraq.

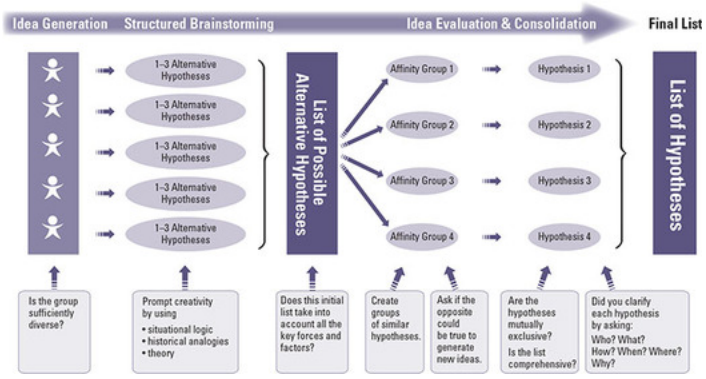
- **Relying on First Impressions.** When pressed for time, analysts can also fall into the trap of giving too much weight to first impressions or initial data that attracts their attention at the time. Analysts are especially susceptible to this bias if they have recently visited a country or have viewed a particularly vivid or disturbing video.

7.4.1 The Method: Simple Hypotheses

To use the Simple Hypotheses method, define the problem and determine how the hypotheses will be used at the beginning of the project. Hypotheses can be applied several ways: (1) in an Analysis of Competing Hypotheses, (2) in some other hypothesis-testing project, (3) as a basis for developing scenarios, or (4) as a means to draw attention to particularly positive or worrisome outcomes that might arise. Figure 7.4.1 illustrates the process.

Gather together a diverse group to review the available information and explanations for the issue, activity, or behavior that you want to evaluate. In forming this diverse group, consider including different types of expertise for different aspects of the problem, cultural expertise about the geographic area involved, different perspectives from various stakeholders, and different styles of thinking (left brain/right brain, male/female). Then do the following:

- Ask each member of the group to write down on an index card up to three alternative explanations or hypotheses. Prompt creative thinking by using the following:
    - **Applying theory.** Drawing from the study of many examples of the same phenomenon.



Description

Figure 7.4.1 Simple Hypotheses

Source: Globalytica, LLC, 2019.

    - **Comparison with historical analogies.** Comparing current events to historical precedents.
    - **Situational logic.** Representing all the known facts and an understanding of the underlying forces at work at the given time and place.

- Collect the cards and display the results on a whiteboard. Consolidate the list to avoid any duplication.
- Employ additional individual and group brainstorming techniques, such as Cluster Brainstorming, to identify key forces and factors.
- Aggregate the hypotheses into affinity groups and label each group.
- Use problem restatement and consideration of the opposite to develop new ideas.

- Update the list of alternative hypotheses. If the hypotheses will be used in Analysis of Competing Hypotheses, strive to keep them mutually exclusive—that is, if one hypothesis is true, all others must be false.
- Have the group clarify each hypothesis by asking the journalist's classic list of questions: Who, What, How, When, Where, and Why?
- Select the most promising hypotheses for further exploration.

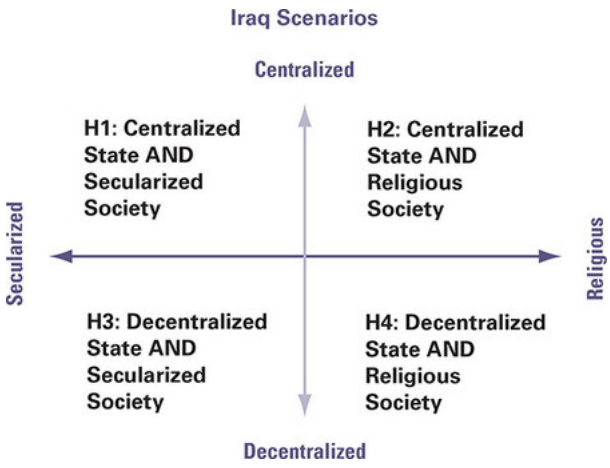
7.4.2 The Method: Quadrant Hypothesis Generation

Use the four-quadrant technique to identify a basic set of hypotheses when two key driving forces are likely to determine the outcome of an issue. The technique identifies four potential scenarios that represent the extreme conditions for each of the two major drivers. It spans the logical possibilities inherent in the relationship and interaction of the two driving forces, thereby generating options that analysts otherwise may overlook.

Quadrant Hypothesis Generation is easier and quicker to use than the Multiple Hypotheses Generator®, but it is limited to cases in which the outcome of a situation will be determined by two major driving forces—and it depends on the correct identification of these forces. The technique is less effective when more than two major drivers are present or when analysts differ over which forces constitute the two major drivers.

The steps for using Quadrant Hypothesis Generation follow:

- Identify two main drivers by using techniques such as Cluster Brainstorming or by surveying subject-matter experts. A discussion to identify the two main drivers can be a useful exercise.
- Construct a 2-×-2 matrix using the two drivers.
- Think of each driver as a continuum from one extreme to the other. Write the extremes of each of the drivers at the end of the vertical and horizontal axes.
- Fill in each quadrant with the details of what the end state would be if shaped by the two extremes of the drivers.
- Develop signposts or indicators that show whether events are moving toward one of the hypotheses. Use the signposts or indicators of change to develop intelligence collection strategies or research priorities to determine the direction in which events are moving.



Description

Figure 7.4.2 Quadrant Hypothesis Generation: Four Hypotheses on the Future of Iraq

Figure 7.4.2 shows an example of a Quadrant Hypothesis Generation chart. In this case, analysts have been tasked with developing a paper to project possible futures for Iraq, focusing on the potential end

state of the government. The analysts have identified and agreed upon the two key drivers in the future of the government: the level of centralization of the federal government and the degree of religious control of that government. They develop their quadrant chart and lay out the four logical hypotheses based on their decisions.

The four hypotheses derived from the quadrant chart can be stated as follows:

- The final state of the Iraq government will be a centralized state and a secularized society.
- The final state of the Iraq government will be a centralized state and a religious society.
- The final state of the Iraq government will be a decentralized state and a secularized society.
- The final state of the Iraq government will be a decentralized state and a religious society.

7.4.3 The Method: Multiple Hypotheses Generator®

The Multiple Hypotheses Generator® is a technique for developing multiple alternatives for explaining an issue, activity, or behavior. Analysts often can brainstorm a useful set of hypotheses without such a tool, but the Multiple Hypotheses Generator® may give greater confidence than other techniques that analysts have not overlooked a critical alternative or outlier. Analysts should employ the Multiple Hypotheses Generator® to ensure that they have considered a broad array of potential hypotheses. In some cases, they may have considerable data and want to ensure that they have generated a set of plausible explanations consistent with all the data at hand. Alternatively, they may have been presented with a hypothesis that seems to explain the phenomenon at hand and been asked to assess its validity. The technique helps analysts rank alternative hypotheses from the most to least credible, focusing on those at the top of the list as those deemed most worthy of attention.

To use this method:

- Gather a diverse group to define the issue, activity, or behavior under study. Often, it is useful to ask questions in the following ways:
    - What variations could be developed to challenge the lead hypothesis that . . .?
    - What are the possible permutations that would flip the assumptions contained in the lead hypothesis that . . .?
    - Identify the Who, What, and Why for the lead hypothesis. Then generate plausible alternatives for each relevant key component.
- Review the lists of alternatives for each of the key components; strive to keep the alternatives on each list mutually exclusive.
- Generate a list of all possible permutations, as shown in Figure 7.4.3.

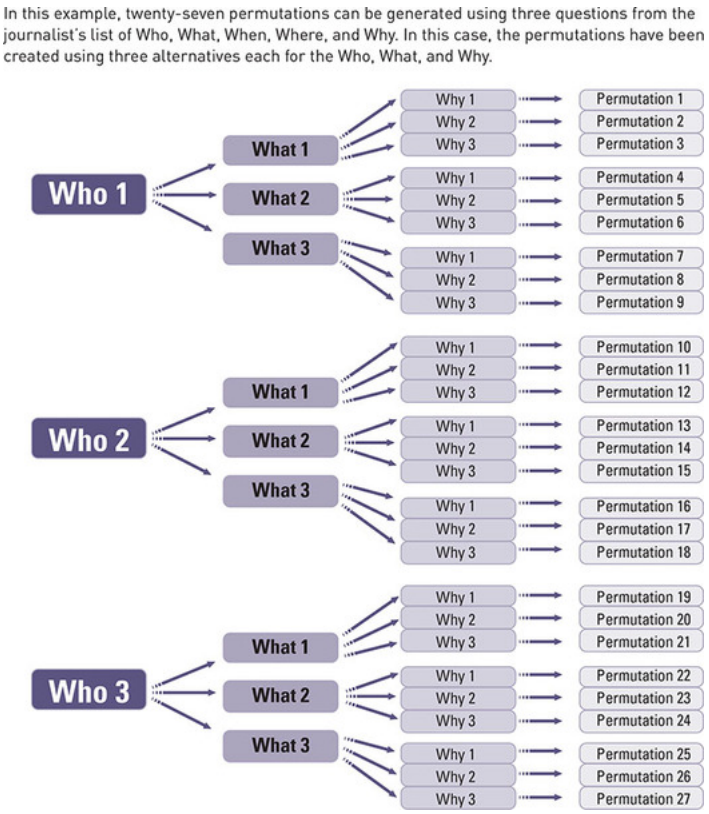


Figure 7.4.3 Multiple Hypotheses Generator®: Generating Permutations

Source: Globalytica, LLC, 2019.

- Discard any permutation that simply makes no sense.
- Evaluate the credibility of the remaining permutations by challenging the key assumptions of each component. Some of these assumptions may be testable themselves. Assign a “credibility score” to each permutation using a 1-to-5-point scale where 1 is low credibility and 5 is high credibility.
- Re-sort the remaining permutations, listing them from most credible to least credible.
- Restate the permutations as hypotheses, ensuring that each meets the criteria of a good hypothesis.
- Select from the top of the list those hypotheses most deserving of attention.

Potential Pitfalls

The value of this technique is limited to the ability of analysts to generate a robust set of alternative explanations. If group dynamics are flawed, the outcomes will be flawed. Whether the correct hypothesis will emerge from this process and analysts identify it as such cannot be guaranteed, but the prospect of the correct hypothesis being included in the set of hypotheses under consideration is greatly increased.

Relationship to Other Techniques

The product of any Foresight analysis process can be thought of as a set of alternative hypotheses. Quadrant Hypothesis Generation is a specific application of the generic method called Morphological Analysis, described in chapter 9. Alternative Futures Analysis uses a similar quadrant chart approach to define four potential outcomes, and Multiple Scenarios Generation uses the approach to define multiple sets of four outcomes. Both of these techniques are also described in chapter 9.

Origins of This Technique

The generation and testing of hypotheses is a key element of scientific reasoning. The Simple Hypotheses approach and Quadrant Hypothesis Generation are described in the *Handbook of Analytic Tools and Techniques,* 5th ed. (Tysons, VA: Pherson Associates, LLC, 2019) and Pherson Associates training materials. The description of the Multiple Hypotheses Generator® can be found in the fourth edition of the *Handbook of Analytic Tools and Techniques* (Reston, VA: Pherson Associates, LLC, 2015).

7.5 DIAGNOSTIC REASONING

Diagnostic Reasoning is the application of hypothesis testing to a new development, a single new item of information or intelligence, or the reliability of a source. It differs from Analysis of Competing Hypotheses (ACH) in that it is used to evaluate a single item of relevant information or a single source; ACH deals with an entire range of hypotheses and multiple items of relevant information.

When to Use It

Analysts should use Diagnostic Reasoning if they find themselves making a snap intuitive judgment while assessing the meaning of a new development, the significance of a new report, or the reliability of a stream of reporting from a new source. Often, much of the information used to support one's lead hypothesis turns out to be consistent with alternative hypotheses as well. In such cases, the new information should not—and cannot—be used as evidence to support the prevailing view or lead hypothesis.

The technique also helps reduce the chances of being caught by surprise. It ensures that the analyst or decision maker will have given at least some consideration to alternative explanations. The technique is especially important to use when an analyst—or decision maker—is looking for evidence to confirm an existing mental model or policy position. It helps the analyst assess whether the same information is consistent with other reasonable conclusions or with alternative hypotheses.

Value Added

The value of Diagnostic Reasoning is that it helps analysts balance their natural tendency to interpret new information as consistent with their existing understanding of what is happening—that is, the analyst's mental model. The technique prompts analysts to ask themselves whether this same information is consistent with other reasonable conclusions or alternative hypotheses. It is a common experience to discover that much of the information supporting belief in the most likely conclusion is of limited value because that same information is consistent with alternative conclusions. One needs to evaluate new information in the context of all possible explanations of that information, not just in the context of a well-established mental model.

The Diagnostic Reasoning technique helps the analyst identify the information that is essential to support a hypothesis and avoid the mistake of focusing attention on one vivid scenario or explanation while ignoring other possibilities or alternative hypotheses (Vividness Bias). When evaluating evidence, analysts tend to assimilate new information into what they currently perceive. Diagnostic Reasoning protects them from the traps of seeking only the information that is consistent with the lead hypothesis (Confirmation Bias) and selecting the first answer that appears "good enough" (Satisficing).

Experience can handicap experts because they often hold tightly to timeworn models—and a fresh perspective can be helpful. Diagnostic Reasoning helps analysts avoid the intuitive trap of assuming the same dynamic is in play when something seems to accord with an analyst's past experiences (Projecting Past Experiences). It also helps analysts counter the pitfall of continuing to hold to an analytic judgment when confronted with a mounting list of evidence that contradicts the initial conclusion (Rejecting Evidence) and dismissing information at first glance without

considering all possible alternatives (Ignoring Inconsistent Evidence).

The Method

Diagnostic Reasoning is a process that focuses on trying to refute alternative judgments rather than confirming what you already believe to be true. Here are the steps to follow:

- When you receive a potentially significant item of information, make a mental note of what it seems to mean (i.e., an explanation of why something happened or what it portends for the future). Make a quick, intuitive judgment based on your current mental model.
- Define the focal question. For example, Diagnostic Reasoning brainstorming sessions often begin with questions like
    - Are there alternative explanations for the lead hypothesis (defined as . . .) that would also be consistent with the new information, new development, or new source of reporting?
    - Is there a reason other than the lead hypothesis that . . .?
- Brainstorm, either alone or in a small group, the alternative judgments that another analyst with a different perspective might reasonably deem to have a chance of being accurate. Make a list of these alternatives.
- For each alternative, ask the following question: If this alternative were true or accurate, how likely is it that I would have seen, but possibly ignored, information that was consistent with this alternative explanation? Make a tentative judgment based on consideration of these alternatives. If the new information is equally likely with each of the alternatives, the information has no diagnostic value and can be ignored. If the

information is clearly inconsistent with one or more alternatives, those alternatives might be ruled out.

- Following this mode of thinking for each of the alternatives, decide which alternatives need further attention and which can be dropped from consideration or put aside until new information surfaces.

- Proceed by seeking additional evidence to refute the remaining alternatives rather than to confirm them.

Potential Pitfalls

When new information is received, analysts need to validate that the new information is accurate and not deceptive or intentionally misleading. It is also possible that none of the key information turns out to be diagnostic, or that all relevant information will not come to light.

Relationship to Other Techniques

Diagnostic Reasoning is an integral part of two other techniques: Analysis of Competing Hypotheses and Indicators Validation and Evaluation (chapter 9). It is presented here as a separate technique to show that its use is not limited to those two techniques. It is a fundamental form of critical reasoning that should be widely used in intelligence analysis.

Origins of This Technique

Diagnostic Reasoning has been the principal method for medical problem solving for many years. For information on the role of Diagnostic Reasoning in the medical world, see the following publications: Albert S. Elstein, “Thinking about Diagnostic Thinking: A Thirty-Year Perspective,” *Advances in Health Science Education,* published online by Springer Science+Business Media, August 11, 2009; and Pat Croskerry, “A Universal Model of Diagnostic Reasoning,” *Academic Medicine* 84, no. 8 (August 2009).

7.6 ANALYSIS OF COMPETING HYPOTHESES

ACH is an analytic process that identifies a complete set of alternative hypotheses, systematically evaluates data that are consistent or inconsistent with each hypothesis, and proceeds by rejecting hypotheses rather than trying to confirm what appears to be the most likely hypothesis. The process of rejecting rather than confirming hypotheses applies to intelligence analysis the scientific principles advocated by Karl Popper, one of the most influential philosophers of science of the twentieth century.[4]

ACH starts with the identification of a set of mutually exclusive alternative explanations or outcomes called hypotheses. The analyst assesses the consistency or inconsistency of each item of relevant information with each hypothesis, and then selects the hypothesis that best fits the relevant information. The scientific principle behind this technique is to proceed by trying to refute as many reasonable hypotheses as possible rather than to confirm what initially appears to be the most likely hypothesis. The most likely hypothesis is then the one with the least amount of inconsistent information—not the one with an abundance of supporting relevant information.

When to Use It

ACH is appropriate for almost any analysis where there are alternative explanations for what has happened, is happening, or is likely to happen. Use it when the judgment or decision is so important that you cannot afford to be wrong or when you need a systematic approach to avoid being surprised by an unforeseen outcome. ACH is particularly appropriate when dealing with controversial issues and when analysts need to leave an audit trail to show what relevant information they considered and how they arrived at their analysis. If other analysts and decision makers disagree with the analysts' conclusions, an ACH matrix can help identify the precise area of disagreement. Subsequent discussion can then focus on the most important substantive differences.

ACH is most effective when there is a robust flow of data to absorb and evaluate. It is well suited for addressing questions about technical issues in the chemical, biological, radiological, and nuclear arenas, such as, "For which weapons' system is this part most likely being imported?" or, "Which type of missile system is Country X importing or developing?" The technique is useful for managing criminal investigations and determining which line of analysis is correct. ACH is particularly helpful when an analyst must deal with the potential for denial and deception, as it was initially developed for that purpose.

The technique can be used by a single analyst but is most effective with a small team that can challenge team members' evaluations of the relevant information. It structures and facilitates the exchange of information and ideas with colleagues in other offices or agencies.

An ACH analysis requires a modest commitment of time; it may take a day or more to build the ACH matrix. Once all the relevant information has been collected, it may take several hours to work through all the stages of the analytic process before writing up the

conclusions. Usually a facilitator or a colleague previously schooled in the use of the technique helps guide analysts through the process, especially if it is the first time they have used the methodology.

Value Added

Analysts are commonly required to work with incomplete, ambiguous, anomalous, and sometimes deceptive data. In addition, strict time constraints and the need to “make a call” often conspire with natural human cognitive biases to cause inaccurate or incomplete judgments. If the analyst is already generally knowledgeable on the topic, a common procedure is to develop a favored hypothesis and then search for relevant information to confirm it. This is called Satisficing or going with the first answer that seems to be supported by the evidence.

Satisficing is efficient because it saves time and often works. However, Confirmation Bias, which impels an analyst to look only for information that is consistent with the favored or lead hypothesis or widely accepted school of thought, is often at work in the background, as the analyst has made no investment in protection against surprise. Satisficing allows analysts to accept data as true without assessing its credibility or questioning fundamental assumptions because it helps create a more coherent story (Evidence Acceptance Bias). If engaged in Satisficing, analysts often bypass the analysis of alternative explanations or outcomes, which should be fundamental to any complete analysis. As a result, Satisficing fails to distinguish that much of the relevant information seemingly supportive of the favored hypothesis is also consistent with one or more alternative hypotheses. It often fails to recognize the importance of what is missing (i.e., what should be observable if a given hypothesis is true but is not there).

ACH improves the analyst’s chances of overcoming these challenges by requiring analysts to identify and then try to refute as many reasonable hypotheses as possible using the full range of data, assumptions, and gaps that are pertinent to the problem at hand. The method for analyzing competing hypotheses takes time and attention in the initial stages, but it pays big dividends in the end.

When analysts are first exposed to ACH and say they find it useful, it is because the simple focus on identifying alternative hypotheses and how they might be disproved prompts analysts to think seriously about evidence, explanations, or outcomes in ways that had not previously occurred to them.

The ACH process requires the analyst to assemble the collected information and organize it in a useful way, so that it can be readily retrieved for use in the analysis. This is done by creating a matrix with relevant information down the left side and hypotheses across the top. Each item of relevant information is then evaluated as to whether it is consistent or inconsistent with each hypothesis. The results are then used to assess the evidentiary and logical support for and against each hypothesis. This can be done manually, but it is much easier and better to use an Excel spreadsheet or ACH software designed for this purpose. Various ACH software applications can be used to sort and analyze the data by type of source and date of information, as well as by degree of support for or against each hypothesis.

ACH helps analysts produce a better analytic product by

- Maintaining a record of the relevant information and tracking how that information relates to each hypothesis.
- Capturing the analysts' key assumptions when the analyst is coding the data and recording what additional information is needed or what collection requirements are needed.
- Enabling analysts to present conclusions in a way that is organized and transparent as it documents how conclusions were reached.
- Providing a foundation for identifying indicators that can then be monitored and validated to determine the direction in which events are heading.

- Leaving a clear audit trail as to how the analysis was done, the conclusions reached, and how individual analysts may have differed in their assumptions or judgments.

ACH Software

ACH started as a manual method at the CIA in the mid-1980s. The first professionally developed and tested ACH software was created in 2005 by the **P**alo **A**lto **R**esearch **C**enter (PARC), with federal government funding and technical assistance from Richards J. Heuer Jr. and Randolph Pherson. Randolph Pherson managed its introduction into the U.S. Intelligence Community. The PARC version, though designed for use by an individual analyst, was commonly used by a co-located team of analysts. Members of such groups reported,

- The technique helped them gain a better understanding of the differences of opinion with other analysts or between analytic offices.
- Review of the ACH matrix provided a systematic basis for identification and discussion of differences between participating analysts.
- Reference to the matrix helped depersonalize the argumentation when there were differences of opinion.

A collaborative version of ACH called Te@mACH® was developed under the direction of Randolph Pherson for Globalytica, LLC, in 2010. It has most of the functions of the PARC ACH tool but allows analysts in different locations to work on the same problem simultaneously. They can propose hypotheses and enter data on the matrix from multiple locations, but they must agree to work from the same set of hypotheses and the same set of relevant information. The software allows them to chat electronically about one another's assessments and assumptions, to compare their analysis with that of

their colleagues, and to learn what the group consensus was for the overall problem solution.

Other government agencies, research centers, and academic institutions have developed versions of ACH. One version called Structured Analysis of Competing Hypotheses, developed for instruction at Mercyhurst College, builds on ACH by requiring deeper analysis at some points.

The use of collaborative ACH tools ensures that all analysts are working from the same database of evidence, arguments, and assumptions, and that each member of the team has had an opportunity to express his or her view on how that information relates to the likelihood of each hypothesis. Such tools can be used both synchronously and asynchronously and include functions such as a survey method to enter data that protects against bias, the ability to record key assumptions and collection requirements, and a filtering function that allows analysts to see how each person rated the relevant information.[5]

The Method

To retain five or seven hypotheses in working memory and note how each item of information fits into each hypothesis is beyond the capabilities of most analysts. It takes far greater mental agility than the common practice of seeking evidence to support a single hypothesis already believed to be the most likely answer. The following nine-step process is at the heart of ACH and can be done without software.

- **Identify all possible hypotheses** that should be considered. Hypotheses should be mutually exclusive; that is, if one hypothesis is true, all others must be false. The list of hypotheses should include a deception hypothesis, if that is appropriate. For each hypothesis, develop a brief scenario or "story" that explains how it might be true. Analysts should strive to create as comprehensive list of hypotheses as possible.
- **Make a list of significant relevant information**, which means everything that would help analysts evaluate the hypotheses, including evidence, assumptions, and the absence of things one would expect to see if a hypothesis were true. It is important to include assumptions as well as factual evidence, because the matrix is intended to be an accurate reflection of the analyst's thinking about the topic. If the analyst's thinking is driven by assumptions rather than hard facts, this needs to become apparent so that the assumptions can be challenged. A classic example of absence of evidence is the Sherlock Holmes story of the dog barking in the night. The failure of the dog to bark was persuasive evidence that the guilty party was not an outsider but an insider whom the dog knew.
- **Create a matrix and analyze the diagnosticity of the information.** Create a matrix with all hypotheses across the top and all items of relevant information down the left side. See Figure 7.6a for an example. Analyze the "diagnosticity" of the evidence and arguments to identify which points are most influential in judging the relative likelihood of the hypotheses. Ask, "Is this input Consistent with the hypothesis, is it Inconsistent with the hypothesis, or is it Not Applicable or not relevant?" This can be done by either filling in each cell of the matrix row-by-row or by randomly selecting cells in the matrix for analysts to rate. If it is Consistent, put a "C" in the appropriate matrix box; if it is Inconsistent, put an "I"; if it is Not Applicable to that hypothesis, put an "NA." If a specific item of evidence, argument, or assumption is particularly compelling, put two "C's" in the box; if it strongly undercuts the hypothesis, put two "I's."

When you are asking if an input is Consistent or Inconsistent with a specific hypothesis, a common response is, "It all depends on . . ." That means the rating for the hypothesis is likely based on an assumption. You should record all such assumptions when filling out the matrix. After completing the matrix, look for any pattern in those assumptions, such as the same assumption being made when ranking multiple items of information. After the relevant information has been sorted for diagnosticity, note how many of the highly diagnostic Inconsistency ratings are based on assumptions. Consider how much confidence you should have in those assumptions and then adjust the confidence in the ACH Inconsistency Scores accordingly.

- **Review where analysts differ** in their assessments and decide if the ratings need to be adjusted (see Figure 7.6b). Often, differences in how analysts rate an item of information can be traced back to different assumptions about the hypotheses when doing the ratings.
- **Refine the matrix** by reconsidering the hypotheses. Does it make sense to combine two hypotheses into one, or to add a new hypothesis that was not considered at the start? If a new hypothesis is added, go back and evaluate all the relevant information for this hypothesis. Additional relevant information can be added at any time.

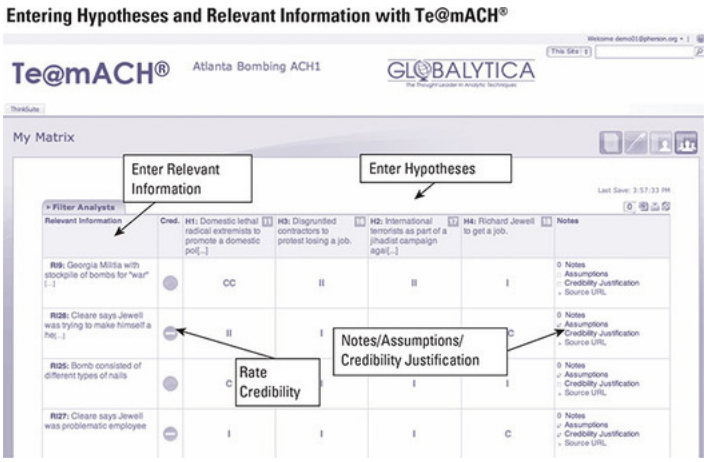
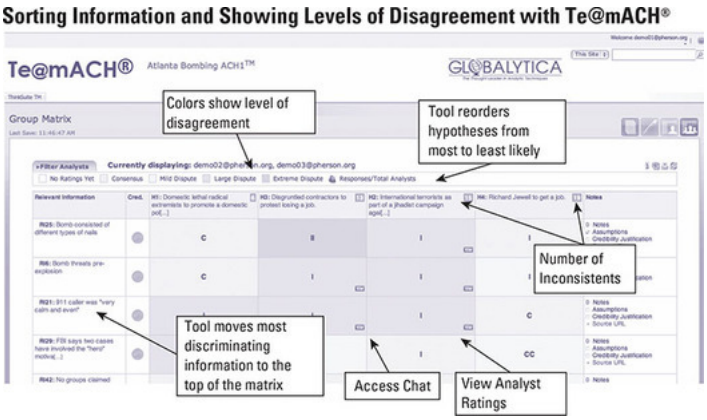


Figure 7.6A Creating an ACH Matrix



Description

Figure 7.6B Evaluating Levels of Disagreement in ACH

- **Draw tentative conclusions** about the relative likelihood of each hypothesis, basing your conclusions on an analysis regarding the diagnosticity of each item of relevant information. Proceed by trying to refute hypotheses rather than confirm them. Add up the number of Inconsistency ratings for each hypothesis and note the Inconsistency Score for each hypothesis. As a first cut, examine the total number of “I” and “II” ratings for each hypothesis. The hypothesis with the most Inconsistent ratings is the least likely to be true and the hypothesis or hypotheses with the lowest Inconsistency Score(s) is tentatively the most likely hypothesis.

- The Inconsistency Scores are broad generalizations, not precise calculations. ACH is a tool designed to help the analyst make a judgment, but not to actually make the judgment for the analyst. This process is likely to produce correct estimates more frequently than less systematic or rigorous approaches, but the scoring system does not eliminate the need for analysts to use their own good judgment. The “Potential Pitfalls” section below identifies several occasions when analysts need to override the Inconsistency Scores.

- **Analyze the sensitivity of your tentative conclusion** to see how dependent it is on a few critical items of information. For example, look for evidence that has a “C” for the lead hypothesis but an “I” for all other hypotheses. Evaluate the importance and credibility of those reports, arguments, or assumptions that garnered a “C.” Consider the consequences for the analysis if that item of relevant

information were wrong or misleading or subject to a different interpretation. If all the evidence earns a “C” for each hypothesis, then the evidence is not diagnostic. If a different interpretation of any of the data would cause a change in the overall conclusion, go back and double-check the accuracy of your interpretation.

- **Report the conclusions.** Consider the relative likelihood of all the hypotheses, not just the most likely one. State which items of relevant information were the most diagnostic, and how compelling a case they make in identifying the most likely hypothesis.
- **Identify indicators or milestones for future observation.** Generate two lists: one focusing on future events or what additional research might uncover that would substantiate the analytic judgment, and a second that would suggest the analytic judgment is less likely to be correct or that the situation has changed. Validate the indicators and monitor both lists on a regular basis, remaining alert to whether new information strengthens or weakens your case.

Potential Pitfalls

A word of caution: ACH only works when all participating analysts approach an issue with a relatively open mind. An analyst already committed to a “right answer” will often find a way to interpret relevant information to align with or make consistent with the preexisting belief. In other words, as an antidote to Confirmation Bias, ACH is like a flu shot. Getting the flu shot will usually keep you from getting the flu, but it won’t make you well if you already have the flu.

The Inconsistency Scores generated for each hypothesis are not the product of a magic formula that tells you which hypothesis to believe. The ACH software takes you through a systematic analytic process, and the Inconsistency Score calculation that emerges is only as accurate as your selection and evaluation of the relevant information.

Because it is more difficult to refute hypotheses than to find information that confirms a favored hypothesis, the generation and testing of alternative hypotheses will often increase rather than reduce the analyst’s level of uncertainty. Such uncertainty is frustrating, but it is usually an accurate reflection of the true situation. The ACH procedure has the offsetting advantage of focusing attention on the few items of critical information that cause the uncertainty or, if they were available, would alleviate it. ACH can guide future collection, research, and analysis to resolve the uncertainty and produce a more accurate judgment.

Analysts should be aware of five circumstances that can cause a divergence between an analyst’s own beliefs and the Inconsistency Scores. In the first two circumstances described in the following list, the Inconsistency Scores seem to be wrong when they are correct. In the next three circumstances, the Inconsistency Scores may seem correct when they are wrong. Analysts need to recognize these circumstances, understand the problem, and adjust accordingly.

- **Assumptions or logical deductions omitted.** If the scores in the matrix do not support what you believe is the most likely hypothesis, the matrix may be incomplete. Your thinking may be influenced by assumptions or logical deductions not included in the list of relevant information or arguments. If so, they should be added so the matrix fully reflects everything that influences your judgment on this issue. It is important for all analysts to recognize the role that unstated or unquestioned (and sometimes unrecognized) assumptions play in their analysis. In political or military analysis, for example, conclusions may be driven by assumptions about another country's capabilities or intentions. A principal goal of the ACH process is to identify those factors that drive the analyst's thinking on an issue so that these factors can be questioned and, if appropriate, changed.

- **Insufficient attention to less likely hypotheses.** If you think the scoring gives undue credibility to one or more of the less likely hypotheses, it may be because you have not assembled the relevant information needed to refute them. You may have devoted insufficient attention to obtaining such relevant information, or the relevant information may simply not be there. If you cannot find evidence to refute a hypothesis, it may be necessary to adjust your thinking and recognize that the uncertainty is greater than you had originally thought.

- **Definitive relevant information.** There are occasions when intelligence collectors obtain information from a trusted and well-placed inside source. The ACH analysis can label the information as having high credibility, but this is probably not enough to reflect the conclusiveness of such relevant information and the impact it should have on an analyst's thinking. In other words, in some circumstances, one or two highly authoritative reports from a trusted source in a position to know may support one hypothesis so strongly that they refute all other hypotheses regardless of what other less reliable or less definitive relevant information may show.

- **Unbalanced set of evidence.** Evidence and arguments must be representative of the entire problem. If there is considerable evidence on a related but peripheral issue and comparatively few items of evidence on the core issue, the Inconsistency Score may be misleading.

- **Diminishing returns.** As evidence accumulates, each new item of Inconsistent relevant information or argument has less impact on the Inconsistency Scores than does the earlier relevant information. For example, the impact of any single item is less when there are fifty items than when there are only ten items. To understand this, consider what happens when you calculate the average of fifty numbers. Each number has equal weight; adding a fifty-first number will have less impact on the average than if you start with only ten numbers and add one more. Stated differently, the accumulation of relevant information over time slows down the rate at which the Inconsistency Score changes in response to new relevant information. Therefore, the numbers may not reflect the actual amount of change in the situation you are analyzing. When you are evaluating change over time, it is desirable to delete the older relevant information periodically, or to partition the relevant information and analyze the older and newer relevant information separately.

Some other caveats when using ACH include the following:

- The possibility that none of the relevant information identified is diagnostic.

- Not all relevant information is identified.

- Some of the relevant information is inaccurate, deceptive, or misleading.

- The ratings are subjective and therefore subject to human error.

- When the analysis is performed by a group, the outcome can be biased by Groupthink or the absence of healthy group dynamics.

Relationship to Other Techniques

ACH is often used in conjunction with other techniques. For example, Cluster Brainstorming, Nominal Group Technique, Multiple Hypothesis Generation, or the Delphi Method can identify hypotheses or relevant information for inclusion in the ACH analysis. They can also help analysts evaluate the significance of relevant information. Deception Detection may identify an opponent's motive, opportunity, or means to conduct deception or to identify past deception practices; information about these factors should be included in the list of ACH-relevant information. The Diagnostic Reasoning technique is incorporated within the ACH method. The final step in the ACH method identifies Indicators for monitoring future developments.

The ACH matrix is intended to reflect all relevant information and arguments that affect one's thinking about a designated set of hypotheses. That means it should also include assumptions identified by a Key Assumptions Check, discussed earlier in this chapter. Conversely, rating the consistency of an item of relevant information with a specific hypothesis is often based on an assumption. When rating the consistency of relevant information in an ACH matrix, the analyst should ask, "If this hypothesis is true, would I see this item of relevant information?" A common thought in response to this question is, "It all depends on. . . ." This means that, however the consistency of that item of relevant information is rated, that rating is likely based on an assumption—whatever assumption the rating "depends on." These assumptions should be recorded in the matrix and then considered in the context of a Key Assumptions Check.

The Delphi Method (chapter 8) can double-check the conclusions of an ACH analysis. In this process, outside experts are asked separately to assess the probability of the same set of hypotheses and to explain the rationale for their conclusions. If the two different

groups of analysts using different methods arrive at the same conclusion, confidence in the conclusion increases. If they disagree, their lack of agreement is also useful, as one can then seek to understand the rationale for the different judgments.

ACH and Argument Mapping (described later in this chapter) are both used on the same types of complex analytic problems. They are both systematic methods for organizing relevant information, but they work in fundamentally different ways and are best used at different stages in the analytic process. ACH is used during an early stage to analyze a range of hypotheses to determine which is most consistent with the broad body of relevant information. At a later stage, when the focus is on developing, evaluating, or presenting the case for a specific conclusion, Argument Mapping is the appropriate method. Each method has strengths and weaknesses, and the optimal solution is to use both.

Origins of This Technique

Richards Heuer originally developed the ACH technique at the CIA in the mid-1980s as one part of a methodology for analyzing the presence or absence of Soviet deception. It was described publicly in his book, *Psychology of Intelligence Analysis*, first published in 1999;[6] Heuer and Randolph Pherson helped the Palo Alto Research Center gain funding from the federal government during 2004 and 2005 to produce the first professionally developed ACH software. Randolph Pherson managed its introduction into the U.S. Intelligence Community. Globalytica, LLC, with Pherson's assistance, subsequently developed a collaborative version of the software called Te@mACH®. An example of an Analysis of Competing Hypotheses can be found at https://www.cia.gov/library/center-for-the-study-of-intelligence/csi-publications/books-and-monographs/psychology-of-intelligence-analysis/art11.html.

7.7 INCONSISTENCIES FINDER™

The Inconsistencies Finder™ is a simpler version of Analysis of Competing Hypotheses that focuses attention on relevant information that is inconsistent with a hypothesis, helping to disconfirm its validity.

When to Use It

The Inconsistencies Finder™ can be used whenever a set of alternative hypotheses exists, or has recently been identified, and analysts need to do the following:

- Carefully weigh the credibility of multiple explanations, or alternative hypotheses, explaining what has happened, is happening, or is likely to happen.
- Evaluate the validity of a large amount of data as it relates to each hypothesis.
- Challenge their current interpretation of the evidence (or, alternatively, the interpretation of others).
- Create an audit trail.

Value Added

The process of systematically reviewing the relevant information and identifying which information or evidence is inconsistent with each hypothesis helps analysts do the following:

- Identify the most diagnostic information.
- Focus on the disconfirming evidence.
- Dismiss those hypotheses with compelling inconsistent information.
- Flag areas of agreement and disagreement.
- Highlight the potential for disinformation or deception.

Instead of building a case to justify a preferred solution or answer, the Inconsistencies Finder™ helps analysts easily dismiss those hypotheses with compelling inconsistent information and focus attention on those with the least disconfirming information. An analytic case can then be built that supports this most likely hypothesis—or hypotheses.

The technique is not an answer generator. It should be viewed as a thinking tool that helps you frame a problem more efficiently. Unlike ACH, the technique does not help analysts identify the most diagnostic information for making their case.

The Inconsistencies Finder™ aids the production of high-quality analysis in much the same way ACH mitigates cognitive biases and intuitive traps by helping analysts do the following:

- Avoid leaping to conclusions.
- Move beyond “first impressions.”
- Challenge preconceived ideas.
- Uncover unknowns and uncertainties.

The Method

1. Create a matrix with all the hypotheses under consideration listed in separate columns along the top of the matrix. Make a list of all the relevant information (including significant evidence, arguments, assumptions, and the absence of things) that would be helpful in evaluating the given set of hypotheses. Put each piece of information in a separate row down the left side of the matrix.
2. Working in small teams, analyze each item for consistency/inconsistency against the given hypotheses. Review each piece of information against each hypothesis. Analysts can move across the matrix row by row to evaluate each hypothesis against all the relevant information moving from column to column.

    - Place an “I” in the box that rates each item against each hypothesis if you would not expect to see that item of information if the hypothesis were true.

    - Place a “II” in the box if the presence of the information makes a compelling case that the hypothesis cannot be true. For example, if a suspect had an unassailable alibi proving he or she was at a different location at the time a crime was committed, then he or she could not be the perpetrator.

3. Add up all the “I’s” (Inconsistent ratings) in each hypothesis column. Assign one point to each “I” and two points to each “II.”
4. Rank order the credibility of the hypotheses based on the total number of points or “I’s” that each hypothesis receives. The higher the score, the less likely the hypothesis.

5. Assess if the “I’s” noted in each column make a compelling case to dismiss that hypothesis. Work your way through the “I’s” beginning with the hypothesis with the most “I’s” to the hypothesis with the fewest or no “I’s.”
6. Identify the hypothesis(es) with the least Inconsistent information and make a case for that hypothesis(es) being true.

7.8 DECEPTION DETECTION

Deception is an action intended by an adversary to influence the perceptions, decisions, or actions of another to the advantage of the deceiver. Deception Detection uses a set of checklists to help analysts determine when to look for deception, discover whether deception actually is present, and figure out what to do to avoid being deceived. As Richards J. Heuer Jr. has argued, “The accurate perception of deception in counterintelligence analysis is extraordinarily difficult. If deception is done well, the analyst should not expect to see any evidence of it. If, on the other hand, deception is expected, the analyst often will find evidence of deception even when it is not there.”[7]

When to Use It

Analysts should be concerned about the possibility of deception when the following occurs:

- The analysis hinges on a single critical piece of information or reporting.
- Key information is received at a critical time—that is, when either the recipient or the potential deceiver has a great deal to gain or to lose.
- Accepting new information would cause the recipient to expend or divert significant resources.
- Accepting new information would require the analyst to alter a key assumption or key judgment.
- The potential deceiver may have a feedback channel that illuminates whether and how the deception information is being processed and to what effect.
- Information is received from a source whose bona fides are questionable.
- The potential deceiver has a history of conducting deception.

Value Added

Most intelligence analysts know not to assume that everything that arrives in their inbox is valid, but few know how to factor such concerns effectively into their daily work practices. Considering the deception hypothesis puts a major cognitive burden on the analyst. If an analyst accepts the possibility that some of the information received may be deceptive, then all evidence is open to question and no valid inferences can be drawn from the reporting. This fundamental dilemma can paralyze analysis unless the analyst uses practical tools to determine when it is appropriate to worry about deception, how best to detect deception in the reporting, and what to do in the future to guard against being deceived.

> *It is very hard to deal with deception when you are really just trying to get a sense of what is going on, and there is so much noise in the system, so much overload, and so much ambiguity. When you layer deception schemes on top of that, it erodes your ability to act.*
>
> —Robert Jervis, "Signaling and Perception in the Information Age," in *The Information Revolution and National Security* (August 2000)

The measure of a good deception operation is how well it exploits the cognitive biases of its target audience. The deceiver's strategy usually is to provide some intelligence or information of value to the person being deceived in the hope that he or she will conclude the "take" is good enough and should be disseminated. As additional information is collected, the Satisficing bias is reinforced and the recipient's confidence in the information or the source usually grows, further blinding the recipient to the possibility that he or she is falling prey to deception. The deceiver knows that the information being provided is highly valued, although over time some people will begin to question the bona fides of the source. Often, this puts the person

who developed the source or acquired the information on the defensive, and the natural reaction is to reject any and all criticism. This cycle is usually broken only by applying structured techniques such as Deception Detection to force a critical examination of the true quality of the information and the potential for deception.

Deception Detection is a useful tool analysts can employ to avoid cognitive biases and heuristics, such as seeking only the information that is consistent with the lead hypothesis (Confirmation Bias), accepting data as true without assessing its credibility because it helps “make the case” (Evidence Acceptance Bias), and judging the frequency of an event by the ease with which instances come to mind (Availability Heuristic). It also safeguards an analyst against several classic mental mistakes, including giving too much weight to first impressions or initial data that appears important at the time (Relying on First Impressions), assuming the same dynamic is in play when something appears to be in accord with past experiences (Projecting Past Experiences), and accepting or rejecting everything someone says because the analyst strongly likes or dislikes the person (Judging by Emotion).

The Method

Analysts should routinely consider the possibility that opponents or competitors are attempting to mislead them or hide important information. The possibility of deception cannot be rejected simply because there is no evidence of it; if the deception is well done, one should not expect to see evidence of it. Some circumstances in which deception is most likely to occur are listed in the “When to Use It” section. When such circumstances occur, the analyst, or preferably a small group of analysts, should assess the situation using four checklists that are commonly referred to by their acronyms: MOM, POP, MOSES, and EVE (see box on pp. 173–174).

Analysts have also found the following “rules of the road” helpful in anticipating the possibility of deception and dealing with it:[8]

- Avoid overreliance on a single source of information.
- Seek and heed the opinions of those closest to the reporting.
- Be suspicious of human sources or human subsources who have not been seen or when it is unclear how or from whom they obtained the information.
- Do not rely exclusively on what someone says (verbal intelligence); always look for material evidence (documents, pictures, an address, a phone number, or some other form of concrete, verifiable information).
- Be suspicious of information that plays strongly to your own known biases and preferences.
- Look for a pattern of a source’s reporting that initially appears to be correct but later and repeatedly turns out to be wrong, with

the source invariably offering seemingly plausible, albeit weak, explanations to justify or substantiate the reporting.

- At the onset of a project, generate and evaluate a full set of plausible hypotheses, including a deception hypothesis, if appropriate.
- Know the limitations as well as the capabilities of the potential deceiver.

Relationship to Other Techniques

Analysts can combine Deception Detection with Analysis of Competing Hypotheses to assess the possibility of deception. The analyst explicitly includes deception as one of the hypotheses to be analyzed, and information identified through the MOM, POP, MOSES, and EVE checklists is included as evidence in the ACH analysis.

Origins of This Technique

Deception—and efforts to detect it—has always been an integral part of international relations. An excellent book on this subject is Michael Bennett and Edward Waltz, *Counterdeception Principles and Applications for National Security* (Boston: Artech House, 2007). The description of Deception Detection in this book was previously published in Randolph H. Pherson, *Handbook of Analytic Tools and Techniques,* 5th ed. (Tysons, VA: Pherson Associates, LLC, 2019). A concrete example of Deception Detection at work can be found at https://www.apa.org/monitor/2016/03/deception.

Deception Detection Checklists

Motive, Opportunity, and Means (MOM)

- *Motive:* What are the goals and motives of the potential deceiver?
- *Channels:* What means are available to the potential deceiver to feed information to us?
- *Risks:* What consequences would the adversary suffer if such a deception were revealed?
- *Costs:* Would the potential deceiver need to sacrifice sensitive information to establish the credibility of the deception channel?
- *Feedback:* Does the potential deceiver have a feedback mechanism to monitor the impact of the deception operation?

Past Opposition Practices (POP)

- Does the adversary have a history of engaging in deception?
- Does the current circumstance fit the pattern of past deceptions?
- If not, are there other historical precedents?
- If not, are there changed circumstances that would explain using this form of deception at this time?

Manipulability of Sources (MOSES)

- Is the source vulnerable to control or manipulation by the potential deceiver?
- What is the basis for judging the source to be reliable?
- Does the source have direct access or only indirect access to the information?
- How good is the source's track record of reporting?

Evaluation of Evidence (EVE)

- How accurate is the source's reporting? Has the whole chain of evidence, including translations, been checked?
- Does the critical evidence check out? Remember, the subsource can be more critical than the source.
- Does evidence from one source of reporting (e.g., human intelligence) conflict with that coming from another source (e.g., signals intelligence or open-source reporting)?
- Do other sources of information provide corroborating evidence?
- Is the absence of evidence one would expect to see noteworthy?

7.9 ARGUMENT MAPPING

Argument Mapping is a technique that tests a single hypothesis through logical reasoning. An Argument Map starts with a single hypothesis or tentative analytic judgment and then graphically separates the claims and evidence to help break down complex issues and communicate the reasoning behind a conclusion. It is a type of tree diagram that starts with the conclusion or lead hypothesis, and then branches out to reasons, evidence, and finally assumptions. The process of creating the Argument Map helps identify key assumptions and gaps in logic.

An Argument Map makes it easier for both the analysts and the recipients of the analysis to clarify and organize their thoughts and evaluate the soundness of any conclusion. It shows the logical relationships between various thoughts in a systematic way and allows one to assess quickly in a visual way the strength of the overall argument. The technique also helps the analysts and recipients of the report to focus on key issues and arguments rather than focusing too much attention on minor points.

When to Use It

When making an intuitive judgment, use Argument Mapping to test your own reasoning. Creating a visual map of your reasoning and the evidence that supports this reasoning helps you better understand the strengths, weaknesses, and gaps in your argument. It is best to use this technique before you write your product to ensure the quality of the argument and refine it if necessary.

Argument Mapping and Analysis of Competing Hypotheses (ACH) are complementary techniques that work well either separately or together. Argument Mapping is a detailed presentation of the argument for a single hypothesis; ACH is a more general analysis of multiple hypotheses. The ideal is to use both, as follows:

- Before you generate an Argument Map, using ACH can be helpful way to take a closer look at the viability of alternative hypotheses. After looking at alternative hypotheses, you can then select the best one to map.
- After you have identified a favored hypothesis through ACH analysis, Argument Mapping helps check and present the rationale for this hypothesis.

Value Added

An Argument Map organizes one's thinking by showing the logical relationships between the various thoughts, both pro and con. An Argument Map also helps the analyst recognize assumptions and identify gaps in the available knowledge. The visualization of these relationships makes it easier to think about a complex issue and serves as a guide for clearly presenting to others the rationale for the conclusions. Having this rationale available in a visual form helps both the analyst and recipients of the report focus on the key points rather than meandering aimlessly or going off on irrelevant tangents.

When used collaboratively, Argument Mapping helps ensure that a variety of views are expressed and considered, helping mitigate the influence of Groupthink. The visual representation of an argument also makes it easier to recognize weaknesses in opposing arguments. It pinpoints the location of any disagreement, serves as an objective basis for mediating a disagreement, and mitigates against seeking quick and easy answers to difficult problems (Mental Shotgun).

An Argument Map is an ideal tool for dealing with issues of cause and effect—and for avoiding the trap that correlation implies causation (Confusing Causality and Correlation). By laying out all the arguments for and against a lead hypothesis—and all the supporting evidence and logic—it is easy to evaluate the soundness of the overall argument.

The process also helps analysts counter the intuitive traps of Ignoring Base Rate Probabilities by encouraging the analyst to seek out and record all the relevant facts that support each supposition. Similarly, the focus on seeking out and recording all data that support or rebut the key points of the argument makes it difficult for the analyst to overdraw conclusions from a small sample of data (Overinterpreting Small Samples) or to continue to hold to an

analytic judgment when confronted with a mounting list of evidence that contradicts the initial conclusion (Rejecting Evidence).

The Method

An Argument Map starts with a hypothesis—a single-sentence statement, judgment, or claim about which the analyst can, in subsequent statements, present general arguments and detailed evidence, both pro and con. Boxes with arguments are arrayed hierarchically below this statement; these boxes are connected with arrows. The arrows signify that a statement in one box is a reason to believe, or not to believe, the statement in the box to which the arrow is pointing. Different types of boxes serve different functions in the reasoning process, and boxes use some combination of color-coding, icons, shapes, and labels so that one can quickly distinguish arguments supporting a hypothesis from arguments opposing it. Figure 7.9 is a simple example of Argument Mapping, showing some of the arguments bearing on the assessment that North Korea has nuclear weapons.

These are the specific steps involved in constructing a generic Argument Map:

- Write down the lead hypothesis—a single-sentence statement, judgment, or claim at the top of the argument tree.
- Draw a set of boxes below this initial box and list the key reasons why the statement is true along with the key objections to the statement.
- Use green lines to link the reasons to the primary claim or other conclusions they support.
- Use green lines to connect evidence that supports the key reason. (*Hint:* State the reason and then ask yourself, “Because?” The answer should be the evidence you are seeking.)

- Identify any counterevidence that is inconsistent with the reason. Use red lines to link the counterevidence to the reasons they contradict.

- Identify any objections or challenges to the primary claim or key conclusions. Use red lines to connect the objections to the primary claim or key conclusions.

- Identify any counterevidence that supports the objections or challenges. Use red lines to link the counterevidence to the objections or challenges it supports.

- Specify rebuttals, if any, with orange lines. An objection, challenge, or counterevidence that does not have an orange-line rebuttal suggests a flaw in the argument.

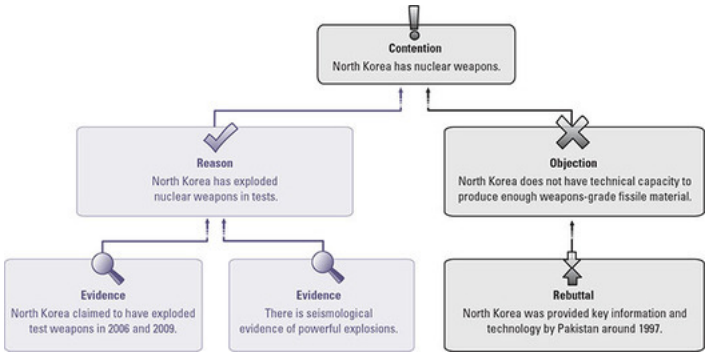
- Evaluate the argument for clarity and completeness, ensuring that red-lined opposing claims and evidence have orange-line rebuttals. If all the reasons can be rebutted, then the argument is without merit.

Potential Pitfalls

Argument Mapping is a challenging skill. Training and practice are required to use the technique properly and to gain its benefits. Detailed instructions for effective use of this technique are available at the website listed below under “Origins of This Technique.” Assistance by someone experienced in using the technique is necessary for first-time users. Commercial software and freeware are available for various types of Argument Mapping. In the absence of software, using a self-stick note to represent each box in an Argument Map drawn on a whiteboard can be helpful, as it is easy to move the self-stick notes around as the map evolves and changes.

Origins of This Technique

The use of Argument Mapping goes back to the early nineteenth century. In the early twentieth century, John Henry Wigmore pioneered its use for legal argumentation. The availability of computers to create and modify Argument Maps in the later twentieth century prompted broader interest in Argument Mapping in Australia for use in a variety of analytic domains. The short description here is based on material in the Austhink website: http://www.austhink.com/critical/pages/argument_mapping.html.



Description

Figure 7.9 Argument Mapping: Does North Korea Have Nuclear Weapons?

Source: Diagram produced using the bCisive Argument Mapping software from Austhink, www.austhink.com.

NOTES

1. See the discussion in chapter 2 contrasting the characteristics of System 1, or intuitive thinking, with System 2, or analytic thinking.

2. Karl Popper, *The Logic of Science* (New York: Basic Books, 1959).

3. Stuart K. Card, "The Science of Analytical Reasoning," in *Illuminating the Path: The Research and Development Agenda for Visual Analytics*, eds. James J. Thomas and Kristin A. Cook (Richland, WA: National Visualization and Analytics Center, Pacific Northwest National Laboratory, 2005), https://pdfs.semanticscholar.org/e6d0/612d677199464af131c16ab0fa657d6954f2.pdf

4. See Popper, *The Logic of Science*.

5. A more detailed description of Te@mACH® can be found on the Software tab at http://www.globalytica.com. The software is in the process of being rehosted in 2019.

6. Richards J. Heuer Jr., *Psychology of Intelligence Analysis* (Washington, DC: CIA Center for the Study of Intelligence, 1999; reprinted by Pherson Associates, LLC, Reston, VA, 2007).

7. Richards J. Heuer Jr., "Cognitive Factors in Deception and Counterdeception," in *Strategic Military Deception*, eds. Donald C. Daniel and Katherine L. Herbig (New York: Pergamon Press, 1982).

8. Heuer, "Cognitive Factors in Deception and Counterdeception"; Michael I. Handel, "Strategic and Operational Deception in Historical Perspective," in *Strategic and Operational Deception in the Second World War*, ed. Michael I. Handel (London: Frank Cass, 1987).

Descriptions of Images and Figures

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Data from the timeline are as follows. February 7: Range instrumentation radar first active. February 12: Airframes observed on ground transport. February 13: TELs observed at suspected launch site. February 16: Transporters observed at launch site. February 24: Telemetry first active. February 28: Military establishes communication links. March 2: Missiles observed on training pads. March 11: Propellant handling activity observed. March 13: Azimuth markers observed on launch pads. March 18: Transporters moved to launch area. March 23: Airframe revealed. April 1: Propellant loading underway. April 3: Navigational closure area announced, and TEL and equipment transloading. April 5: Military assets deployed to support launch. April 6: Missiles launched.

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The cells in each row show the impact of the variable represented by that row on each of the variables listed across the top of the matrix. The cells in each column show the impact of each variable listed down the left side of the matrix on the variable represented by the column.

Variables 2 and 4 in the cross-impact matrix have the greatest effect on the other variables, while variable 6 has the most negative effect.

	Variable 1	**Variable 2**	**Variable 3**	**Variable 4**	**Variable 5**	**Variable 6**
Variable 1	Nil	Neutral	Positive	Neutral	Strong negative	Neutral
Variable 2	Neutral	Nil	Negative	Strong positive	Positive	Positive

	Variable 1	Variable 2	Variable 3	Variable 4	Variable 5	Variable 6
Variable 3	Strong positive	Negative	Nil	Positive	Neutral	Negative
Variable 4	Neutral	Strong positive	Neutral	Nil	Positive	Negative
Variable 5	Strong negative	Positive	Neutral	Positive	Nil	Neutral
Variable 6	Negative	Positive	Strong negative	Negative	Negative	Nil

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Idea is generated by a group, who performs structured brainstorming to produce 1 to 3 alternative hypotheses. A list of possible alternative hypotheses leads to idea evaluation and consolidation, such as formation of affinity groups 1 through 4, and their related hypotheses. The final list consists of hypotheses. Text for the group reads, “Is the group sufficiently diverse?” Text for structured brainstorming reads, “Prompt creativity by using situational logic, historical analogies, and theory.” Text for the list of possible hypotheses reads, “Does this initial list take into account all the key forces and factors?” Text for the affinity group reads, “Create groups of similar hypotheses. Ask if the opposite could be true to generate new ideas.” Text for the hypotheses list reads, “Are the hypotheses mutually exclusive? Is the list comprehensive? Did you clarify each hypothesis by asking who, what, how, when, where, and why?”

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The illustration shows a quadrant. The top side is labeled centralized; the right side is labeled religious; the bottom side is labeled decentralized; and the left side is labeled secularized. H1: Centralized state and secularized society. H2: Centralized state and religious society. H3: Decentralized state and secularized society. H4: Decentralized state and religious society.

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The matrix lists relevant information and hypothesis, buttons for rating credibility, and a column for listing notes, assumptions, and credibility justification. At the top of the matrix, a color legend shows the level of disagreement. The column consists of a tool for reordering hypotheses from most to least likely. The row consists of a tool for moving the most discriminating information to the top of the matrix. The cells consists of options for access chat and viewing analyst ratings. The number of inconsistencies in the hypotheses is also displayed.

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The contention is that North Korea has nuclear weapons. The objection to this is that North Korea does not have technical capacity to produce enough weapons-grade fissile material. A rebuttal to this is that North Korea was provided key information and technology by Pakistan around 1997. The reasoning to the contention is that North Korea has exploded nuclear weapons in tests. The evidence to this is that North Korea claimed to have exploded test weapons in 2006 and 2009, and that there are seismological evidence of powerful explosions.

CHAPTER 8 REFRAMING TECHNIQUES

8.1 Cause and Effect Techniques [190]

8.1.1 Outside-In Thinking [191]

8.1.2 Structured Analogies [194]

8.1.3 Red Hat Analysis [198]

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Students of the intelligence profession have long recognized that failure to challenge a consensus judgment or a well-established mental model has caused most major intelligence failures. The postmortem analysis of virtually every major U.S. intelligence failure since Pearl Harbor has identified an analytic mental model or outdated mindset as a key factor contributing to the failure. Appropriate use of the techniques in this chapter can, however, help mitigate a variety of common cognitive limitations and improve the analyst's odds of getting the analysis right.

This record of analytic failures has generated discussion about the "paradox of expertise."[1] Experts can be the last to recognize the occurrence and significance of change. For example, few specialists on the Middle East foresaw the events of the Arab Spring, few experts on the Soviet Union foresaw its collapse, and almost every economist was surprised by the depth of the financial crisis in 2008. Political analysts in 2016 also failed to forecast the United Kingdom vote to leave the European Union or Donald Trump's election to the presidency of the United States.

As we noted in chapter 2, an analyst's mental model is everything the analyst knows about how things normally work in a certain environment or a specific scientific field. It tells the analyst, sometimes subconsciously, what to look for, what is important, and how to interpret what he or she sees. A mental model formed through education and experience serves an essential function: it is what enables the analyst to provide routinely reasonably good intuitive assessments or estimates about what is happening or likely to happen.

> *What gets us into trouble is not what we don't know, it's what we know for sure that just ain't so.*
>
> —Mark Twain, American author and humorist

The problem is that a mental model that has previously provided accurate assessments and estimates for many years can be slow to change. New information received incrementally over time is easily assimilated into one's existing mental model, so the significance of gradual change over time is easily missed. It is human nature to see the future as a continuation of the past. Generally, major trends and events evolve slowly, and the future is often foreseen by skilled intelligence analysts. However, life does not always work this way. The most significant intelligence failures have been failures to foresee historical discontinuities, when history pivots and changes direction.

In the wake of Al-Qaeda's attack on the United States on September 11, 2001, and the erroneous 2002 National Intelligence Estimate on Iraq's weapons of mass destruction, the U.S. Intelligence Community came under justified criticism. This prompted demands to improve its analytic methods to mitigate the potential for future such failures. For the most part, critics, especially in the U.S. Congress, focused on the need for "alternative analysis" or techniques that challenged conventional wisdom by identifying potential alternative outcomes. Such techniques carried many labels, including challenge analysis, contrarian analysis, and Red Cell/Red Team/Red Hat analysis.

U.S. intelligence agencies responded by developing and propagating techniques such as Devil's Advocacy, Team A/Team B Analysis, Red Team Analysis, and Team A/Team B Debate. Use of such techniques had both plusses and minuses. The techniques forced analysts to consider alternative explanations and explore how their key conclusions could be undermined, but the proposed techniques have several drawbacks.

In a study evaluating the efficacy of Structured Analytic Techniques, Coulthart notes that techniques such as Devil's Advocacy, Team A/Team B Analysis, and Red Teaming are not quantitative and are more susceptible to the biasing found in System 1 Thinking.[2] This observation reinforces our view that this book should give more weight to techniques, such as Analysis of Competing Hypotheses or Structured Self-Critique, that are based on the more formalized and deliberative rule processes consistent with System 2 Thinking.

Another concern is the techniques carry with them an emotional component. No one wants to be told they did something wrong, and it is hard not to take such criticism personally. Moreover, when analysts feel obligated to defend their positions, their key judgments and mindsets tend to become even more ingrained.

One promising solution to this dilemma has been to develop and propagate Reframing Techniques that hopefully accomplish the same objective while neutralizing the emotional component. The goal is to find ways to look at a problem from multiple perspectives while avoiding the emotional pitfalls of an us-versus-them approach.

A frame is any cognitive structure that guides the perception and interpretation of what one sees. A mental model of how things normally work can be thought of as a frame through which an analyst sees and interprets evidence. An individual or a group of people can change their frame of reference, and thus challenge their own thinking about a problem, simply by changing the questions they ask or changing the perspective from which they ask the questions. Analysts can use a Reframing Technique when they need to generate new ideas, when they want to see old ideas from a new perspective, or when they want to challenge a line of analysis.[3] Reframing helps analysts break out of a mental rut by activating a different set of synapses in their brain.

To understand the power of reframing and why it works, it is necessary to know a little about how the human brain works. Scientists believe the brain has roughly 100 billion neurons, each analogous to a computer chip capable of storing information. Each neuron has octopus-like arms called axons and

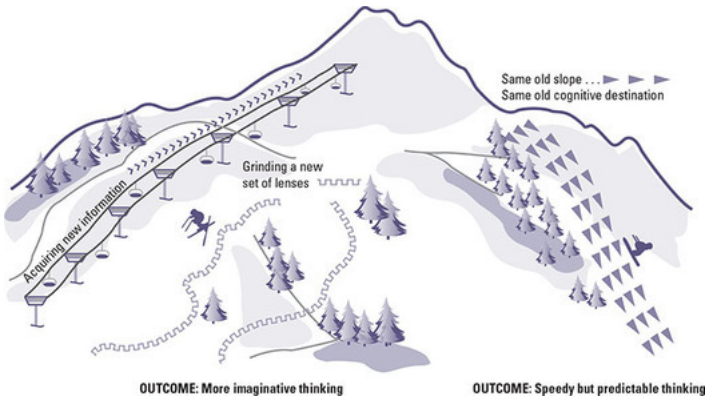
dendrites. Electrical impulses flow through these arms and are ferried by neurotransmitting chemicals across the synaptic gap between neurons. Whenever two neurons are activated, the connections, or synapses, between them are strengthened. The more frequently those same neurons are activated, the stronger the path between them.

Once a person has started thinking about a problem one way, the same mental circuits or pathways are activated and strengthened each time the person thinks about it. The benefit of this is that it facilitates the retrieval of information one wants to remember. The downside is that these pathways become mental ruts that make it difficult to see the information from a different perspective. When an analyst reaches a judgment or decision, this thought process is embedded in the brain. Each time the analyst thinks about it, the same synapses are triggered, and the analyst's thoughts tend to take the same well-worn pathway through the brain. Because the analyst keeps getting the same answer every time, she or he will gain confidence, and often overconfidence, in that answer.

Another way of understanding this process is to compare these mental ruts to the route a skier will cut looking for the best path down from a mountain top (see Figure 8.0). After several runs, the skier has identified the ideal path and most likely will remain stuck in the selected rut unless other stimuli or barriers force him or her to break out and explore new opportunities.

Fortunately, it is easy to open the mind to think in different ways. The techniques described in this chapter are designed to serve that function. The trick is to restate the question, task, or problem from a different perspective to activate a different set of synapses in the brain. Each of the applications of reframing described in this chapter does this in a different way. Premortem Analysis, for example, asks analysts to imagine themselves at some future point in time, after having just learned that a previous analysis turned out to be completely wrong. The task then is to figure out how and why it might have gone wrong. What If? Analysis asks the analyst to imagine that some unlikely event has occurred, and then to explain how it could have happened along with the implications of the event.

These techniques are generally more effective in a small group than with a single analyst. Their effectiveness depends in large measure on how fully and enthusiastically participants in the group embrace the imaginative or alternative role they are playing. Just going through the motions is of limited value. Practice in using Reframing Techniques—especially Outside-In Thinking, Premortem Analysis, and Structured Self-Critique—will help analysts become proficient in the fifth habit of the Five Habits of the Master Thinker: understanding the overarching context within which the analysis is being done.



Description

Figure 8.0 Mount Brain: Creating Mental Ruts

In addition, appropriate use of Reframing Techniques can help mitigate a variety of common cognitive limitations and improve the analyst's odds of getting the analysis right. They are particularly useful in minimizing Mirror Imaging or the tendency to assume others will act in the same way we would, given

similar circumstances. They guard against the Anchoring Effect, which is accepting a given value of something unknown as a proper starting point for generating an assessment. Reframing Techniques are especially helpful in countering the intuitive traps of focusing on a narrow range of alternatives representing only modest change (Expecting Marginal Change) and continuing to hold to a judgment when confronted with a mounting list of contradictory evidence (Rejecting Evidence).

This chapter discusses three families of Reframing Techniques:

- Three techniques for assessing cause and effect: Outside-In Thinking, Structured Analogies, and Red Hat Analysis
- Six techniques for challenging conventional wisdom or the group consensus: Quadrant Crunching™, Premortem Analysis, Structured Self-Critique, What If? Analysis, High Impact/Low Probability Analysis, and the Delphi Method
- Two techniques for managing conflict: Adversarial Collaboration and Structured Debate

OVERVIEW OF TECHNIQUES

Outside-In Thinking broadens an analyst's thinking about the forces that can influence an issue of concern. The technique prompts the analyst to reach beyond his or her specialty area to consider broader social, organizational, economic, environmental, political, legal, military, technological, and global forces or trends that can affect the topic under study.

Structured Analogies applies analytic rigor to reasoning by analogy. This technique requires that the analyst systematically compare the topic at hand with multiple potential analogies before selecting the one for which the circumstances are most similar. Most analysts are comfortable using analogies to organize their thinking or make forecasts as, by definition, they contain information about what has happened in similar situations in the past. People often recognize patterns and then consciously take actions that were successful in a previous experience or avoid actions that previously were unsuccessful. However, analysts need to avoid the strong tendency to fasten onto the first analogy that comes to mind—particularly one that supports their prior view about an issue.

Red Hat Analysis is a useful technique for trying to perceive threats and opportunities as others see them. Intelligence analysts frequently endeavor to forecast the behavior of a foreign leader, group, organization, or country. In doing so, they need to avoid the common error of Mirror Imaging, which is the natural tendency of analysts to assume that others think and perceive the world in the same way they do. Business analysts can fall into the same trap when projecting the actions of their competitors. Red Hat Analysis is of limited value without significant understanding of the culture of the target company or country and the decision-making styles of the people involved.

Quadrant Crunching™ uses key assumptions and their opposites as a starting point for systematically generating multiple alternative outcomes. The technique forces analysts to rethink an issue from a broad range of perspectives and systematically question all the assumptions that underlie their lead hypothesis. It is most useful for ambiguous situations for which little information is available. Two versions of the technique have been developed: Classic Quadrant Crunching™ to avoid surprise and Foresight Quadrant Crunching™ to develop a comprehensive set of potential alternative futures. For example, analysts might use Classic Quadrant Crunching™ to identify the many ways terrorists might attack a water supply. They would use Foresight Quadrant Crunching™ to generate multiple scenarios of how the conflict in Syria might evolve over the next five years.

Premortem Analysis reduces the risk of analytic failure by identifying and analyzing a potential failure *before* it occurs. Imagine that several months or years have passed, and the just-completed analysis has turned out to be spectacularly wrong. Then imagine what could have caused it to be wrong. Looking back from the future to explain something that has happened is much easier than looking into the future to forecast what will happen. This approach to analysis helps identify problems one has not foreseen.

Structured Self-Critique is a procedure that a small team or group uses to identify weaknesses in its own analysis. All team or group members don a hypothetical black hat and become critics rather than supporters of their own analysis. From this opposite perspective, they respond to a list of questions about sources of uncertainty, the analytic processes used, critical assumptions, diagnosticity of evidence, anomalous evidence, and information gaps. They also consider changes in the broad environment in which events are happening, alternative decision models, current cultural expertise, and indicators of possible deception. Looking at the responses to these questions, the team strengthens its analysis by addressing uncovered faults and reassesses its confidence in its overall judgment.

What If? Analysis is an important technique for alerting decision makers to an event that could happen, or is already happening, even if it may seem unlikely at the time. It is a tactful way of suggesting to decision makers the possibility that their understanding of an issue may be wrong. What If? Analysis serves a function like Foresight analysis—it creates an awareness that prepares the mind to recognize early signs of a significant change, and it may enable a decision maker to plan for that contingency. The analyst imagines that an event has occurred and then considers how the event could have unfolded.

High Impact/Low Probability Analysis is used to sensitize analysts and decision makers to the possibility that a low-probability event might happen. It should also stimulate them to think about measures that could deal with the danger or to exploit the opportunity if the event occurs. The analyst assumes the event has occurred, and then figures out how it could have happened and what the consequences might be.

Delphi Method is a procedure for obtaining ideas, judgments, or forecasts electronically from a geographically dispersed panel of experts. It is a time-tested, extremely flexible procedure that can be used on any topic to which expert judgment applies. The technique can identify divergent opinions that challenge conventional wisdom and double-check research findings. If two analyses from different analysts who are using different techniques arrive at the same conclusion, confidence in the conclusion is increased or at least warranted. If the two conclusions disagree, this is also valuable information that may open new avenues of research.

Adversarial Collaboration is an agreement between opposing parties on how they will work together to resolve their differences, gain a better understanding of why they differ, or collaborate on a joint paper to explain the differences. Six approaches to implementing Adversarial Collaboration are presented in this chapter, including variations of three techniques described elsewhere in this book—Key Assumptions Check, Analysis of

Competing Hypotheses, and Argument Mapping—and three new techniques—Mutual Understanding, Joint Escalation, and the Nosenko Approach.

Structured Debate is a planned debate of opposing points of view on a specific issue in front of a "jury of peers," senior analysts, or managers. As a first step, each side writes up the best possible argument for its position and passes this summation to the opposing side. The next step is an oral debate that focuses on refuting the other side's arguments rather than further supporting one's own arguments. The goal is to elucidate and compare the arguments *against* each side's argument. If neither argument can be refuted, perhaps both merit some consideration in the analytic report.

8.1 CAUSE AND EFFECT TECHNIQUES

Attempts to explain the past and forecast the future are based on an understanding of cause and effect. Such understanding is difficult, because the kinds of variables and relationships studied by the intelligence analyst are, in most cases, not amenable to the kinds of empirical analysis and theory development common in academic research. The best the analyst can do is to make an informed judgment, but such judgments depend upon the analyst's subject-matter expertise and reasoning ability and are vulnerable to various cognitive pitfalls and fallacies of reasoning.

One of the most common causes of intelligence failures is the unconscious assumption that other countries and their leaders will act as we would in similar circumstances, a form of Mirror Imaging. Two related pitfalls are the tendency to assume that the results of an opponent's actions are what the opponent intended and an analyst's reluctance to accept the reality that simple mistakes, accidents, unintended consequences, coincidences, or small causes can have large effects. Perceptions of causality are partly determined by where one's attention is directed; as a result, information that is readily available, salient, or vivid is more likely to be perceived as causal than information that is not. Cognitive limitations and common errors in the perception of cause and effect are discussed in greater detail in Richards J. Heuer Jr.'s *Psychology of Intelligence Analysis* (Reston, VA: Pherson Associates, LLC, 2007).

> *I think we ought always to entertain our opinions with some measure of doubt. I shouldn't wish people dogmatically to believe any philosophy, not even mine.*
>
> —Bertrand Russell, English philosopher

There is no single, easy technique for mitigating the pitfalls involved in making causal judgments because analysts usually lack the information they need to be certain of a causal relationship. Moreover, the complex events that are the focus of intelligence analysis often have multiple causes that interact with one another.

Psychology of Intelligence Analysis describes three principal strategies that intelligence analysts use to make judgments to explain the cause of current events or forecast what might happen in the future:

- **Applying theory.** Basing judgments on the systematic study of many examples of the same phenomenon. Theories or models often based on empirical academic research are used to explain how and when certain types of events normally occur. Many academic models are too generalized to be applicable to the unique characteristics of most intelligence problems. Many others involve quantitative analysis that is beyond the domain of Structured Analytic Techniques as defined in this book. However, a conceptual model that simply identifies relevant variables and the diverse ways they might combine to cause specific outcomes can be a useful template for guiding collection and analysis of some common types of problems. Outside-In Thinking can be used to explain current events or forecast the future in this way.

- **Comparison with historical analogies.** Combining an understanding of the facts of a specific situation with knowledge of what happened in similar situations either in one's personal experience or historical events. The Structured Analogies technique adds rigor to this process for understanding what has occurred and Analysis by Contrasting Narratives in chapter 9 provides insight into understanding how the future might evolve.

- **Situational logic.** Making expert judgments based on the known facts and an understanding of the underlying forces at work at a given time and place. When an analyst is working with

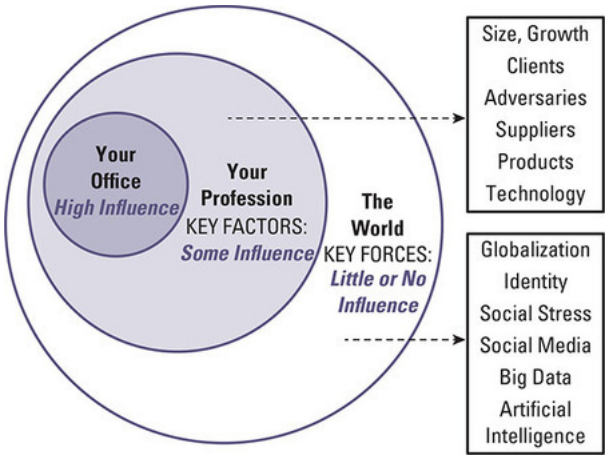
incomplete, ambiguous, and possibly deceptive information, these expert judgments usually depend upon assumptions about capabilities, intent, or the normal workings of things in the country of concern. Red Hat Analysis has proven highly effective when seasoned analysts use it to anticipate the actions of dictators or autocratic regimes.

8.1.1 Outside-In Thinking

Outside-In Thinking identifies the broad range of global, political, environmental, technological, economic, or social forces and trends that are outside the analyst's area of expertise but that may profoundly affect the issue of concern. Many analysts tend to think from the inside out, focused on factors they are familiar with in their specific area of responsibility. Outside-In Thinking reverses this process as illustrated in Figure 8.1.1a. Whereas an analyst usually works from the data at hand outward to explain what is happening, Outside-In Thinking spurs the analyst to first consider how external factors such as an adversary's intent or new advances in artificial intelligence (AI) could have an impact on the situation, thereby enriching the analysis.

When to Use It

This technique is most useful in the early stages of an analytic process when analysts need to identify all the critical factors that might explain an event or could influence how a situation will develop. It should be part of the standard process for any project that analyzes potential future outcomes, for this approach covers the broader environmental context from which surprises and unintended consequences often come.



Description

Figure 8.1.1A An Example of Outside-In Thinking

Source: Pherson Associates, LLC, 2019.

Outside-In Thinking also is useful when assembling a large database, and analysts want to ensure they have not forgotten important fields in the database architecture. For most analysts, important categories of information (or database fields) are easily identifiable early in a research effort, but invariably one or two additional fields emerge after an analyst or group of analysts is well into a project. This forces the analyst or group to go back and review all previous reporting and input the additional data. Typically, the overlooked fields are in the broader environment over which the analysts have little control. By applying Outside-In Thinking, analysts can better visualize the entire set of data fields early in the research effort.

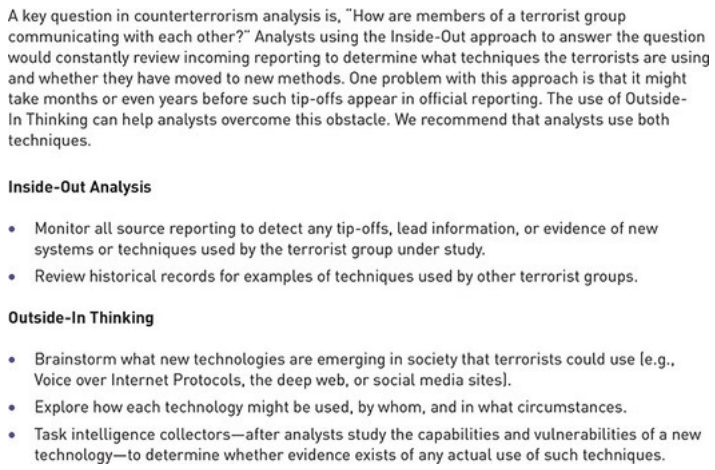
Value Added

Most analysts focus on familiar factors within their field of specialty, but we live in a complex, interrelated world where events in our little niche of that world are often affected by forces in the broader environment over which we have no control. The goal of Outside-In Thinking is to help analysts see the entire picture, not just the part of the picture with which they are already familiar.

Outside-In Thinking reduces the risk of missing important variables early in the analytic process because of the tendency to focus on a narrow range of alternatives representing only incremental or marginal change in the current situation. It encourages analysts to rethink a problem or an issue while employing a broader conceptual framework. The technique is illustrated in Figure 8.1.1b. By casting their net broadly at the beginning, analysts are more likely to see an important dynamic or to include a relevant alternative hypothesis. The process can provide new insights and uncover relationships that were not evident from the intelligence reporting. In doing so, the technique helps analysts think in terms that extend beyond day-to-day reporting. It stimulates them to address the absence of information and identify more fundamental forces and factors that should be considered.

The Method

- Generate a generic description of the problem or phenomenon under study.



A key question in counterterrorism analysis is, "How are members of a terrorist group communicating with each other?" Analysts using the Inside-Out approach to answer the question would constantly review incoming reporting to determine what techniques the terrorists are using and whether they have moved to new methods. One problem with this approach is that it might take months or even years before such tip-offs appear in official reporting. The use of Outside-In Thinking can help analysts overcome this obstacle. We recommend that analysts use both techniques.

Inside-Out Analysis

- Monitor all source reporting to detect any tip-offs, lead information, or evidence of new systems or techniques used by the terrorist group under study.
- Review historical records for examples of techniques used by other terrorist groups.

Outside-In Thinking

- Brainstorm what new technologies are emerging in society that terrorists could use (e.g., Voice over Internet Protocols, the deep web, or social media sites).
- Explore how each technology might be used, by whom, and in what circumstances.
- Task intelligence collectors—after analysts study the capabilities and vulnerabilities of a new technology—to determine whether evidence exists of any actual use of such techniques.

Figure 8.1.1B Inside-Out Analysis versus Outside-In Thinking

Source: Pherson Associates, LLC, 2019.

- Form a group to brainstorm all the key forces and factors that could affect the topic but over which decision makers or other individuals can exert little or no influence, such as globalization, the emergence of new technologies, historical precedent, and the growing role of social media.
- Employ the mnemonic STEMPLES + to trigger new ideas (**S**ocial, **T**echnical, **E**conomic, **M**ilitary, **P**olitical, **L**egal, **E**nvironmental, and **S**ecurity, plus other factors such as Demographic, Religious, or Psychological) and structure the discussion.
- Determine whether sufficient expertise is available for each factor or category.
- Assess specifically how each of these forces and factors might affect the problem.
- Ascertain whether these forces and factors have an impact on the issue at hand, basing your conclusion on the available evidence.
- Generate new intelligence collection tasking or research priorities to fill in information gaps.

Relationship to Other Techniques

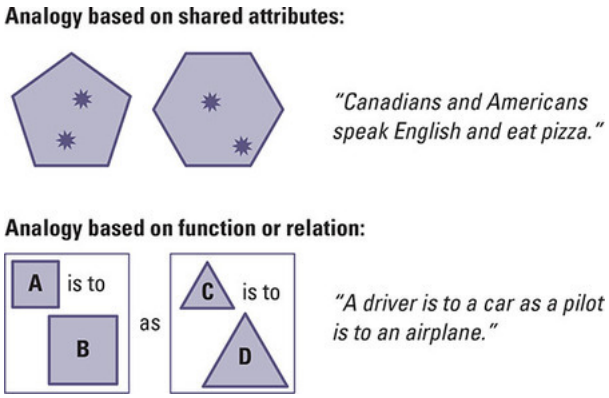
Outside-In Thinking is essentially the same as a business analysis technique that goes by different acronyms such as STEEP, STEEPLED, PEST, or PESTLE. For example, PEST is an acronym for **P**olitical, **E**conomic, **S**ocial, and **T**echnological; STEEPLED also includes **L**egal, **E**thical, and **D**emographic. Military intelligence organizations often use the mnemonic PMESII, which stands for **P**olitical, **M**ilitary, **E**conomic, **S**ocial, **I**nformation, and **I**nfrastructure.[4] All require the analysis of external factors that may have either a favorable or unfavorable influence on an organization or the phenomenon under study.

Origins of This Technique

This technique has been used in planning and management environments to ensure identification of outside factors that might affect an outcome. The Outside-In Thinking approach described here is from Randolph H. Pherson, *Handbook of Analytic Tools and Techniques*, 5th ed. (Tysons, VA: Pherson Associates, LLC, 2019).

8.1.2 Structured Analogies

Analogies compare two situations to elicit and provoke ideas, help solve problems, and suggest history-tested indicators. An analogy can capture shared attributes or it can be based on similar relationships or functions being performed (see Figure 8.1.2). The Structured Analogies technique applies increased rigor to analogical reasoning by requiring that the issue of concern be compared systematically with multiple analogies.



Description

Figure 8.1.2 Two Types of Structured Analogies

Source: Pherson Associates, LLC, 2019.

When to Use It

In daily life, people recognize patterns of events or similar situations, then consciously take actions that were successful in a previous experience or avoid actions that were previously unsuccessful. Similarly, analysts infer courses of action from past, similar situations, often turning to analogical reasoning in unfamiliar or uncertain situations where the available information is inadequate for any other approach. However, analysts should consider the time required for this structured approach and may choose to use it only when the cost of being wrong is high.

Structured Analogies also is one of many structured techniques analysts can use to generate a robust set of indicators. If history reveals sets of events or actions that foretold what was about to occur in the past, they could prove to be valuable lead indicators for anticipating whether a similar event is likely to unfold in the future.

> *One of the most widely used tools in intelligence analysis is the analogy. Analogies serve as the basis for constructing many predictive models, are the basis for most hypotheses, and rightly or wrongly, underlie many generalizations about what the other side will do and how they will go about doing it.*
>
> —Jerome K. Clauser and Sandra M. Weir, *Intelligence Research Methodology*, Defense Intelligence School (1975)

Value Added

Reasoning by analogy helps achieve understanding by reducing the unfamiliar to the familiar. In the absence of data required for a full understanding of the current situation, analogical reasoning may be the only forecasting option. Using the Structured Analogies technique helps analysts avoid the tendency to fasten quickly on a single analogy and then focus only on evidence that supports the similarity of that analogy.

Structured Analogies is one technique for which there has been an empirical study of its effectiveness. A series of experiments compared Structured Analogies with unaided judgments in predicting the decisions made in eight conflict situations. These were difficult forecasting problems, and the 32 percent accuracy of unaided experts was only slightly better than chance. In contrast, 46 percent of the forecasts made by using the Structured Analogies process described here were accurate. Among the experts who were independently able to think of two or more analogies and who had direct experience with their closest analogy, 60 percent of the forecasts were accurate.[5]

Structured Analogies help analysts avoid the mistake of focusing attention on one vivid scenario while ignoring other possibilities (Vividness Bias), seeing patterns in random events as systematic (Desire for Coherence and Uncertainty Reduction), and selecting the first answer that appears “good enough” (Satisficing). It also helps protect analysts from assuming the same dynamic is in play when, at first glance, something seems to accord with their past experiences (Projecting Past Experiences), assuming an event was more certain to occur than actually was the case (Assuming Inevitability), and believing that actions are the result of centralized patterns or direction and finding patterns where they do not exist (Presuming Patterns).

The Method

We recommend training in this technique before using it. Such a training course is available at http://www.academia.edu/1070109/Structured_Analogies_for_Forecasting.

- Describe the issue and the judgment or decision that needs to be made.
- Identify experts who are familiar with the problem and have a broad background that enables them to identify analogous situations. Aim for at least five experts with varied backgrounds.
- Brainstorm as many analogies as possible without focusing too strongly on how similar they are to the current situation. Various universities and international organizations maintain databases to facilitate this type of research. For example, the Massachusetts Institute of Technology (MIT) maintains its Cascon System for Analyzing International Conflict, a database of 85 post–World War II conflicts that are categorized and coded to facilitate their comparison with current conflicts of interest. The University of Maryland maintains the International Crisis Behavior Project database covering 452 international crises between 1918 and 2006. Each case is coded for eighty-one descriptive variables.
- Review the list of potential analogies and agree on which ones should be examined further.
- Develop a tentative list of categories for comparing the analogies to determine which analogy is closest to the issue in question. For example, the MIT conflict database codes each case according to the following broad categories as well as finer subcategories: previous or general relations, military-strategic,

international organization (United Nations, legal, public opinion), ethnic, economic/resources, internal politics of the sides, communication and information, and actions in disputed area.

- Write an account of each selected analogy, with equal focus on those aspects of the analogy that are similar and those that are different from the situation in play. A sophisticated approach to analogical reasoning examines the nature of the similarities and traces these critical aspects back to root causes. A good analogy goes beyond superficial similarity to examine deep structure. Each write-up, distributed among the experts, can be posted electronically so each member of the group can read and comment on it.

- Evaluate the analogies by asking each expert to rate the similarity of each to the issue of concern on a scale of 0 to 10, where 0 = not at all similar and 10 = very similar.

- Relate the highest-ranked analogies to the issue of concern by discussing the results of the evaluation and making a forecast for the current issue. The forecast may be the same as the outcome of the most-similar analogy. Alternatively, identify several other possible outcomes based on the diverse outcomes of analogous situations.

- When appropriate, use the analogous cases to identify drivers or policy actions that might influence the outcome of the current situation.

If using Structured Analogies to generate indicators, consider the highest-ranking analogies and ask if the previous actions and events are happening now or have happened. Also ask what actions have not happened or are not happening and assess the implications.

Potential Pitfalls

Noticing shared characteristics leads most people to an analogy, but logical reasoning necessitates considering conditions, qualities, or circumstances that are dissimilar between the two phenomena. A sophisticated approach examines the nature of the similarities and traces these critical aspects back to root causes. This should be standard practice in all reasoning by analogy and especially in those cases when one cannot afford to be wrong.

> *When resorting to an analogy, [people] tend to seize upon the first that comes to mind. They do not research more widely. Nor do they pause to analyze the case, test its fitness, or even ask in what ways it might be misleading.*
>
> —Ernest R. May, "*Lessons" of the Past: The Use and Misuse of History in American Foreign Policy* (1975)

Additionally, many analogies are used loosely and have a broad impact on the thinking of both decision makers and the public at large—for better or worse. One role for analysis is to take analogies that are already being used by others and subject these analogies to rigorous examination to prevent assumption-based decision making.

Origins of This Technique

Structured Analogies is described in greater detail in Kesten C. Green and J. Scott Armstrong, “Structured Analogies for Forecasting,” in *International Journal of Forecasting (2007),* and www.forecastingprinciples.com/paperpdf/Structured_Analogies.pdf.

We recommend that analysts considering the use of this technique read Richard D. Neustadt and Ernest R. May, “Unreasoning from Analogies,” chapter 4 in *Thinking in Time: The Uses of History for Decision Makers* (New York: Free Press, 1986). We also suggest Giovanni Gavetti and Jan W. Rivkin, “How Strategists Really Think: Tapping the Power of Analogy,” *Harvard Business Review* (April 2005).

8.1.3 Red Hat Analysis

Red Hat Analysis is anticipating the behavior of another individual or group by trying to replicate how they think. Intelligence analysts frequently endeavor to forecast the actions of an adversary or a competitor. In doing so, they must take care to avoid the common error of Mirror Imaging, the natural tendency to assume that others think and perceive the world in the same way as the analyst does. Red Hat Analysis[6] is a useful technique for trying to perceive threats and opportunities as others see them. This technique alone, however, is of limited value without significant understanding of the culture of the other country or company and the decision-making style of the people involved.

> *To see the options faced by foreign leaders as these leaders see them, one must understand their values and assumptions and even their misperceptions and misunderstandings. Without such insight, interpreting foreign leaders' decisions or forecasting future decisions is often little more than partially informed speculation. Too frequently, behavior of foreign leaders appears "irrational" or "not in their own best interest." Such conclusions often indicate analysts have projected American values and conceptual frameworks onto the foreign leaders and societies, rather than understanding the logic of the situation as it appears to them.*
>
> —Richards J. Heuer Jr., *Psychology of Intelligence Analysis* (2007)

When to Use It

The chances of a Red Hat Analysis being accurate are better when one is trying to foresee the behavior of a specific person who has the authority to make decisions. Authoritarian leaders as well as small, cohesive groups, such as terrorist cells, are obvious candidates for this type of analysis. In contrast, the chances of making an accurate forecast about an adversary's or a competitor's decision is appreciably lower when the decision is constrained by a legislature or influenced by conflicting interest groups. In law enforcement, Red Hat Analysis is useful in simulating the likely behavior of a criminal or a drug lord.

Value Added

There is a great deal of truth in the maxim, “Where you stand depends on where you sit.” Red Hat Analysis requires the analyst to adopt—and make decisions consonant with—the culture of a foreign leader, cohesive group, criminal, or competitor. This conscious effort to imagine the situation as the target perceives it helps the analyst gain a different and usually more accurate perspective on a problem or issue. Reframing the problem in this way typically changes the analyst’s perspective from that of an analyst observing and forecasting an adversary’s behavior to that of a leader who must make a difficult decision within that operational culture. This reframing process often introduces new and different stimuli that might not have been factored into a traditional analysis, such as a target’s familial ties.

The technique introduces more human factors into the analysis such as, “Who can I count on (e.g., do I have relatives, friends, or business associates) to help me out?” “Is that operation within my capabilities?” “What are my supporters expecting from me?” “Do I really need to make this decision now?” and “What are the consequences of making a wrong decision?”

In addition to protecting the analyst against the bias of Mirror Imaging, Red Hat Analysis has proved to be effective in combating the influence of accepting the given value of things unknown as proper starting points for predicting someone’s future course of action (Anchoring Effect) and predicting rare events based on weak evidence or evidence that easily comes to mind (Associative Memory).

Red Hat Analysis helps analysts guard against the common pitfall of Overrating Behavioral Factors (also referred to as Fundamental Attribution Error) by dampening the tendency to attribute the behavior of other people, organizations, or governments to the

nature of the actor and underestimate the influence of situational factors. Conversely, people tend to see their own behavior as conditioned almost entirely by the situation in which they find themselves. We seldom see ourselves as a bad person, but we often see malevolent intent in others.[7]

Red Hat Analysis also protects analysts from falling prey to the practitioners' traps of not addressing the impact of the absence of information on analytic conclusions (Ignoring the Absence of Information) and continuing to hold to a judgment when confronted with a mounting list of contradictory evidence (Rejecting Evidence).

The Method

- Gather a group of experts with in-depth knowledge of the operating environment and target's personality, motives, and style of thinking. If possible, try to include people who are well-grounded in the target's culture, speak the same language, share the same ethnic background, or have lived in the target's country.

- Establish a baseline by presenting the experts with a situation or a stimulus and ask them what they would do in this situation. For example, you might ask for a response to this situation: "The United States has just imposed sanctions on your country. How would you react?" Or, "We are about to launch a new product. How would you react if you were a competitor?" The reason for first asking the experts *how* they would react is to assess whether the adversary is likely to react differently than the analyst would.[8]

- After the experts have articulated *how* they would have responded or acted, ask them to explain *why* they think they would behave that way. Ask the experts to list what core values or core assumptions were motivating their behavior or actions. Again, this step establishes a baseline for assessing *why* the adversary is likely to react differently than the analyst would.

- Once they can explain in a convincing way *why* they chose to act the way they did, ask the experts to put themselves in the shoes of the target, adversary, or competitor and simulate how the *target* would respond. At this point, the experts should ask themselves, "Does our target share our values or motives or methods of operation?" If not, then how would those differences lead the target to act in ways the analysts might not have anticipated before engaging in this exercise? To gain cultural

expertise that might otherwise be lacking, consider using the Delphi Method to elicit the expertise of geographically distributed experts.

- In presenting the results, describe the considered alternatives and the rationale for selecting the path the assembled participants think the person or group is most likely to take. Consider other less conventional means of presenting the results of your analysis, such as the following:

    - Describing a hypothetical conversation in which the leader and other players talk in first person.

    - Drafting a document (a set of instructions, military orders, policy paper, or directives) that the target, adversary, or competitor would likely generate.

Figure 8.1.3 shows how one might use Red Hat Analysis to catch bank robbers.

Potential Pitfalls

Forecasting human decisions or the outcome of a complex organizational process is difficult in the best of circumstances. For example, how successful would you expect to be in forecasting the difficult decisions to be made by the U.S. president or even your local mayor? It is even more difficult when dealing with a foreign culture with sizeable gaps in the available information. Mirror Imaging is hard to avoid because, in the absence of a thorough understanding of the foreign situation and culture, your own perceptions appear to be the only reasonable way to look at the problem.

A key first step in avoiding Mirror Imaging is to establish how you would behave and the reasons why. After establishing this baseline, the analyst then asks if the adversary would act differently and why. Is the adversary motivated by different stimuli, or does the adversary hold different core values? The task of Red Hat Analysis then becomes illustrating how these differences would result in different policies or behaviors.

A common error in our perceptions of the behavior of other people, organizations, or governments is to fall prey to the heuristic of Overrating Behavior Factors, which is likely to be even more common when assessing the behavior of foreign leaders or groups. This error is especially easy to make when one assumes that the target has malevolent intentions, but our understanding of the pressures on that actor is limited.

Most banking establishments use surveillance cameras to deter potential robberies, catch bank robbers, and avert internal loss. Multiple cameras usually are deployed near the ceiling to provide a broad panoramic view of all public spaces; some banks also put cameras behind the tellers to better acquire an image of the face of potential bank robbers. All these camera locations are appropriate for various reasons. If Red Hat Analysis were employed during the development of surveillance strategies, however, many banks would discover that another, more optimal, camera placement for capturing the face of a bank robber merits serious consideration.

By putting themselves "in the shoes" of the robber, banks can gain a better understanding of what behaviors they are most likely to encounter. For instance, most bank robbers know that banks have surveillance cameras. For this reason, they often wear baseball caps with visors, look down at their feet, and partially cover their faces when entering the bank to hide or obscure their image. Often when they confront the teller, they continue to look down to avoid showing their face. After they have collected their money, they turn around and look up to assess whether someone might impede their exit route.

By using Red Hat Analysis, security consultants would be more likely to conclude that the most effective location for a bank surveillance camera [for robbery suspect identification] is adjacent to the exit door at shoulder level. When the camera is placed at that location, it will catch the back of a robber entering the bank but increase the chances of capturing an unobstructed image of the robber's face when the robber departs. Once bank robbers have their money, they only care about how quickly they can exit the bank, and they stop looking down.

Figure 8.1.3 Using Red Hat Analysis to Catch Bank Robbers

Source: Eric Hess, Senior Biometric Product Manager, MorphoTrak, Inc. From an unpublished paper, "Facial Recognition for Criminal Investigations," delivered at the International Association of Law Enforcement Intelligence Analysts, Las Vegas, NV, 2009. Reproduced with permission.

Analysts should always try to see the situation from the other side's perspective, but if a sophisticated grounding in the culture and operating environment of their subject is lacking, they will often be wrong. Recognition of this pitfall should prompt analysts to consider using words such as "possibly" and "could happen" rather than "likely" or "probably" when reporting the results of Red Hat Analysis.

Relationship to Other Techniques

Red Hat Analysis differs from Red Team Analysis in that it can be done or organized by any analyst—or more often a team of analysts—who needs to understand or forecast an adversary's behavior and who has, or can gain access to, the required cultural expertise. Red Cell and Red Team Analysis are challenge techniques usually conducted by a permanent organizational unit staffed by individuals well qualified to think like or play the role of an adversary. The goal of Red Hat Analysis is to exploit available resources to develop the best possible analysis of an adversary's or competitor's behavior. The goal of Red Cell or Red Team Analysis is usually to challenge the conventional wisdom of established analysts or an opposing team.

Origins of This Technique

Red Hat, Red Cell, and Red Team Analysis became popular during the Cold War when “red” symbolized the Soviet Union, but they continue to have broad applicability. This description of Red Hat Analysis is a modified version of that in Randolph H. Pherson, *Handbook of Analytic Tools and Techniques*, 5th ed. (Tysons, VA: Pherson Associates, 2019).

8.2 CHALLENGE ANALYSIS TECHNIQUES

Challenge analysis encompasses a set of analytic techniques that are also called contrarian analysis, alternative analysis, red teaming, and competitive analysis. What all of these have in common is the goal of challenging an established mental model or analytic consensus to broaden the range of possible explanations or estimates that should be seriously considered. That this same activity has been called by so many different names suggests there has been some conceptual diversity about how and why these techniques are used and what they might help accomplish. All of them apply some form of reframing to better understand past patterns or foresee future events.

These techniques enable the analyst, and eventually the intelligence or business client, to evaluate events from a different or contrary perspective—in other words, with a different mental model. A surprising event is not likely to be anticipated if it has not been imagined, which requires examining the world from a different perspective.[9]

Former Central Intelligence Agency director Michael Hayden makes a compelling logical case for consistently challenging conventional wisdom. He has stated that “our profession deals with subjects that are inherently ambiguous, and often deliberately hidden. Even when we’re at the top of our game, we can offer policymakers insight, we can provide context, and we can give them a clearer picture of the issue at hand, but we cannot claim certainty for our judgments.” The director went on to suggest that getting it right seven times out of ten might be a realistic expectation.[10]

Hayden’s estimate of seven times out of ten is supported by a quick look at verbal expressions of probability used in intelligence reports. “Probable” seems to be the most common verbal expression of the likelihood of an assessment or estimate. Unfortunately, there is no

consensus within the Intelligence Community on what “probable” and other verbal expressions of likelihood mean when they are converted to numerical percentages. For discussion here, we accept Sherman Kent’s definition of “probable” as meaning “75% plus or minus 12%.”[11] This means that analytic judgments described as “probable” are expected to be correct roughly 75 percent of the time—and, therefore, incorrect or off target about 25 percent of the time.

Logically, one might then expect that one of every four judgments that intelligence analysts describe as “probable” will turn out to be wrong. This perspective broadens the scope of what challenge analysis might accomplish. It should not be limited to questioning the dominant view to be sure it’s right. Even if the challenge analysis confirms the initial probability judgment, it should go further to seek a better understanding of the other 25 percent. In what circumstances might there be a different assessment or outcome, what would that be, what would constitute evidence of events moving in that alternative direction, how likely is it, and what would be the consequences?

As we will discuss in the next section on conflict management, an understanding of these probabilities should reduce the frequency of unproductive conflict between opposing views. Analysts who recognize a one-in-four chance of being wrong should at least be open to consideration of alternative assessments or estimates to account for the other 25 percent.

This chapter describes three categories of challenge analysis techniques: self-critique, critique *of* others, and solicitation of critique *by* others:

- **Self-critique.** Three techniques that help analysts challenge their own thinking are Classic Quadrant Crunching™, Premortem Analysis, and Structured Self-Critique. These techniques spur analysts to reframe and challenge their analysis in multiple ways. They can counteract the pressures for

conformity or consensus that often suppress the expression of dissenting opinions in an analytic team or group. We adapted Premortem Analysis from the business world and applied it to the analytic process more broadly.

- **Critique *of* others.** Analysts can use What If? Analysis or High Impact/Low Probability Analysis to tactfully question the conventional wisdom by making the best case for an alternative explanation or outcome.

- **Critique *by* others.** The Delphi Method is a structured process for eliciting usually anonymous opinions from a panel of outside experts. The authors have decided to drop from this edition of the book two other techniques for seeking critique by others—Devil's Advocacy and Red Team Analysis. They can be counterproductive because they add an emotional component to the analytic process that further ingrains mindsets.

8.2.1 Quadrant Crunching™

Quadrant Crunching™ is a systematic procedure for identifying all the potentially feasible combinations among several sets of variables. It combines the methodology of a Key Assumptions Check (chapter 7) with Multiple Scenarios Generation (chapter 9).

There are two versions of the technique: Classic Quadrant Crunching™ helps analysts avoid surprise, and Foresight Quadrant Crunching™ is used to develop a comprehensive set of potential alternative futures. Both techniques spur analysts to rethink an issue from a broad range of perspectives and systematically question all the assumptions that underlie their lead hypothesis.

- Classic Quadrant Crunching™ helps analysts avoid surprise by examining multiple possible combinations of selected key variables. Pherson Associates, LLC, initially developed the technique in 2006 to help counterterrorism analysts and decision makers discover all the ways international terrorists or domestic radical extremists might mount an attack.

- Foresight Quadrant Crunching™ was developed in 2013 by Globalytica, LLC. It adopts the same initial approach of Reversing Assumptions as Classic Quadrant Crunching™. It then applies Multiple Scenarios Generation to generate a wide range of comprehensive and mutually exclusive future scenarios or outcomes of any type—many of which analysts had not previously contemplated.

When to Use It

Both techniques are useful for dealing with highly complex and ambiguous situations for which little data is available and the chances for surprise are great. Analysts need training and practice before using either technique, and we highly recommend engaging an experienced facilitator, especially when this technique is used for the first time.

Analysts can use Classic Quadrant Crunching™ to identify and systematically challenge assumptions, explore the implications of contrary assumptions, and discover “unknown unknowns.” By generating multiple possible alternative outcomes for any situation, Classic Quadrant Crunching™ reduces the chance that events could play out in a way that analysts have not previously imagined or considered. Analysts, for example, would use Classic Quadrant Crunching™ to identify the different ways terrorists might conduct an attack on the homeland or how business competitors might react to a new product launch.

Analysts who use Foresight Quadrant Crunching™ can be more confident that they have considered a broad range of possible situations that could develop and have spotted indicators that signal a specific scenario is starting to unfold. For example, an analyst could use Foresight Quadrant Crunching™ to generate multiple scenarios of how the conflict in Syria or Venezuela might evolve over the next five years and gain a better understanding of the interplay of key drivers in that region.

Value Added

Both techniques reduce the potential for surprise by providing a structured framework with which the analyst can generate an array of alternative options or mini-stories. Classic Quadrant Crunching™ requires analysts to identify and systematically challenge all their key assumptions about how a terrorist attack might be launched or how any other specific situation might evolve. By critically examining each assumption and how a contrary assumption might play out, analysts can better assess their level of confidence in their predictions and the strength of their lead hypothesis. Foresight Quadrant Crunching™ belongs to the family of Foresight Techniques; it is most effective when there is a strong consensus that only a single future outcome is likely.

Both techniques provide a useful platform for developing indicator lists and for generating collection requirements. They also help decision makers focus on what actions need to be undertaken today to best prepare for events that could transpire in the future. By reviewing an extensive list of potential alternatives, decision makers are in a better position to select those that deserve the most attention. They can then take the necessary actions to avoid or mitigate the impact of unwanted or bad alternatives and help foster more desirable ones. The techniques also are helpful in sensitizing decision makers to potential “wild cards” (High Impact/Low Probability developments) or “nightmare scenarios,” both of which could have significant policy or resource implications.

The Method

8.2.1.1 The Method: Classic Quadrant Crunching™

Classic Quadrant Crunching™ is sometimes described as a Key Assumptions Check on steroids. It is most useful when there is a well-established lead hypothesis that can be articulated clearly. Classic Quadrant Crunching™ calls on the analyst to break down the lead hypothesis into its component parts, identifying the key assumptions that underlie the lead hypothesis, or the dimensions that focus on Who, What, How, When, Where, and Why. After the key dimensions of the lead hypothesis are articulated, the analyst generates two or four examples of contrary dimensions.

For example, two contrary dimensions for a single attack would be simultaneous attacks and cascading attacks. The various contrary dimensions are then arrayed in sets of 2-×-2 matrices. If four dimensions are identified for a topic, the technique would generate six different 2-×-2 combinations of these four dimensions (AB, AC, AD, BC, BD, and CD). Each of these pairs would be presented as a 2-×-2 matrix with four quadrants. Participants then generate different stories or alternatives for each quadrant in each matrix. If analysts create two stories for each quadrant in each of these 2-×-2 matrices, there will be a total of forty-eight different ways the situation could evolve. Similarly, if six drivers are identified, the technique will generate as many as 120 different stories to consider (see Figure 8.2.1.1a).

> *The best way to have a good idea is to have a lot of ideas.*
>
> —Linus Pauling, American chemist

After a rich array of potential alternatives is generated, the analyst's task is to identify which of the various alternative stories are the most deserving of attention. The last step in the process is to develop lists of indicators for each story and track them to determine which story is beginning to emerge.

The question, "How might terrorists attack a nation's water system?" is useful for illustrating the Classic Quadrant Crunching™ technique. State the conventional wisdom for the most likely way terrorists might launch such an attack. For example, "Al-Qaeda or its affiliates will contaminate the water supply for a large metropolitan area, causing mass casualties."

- Break down this statement into its component parts or key assumptions. For example, the statement makes its key assumptions: (1) a single attack, (2) involving the contamination of drinking water, (3) conducted by an outside attacker, (4) against a major metropolitan area, causing large numbers of casualties.
- Posit a contrary assumption for each key assumption. For example, what if there are multiple attacks instead of a single attack?

# of Dimensions	# of Matrices Generated	# of "Scenario Categories" (4 per Matrix)	# of Scenarios (Up to 2 per Quadrant)
3	3	12	24
4	6	24	48
5	10	40	80
6	15	60	120

Figure 8.2.1.1A Classic Quadrant Crunching™: Creating a Set of Stories

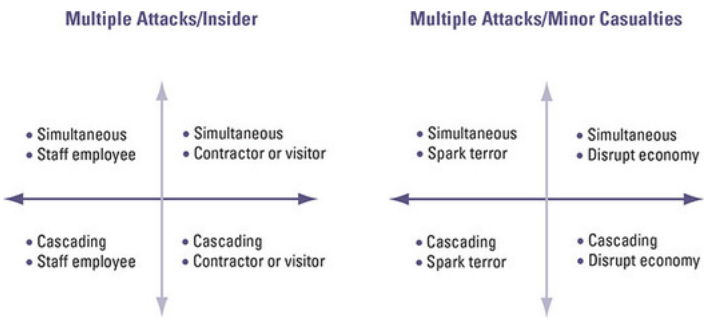
Source: Pherson Associates, LLC, 2019.

- Identify two or four dimensions of that contrary assumption. For example, what are different ways a terrorist group could launch a multiple attack? Two possibilities would be simultaneous attacks (as in the September 2001 attacks on the World Trade Center and the Pentagon or the London bombings in 2005) or cascading attacks (as in the sniper killings in the Washington, D.C., area in October 2002).

Key Assumption	Contrary Assumption	Contrary Dimensions
Single attack	Multiple attacks	• Simultaneous • Cascading
Contamination	Other strategies	• Denial of service • Water as a weapon
Drinking water	Wastewater	• Treatment plants • Sewage pipes
Outsider	Insider	• Staff employees • Contractors/visitors
Major casualties	Minor casualties	• Terrorize population • Disrupt economy

Figure 8.2.1.1B Terrorist Attacks on Water Systems: Reversing Assumptions

Source: Pherson Associates, LLC, 2019.

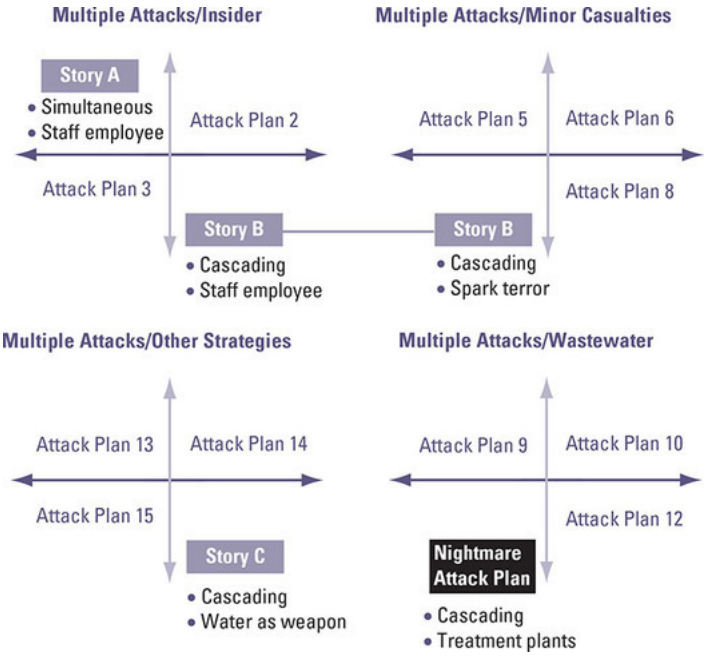


Description

Figure 8.2.1.1C Terrorist Attacks on Water Systems: Sample Matrices

Source: Pherson Associates, LLC, 2019.

- Repeat this process for each of the key assumptions. Develop two or four contrary dimensions for each contrary assumption. (See Figure 8.2.1.1b.)
- Array pairs of contrary dimensions into sets of 2-×-2 matrices. In this case, ten different 2-×-2 matrices are the result. Two of the ten matrices are shown in Figure 8.2.1.1c.
- For each cell in each matrix, generate one to three examples of how terrorists might launch an attack. In some cases, such an attack might already have been imagined. In other quadrants, there may be no credible attack concept. But several of the quadrants will usually stretch the analysts' thinking, pushing them to consider the dynamic in new and different ways.



Description

Figure 8.2.1.1D Selecting Attack Plans

Source: Pherson Associates, LLC, 2019.

- Review all the attack plans generated; using a preestablished set of criteria, select those most deserving of attention. In this example, possible criteria might be plans that are most likely to do the following:
    - Cause the most damage; have the most impact.
    - Be the hardest to detect or prevent.
    - Pose the greatest challenge for consequence management.
- This process is illustrated in Figure 8.2.1.1d. In this case, three attack plans were deemed the most likely. Attack plan 1 became Story A, attack plans 4 and 7 were combined to form Story B, and attack plan 16 became Story C. It may also be desirable to select one or two additional attack plans that might be described as “wild cards” or “nightmare scenarios.” These are attack plans that have a low probability of being tried but are worthy of attention because their impact would be substantial if they did occur. The figure shows attack plan 11 as a “nightmare scenario.”
- Consider what decision makers might do to prevent bad stories from happening, mitigate their impact, and deal with their consequences.
- Generate a list of key indicators to help assess which, if any, of these attack plans is beginning to emerge.

8.2.1.2 The Method: Foresight Quadrant Crunching™

Foresight Quadrant Crunching™ adopts much the same method as Classic Quadrant Crunching™, with two major differences. In the first step, state the scenario that most analysts believe has the greatest probability of emerging. When later developing the list of alternative dimensions, include the dimensions contained in the lead scenario. By including the lead scenario, the final set of alternative scenarios or futures should be comprehensive and mutually exclusive. The specific steps for Foresight Quadrant Crunching™ are the following:

- State what most analysts believe is the most likely future scenario.
- Break down this statement into its component parts or key assumptions.
- Posit a contrary assumption for each key assumption.
- Identify one or three contrary dimensions of that contrary assumption.
- Repeat this process for each of the contrary assumptions—a process like that shown in Figure 8.2.1.1b.
- Add the key assumption to the list of contrary dimensions, creating either one or two pairs.
- Repeat this process for each row, creating one or two pairs, including a key assumption and one or three contrary dimensions.
- Array these pairs into sets of 2-×-2 matrices, a process shown in Figure 8.2.1.1c.
- For each cell in each matrix, generate one to three credible scenarios. In some cases, such a scenario may already have been imagined. In other quadrants, there may be no scenario that makes sense. But several of the quadrants will usually stretch the analysts' thinking, often generating counterintuitive scenarios.
- Review all the scenarios generated—a process outlined in Figure 8.2.1.1d; using a preestablished set of criteria, select those scenarios most deserving of attention. The difference is that with Classic Quadrant Crunching™, analysts are seeking to develop a set of credible alternative attack plans to avoid surprise. In Foresight Quadrant Crunching™, analysts are engaging in a new version of Multiple Scenarios Generation analysis.

Relationship to Other Techniques

Both Quadrant Crunching™ techniques are specific applications of a generic method called Morphological Analysis (described in chapter 9). They draw on the results of the Key Assumptions Check and can contribute to Multiple Scenarios Generation. They are also useful in identifying indicators.

Origins of This Technique

Classic Quadrant Crunching™ was developed by Randolph Pherson and Alan Schwartz to meet a specific analytic need in the counterterrorism arena. It was first published in Randolph H. Pherson, *Handbook of Analytic Tools and Techniques*, 4th ed. (Reston, VA: Pherson Associates, LLC, 2008). Foresight Quadrant Crunching™ was developed by Globalytica, LLC, in 2013 as a new method for conducting Foresight analysis.

8.2.2 Premortem Analysis

Premortem Analysis is conducted prior to finalizing an analysis or a decision to assess how a key analytic judgment, decision, or plan of action could go spectacularly wrong. The goal is to reduce the risk of surprise and the subsequent need for a postmortem investigation of what went wrong. It is an easy-to-use technique that enables a group of analysts who have been working together on any type of future-oriented analysis or project to challenge effectively the accuracy of their own conclusions. It is a specific application of the reframing method, in which restating the question, task, or problem from a different perspective enables one to see the situation differently and come up with different ideas.

When to Use It

Premortem Analysis should be used by analysts who can devote a few hours to challenging their own analytic conclusions about the future to see where they might be wrong. It is much easier to influence people's decisions before they make up their mind than afterward when they have a personal investment in that decision. For this reason, analysts should use Premortem Analysis and its companion technique, Structured Self-Critique, just before finalizing their key analytic judgments.

A single analyst may use the two techniques, but, like all Structured Analytic Techniques, they are most effective when used by a small group. If a team assessment, the process should be initiated as soon as the group starts to coalesce on a common position.

The concept of a premortem as an analytic aid was first used in the context of decision analysis by Gary Klein in his 1998 book, *Sources of Power: How People Make Decisions*. He reported using it in training programs to show decision makers that they typically are overconfident that their decisions and plans will work. After the trainees formulated a plan of action, they were asked to imagine that it is several months or years in the future, and their plan has been implemented but has failed. They were then asked to describe how it might have failed, despite their original confidence in the plan. The trainees could easily come up with multiple explanations for the failure, but none of these reasons were articulated when the plan was first proposed and developed.

This assignment provided the trainees with evidence of their overconfidence, and it demonstrated that the premortem strategy can be used to expand the number of interpretations and explanations that decision makers consider. Klein explains: "We devised an exercise to take them out of the perspective of defending their plan and shielding themselves from flaws. We tried to give them

a perspective where they would be actively searching for flaws in their own plan."[12] Klein reported his trainees showed a "much higher level of candor" when evaluating their own plans after exposure to the premortem exercise, as compared with other, more passive attempts at getting them to critique their initial drafts.[13]

Value Added

The primary goal of Premortem Analysis is to reduce the risk of surprise and the subsequent need for a postmortem investigation. The technique—and its companion, Structured Self-Critique—helps analysts identify potential causes of error that they had overlooked. Two creative processes are at work here:

- **The questions are reframed.** This exercise typically elicits responses that are different from the original ones. Asking questions about the same topic, but from a different perspective, opens new pathways in the brain.
- **The method legitimizes dissent.** For various reasons, individual egos and group dynamics can suppress dissenting opinions, leading to premature consensus. In Premortem Analysis, all the participants make a positive contribution to the group goal by identifying weaknesses in the previous analysis.

An important cause of poor group decisions is the desire for consensus. This desire can lead to Groupthink or agreement with majority views regardless of whether participants perceive them as right or wrong. Attempts to improve group creativity and decision making often focus on ensuring that the group considers a wide range of information and opinions.[14]

Group members tend to go along with the group leader, with the first group member to stake out a position, or with an emerging majority viewpoint for many reasons. Most benign is the common rule of thumb that when we have no firm opinion, we take our cues from the opinions of others. We follow others because we believe (often rightly) that they know what they are doing. Analysts may also be concerned that others will critically evaluate their views, or that

dissent will come across as disloyalty or as an obstacle to progress that will just prolong the meeting.

In a candid newspaper column written long before he became CIA director, Leon Panetta wrote that “an unofficial rule in the bureaucracy says that to ‘get along, go along.’ In other words, even when it is obvious that mistakes are being made, there is a hesitancy to report the failings for fear of retribution or embarrassment. That is true at every level, including advisers to the president. The result is a ‘don’t make waves’ mentality that . . . is just another fact of life you tolerate in big organizations.”[15]

> *It is not bigotry to be certain we are right; but it is bigotry to be unable to imagine how we might possibly have gone wrong.*
>
> —G. K. Chesterton, English writer

A major benefit of Premortem Analysis is that it legitimizes dissent. The technique empowers team members who may have unspoken reservations or doubts because they lacked confidence to participate in a way that is consistent with perceived group goals. If this change in perspective is handled well, each team member will know that they add value to the exercise by being critical of the previous judgment, not for supporting it. By employing both companion techniques analysts can explore all the ways analysis could turn out to be wrong—one is a totally unbounded approach and the other is a highly structured mechanism. The first technique is a right-brained process called Premortem Analysis; the second is a left-brained technique, the Structured Self-Critique, which is discussed later in this chapter.

The Method

The best time to conduct a Premortem Analysis is shortly after a group has reached a conclusion on an action plan but before any serious drafting of the report. If the group members are not already familiar with the Premortem Analysis technique, the group leader, another group member, or a facilitator steps up and makes a statement along the lines of the following: “Okay, we now think we know the right answer, but we need to double-check this. To free up our minds to consider other possibilities, let’s imagine that we have made this judgment, our report has gone forward and been accepted, and now, *x* months or *x* years later, we learn that our analysis was wrong. Things have turned out much differently than we expected. Now, working from that perspective in the future, let’s put our imaginations to work and brainstorm what could have possibly happened to cause our analysis to be spectacularly wrong.”

Ideally, the actual brainstorming session should be a separate meeting to give the participants time to think about what might have happened to cause the analytic judgment to be wrong. They should bring to the meeting a list of what might have gone differently than expected. To set the tone for the brainstorming session, analysts should be advised not to focus only on the hypotheses, assumptions, and key evidence already discussed during their group meetings. Rather, they should be encouraged to look at the situation from the perspective of their own life experiences. They should think about how fast the world is changing, how many of their organization’s programs are unsuccessful or have unintended consequences, or how difficult it is to see things from the perspective of a foreign culture or a competitor. This type of thinking may bring a different part of analysts’ brains into play as they are mulling over what could have gone wrong with their analysis. Outside-In Thinking can also be helpful for this purpose.

In the Premortem Analysis meeting, the group leader or a facilitator writes the ideas presented on a whiteboard or flip chart. To ensure that no single person dominates the presentation of ideas, the Nominal Group Technique version of brainstorming is a good option. With that technique, the facilitator goes around the room in round-robin fashion, taking one idea from each participant until all have presented every idea on their lists (see chapter 6). After all ideas are posted on the board and made visible to all, the group discusses what it has learned from this exercise, and what action, if any, the group should take. This generation and initial discussion of ideas can often occur in a single two-hour meeting, which is a small investment of time to undertake a systematic challenge to the group's thinking.

One expected result is an increased appreciation of the uncertainties inherent in any assessment of the future. Another outcome might be identification of indicators that, if observed, would provide early warning that events are not proceeding as expected. Such findings may lead to modification of the existing analytic framework.

If the Premortem Analysis leads the group to reconsider and revise its analytic judgment, the questions shown in Figure 8.2.2 are a good starting point. For a more thorough set of self-critique questions, see the discussion of Structured Self-Critique, which involves changing one's role from advocate to critic of one's previous analysis.

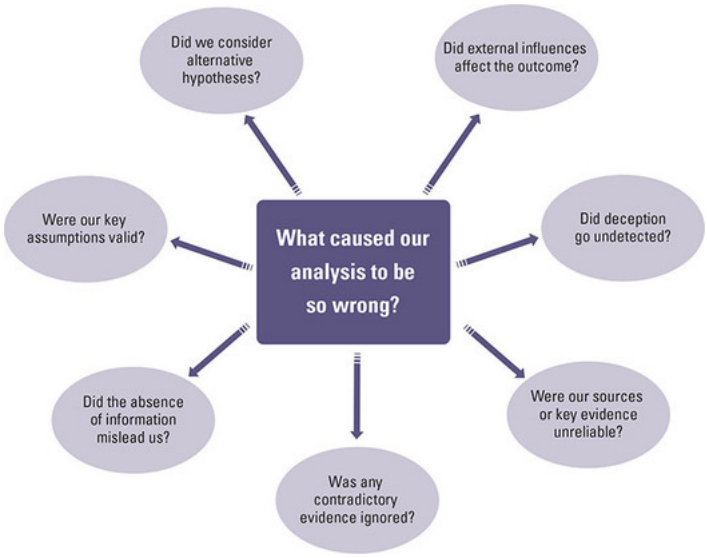
Premortem Analysis may identify problems, conditions, or alternatives that require rethinking the group's original position. In such a case, Premortem Analysis has done its job by alerting the group to the fact that it has a problem, but it does not necessarily tell the group exactly what the problem is or how to fix it. That is beyond the scope of Premortem Analysis. The technique alerts the group to the fact that it has a problem, but it does not systematically assess the likelihood of these things happening. It also has not evaluated multiple sources of analytic error or made a comprehensive assessment of alternative courses of action. These tasks are better accomplished with the Structured Self-Critique.

Relationship to Other Techniques

If the Premortem Analysis identifies a significant problem, the natural follow-up technique for addressing this problem is Structured Self-Critique, described in the next section.

Origins of This Technique

Gary Klein originally developed the premortem concept to train managers to recognize their habitual overconfidence in the success of their plans and decisions. The authors adapted the technique and redefined it as an intelligence analysis technique called Premortem Analysis. For original references on this subject, see Gary Klein, *Sources of Power: How People Make Decisions* (Cambridge, MA: MIT Press, 1998); Klein, *Intuition at Work: Why Developing Your Gut Instinct Will Make You Better at What You Do* (New York: Doubleday, 2002); and Klein, "Performing a Project *Pre*Mortem," *Harvard Business Review* (September 2007). An interactive group activity can be planned at https://www.atlassian.com/team-playbook/plays/pre-mortem.



Description

Figure 8.2.2 Premortem Analysis: Some Initial Questions

Source: Pherson Associates, LLC, 2019.

8.2.3 Structured Self-Critique

Structured Self-Critique is a systematic procedure that a small team or group can use to identify weaknesses in its own analysis. All team or group members don a hypothetical black hat and become critics rather than supporters of their own analysis. From this opposite perspective, they respond to a list of questions about sources of uncertainty, the analytic processes used, critical assumptions, diagnosticity of evidence, anomalous evidence, information gaps, changes in the broad environment in which events are happening, alternative decision models, availability of cultural expertise, and indicators of possible deception. As it reviews responses to these questions, the team reassesses its overall confidence in its own judgment.

> *Begin challenging your own assumptions. Your assumptions are your windows on the world. Scrub them off every once in a while, or the light won't come in.*
>
> —Alan Alda, American actor

When to Use It

You can use Structured Self-Critique productively to look for weaknesses in any analytic explanation of events or estimate of the future. We specifically recommend using it in the following ways:

- As the next step if the Premortem Analysis raises unresolved questions about any estimated future outcome or event.
- As a double-check prior to the publication of any major product such as a National Intelligence Estimate or a corporate strategic plan.
- As one approach to resolving conflicting opinions (as discussed in the next section on Adversarial Collaboration).

The amount of time required to work through the Structured Self-Critique will vary greatly depending upon how carefully the previous analysis was done. The questions listed in the method later in this section are just a prescription for careful analysis. To the extent that analysts have already explored these same questions during the initial analysis, the time required for the Structured Self-Critique is reduced. If these questions are asked for the first time, the process will take longer. As analysts gain experience with Structured Self-Critique, they may have less need for certain parts of it, as they will have internalized the method and used its questions during the initial analysis (as they should have).

Value Added

When people are asked questions about the same topic but from a different perspective, they often give different answers than the ones they gave before. For example, if someone asks a team member if he or she supports the team's conclusions, the answer will usually be "yes." However, if all team members are asked to look for weaknesses in the team's argument, that member may give a different response.

This change in the frame of reference is intended to change the group dynamics. The critical perspective should always generate more critical ideas. Team members who previously may have suppressed questions or doubts because they lacked confidence or wanted to be good team players are now able to express those divergent thoughts. If the change in perspective is handled well, all team members will know that they win points with their colleagues for being critical of the previous judgment, not for supporting it.

The Method

Start by reemphasizing that all analysts in the group are now wearing a black hat. They have become critics, not advocates, and their job is to find weaknesses in the previous analysis, not support the previous analysis. The group then works its way through the following topics or questions:

- **Sources of uncertainty.** Identify the sources and types of uncertainty to set reasonable expectations for what the team might expect to achieve. Should one expect to find (1) a single correct or most likely answer, (2) a most likely answer together with one or more alternatives that must also be considered, or (3) many possible explanations or scenarios for future development? To judge the uncertainty, answer these questions:

    - Is the question being analyzed a puzzle or a mystery? Puzzles have answers, and correct answers are attainable if enough pieces of the puzzle surface. A mystery has no single definitive answer; it depends upon the future interaction of many factors, some known and others unknown. Analysts can frame the boundaries of a mystery only “by identifying the critical factors and making an intuitive judgment about how they have interacted in the past and might interact in the future.”[16]

    - How does the team rate the quality and timeliness of its evidence?

    - Are there a greater than usual number of assumptions because of insufficient evidence or the complexity of the situation?

    - Is the team dealing with a relatively stable situation or with a situation that is undergoing, or potentially about to undergo, significant change?

- **Analytic process.** In the initial analysis, see if the team did the following: Did it identify alternative hypotheses and seek out information on these hypotheses? Did it identify key assumptions? Did it seek a broad range of diverse opinions by including analysts from other offices and agencies, academia, or the private sector in the deliberations? If the team did not take these steps, the odds of the team having a faulty or incomplete analysis increased. Either consider doing some of these things now or lower the team's level of confidence in its judgment.

- **Critical assumptions.** Presuming that the team has already identified key assumptions, the next step is to identify the one or two assumptions that would have the greatest impact on the analytic judgment if they turned out to be wrong. In other words, if the assumption is wrong, the judgment will be wrong. How recent and well documented is the evidence that supports each such assumption? Brainstorm circumstances that could cause each of these assumptions to be wrong and assess the impact on the team's analytic judgment if the assumption is wrong. Would the reversal of any of these assumptions support any alternative hypothesis? If the team has not previously identified key assumptions, it should do a Key Assumptions Check.

- **Diagnostic evidence.** Identify alternative hypotheses and the most diagnostic items of evidence that enable the team to reject alternative hypotheses. For each item, brainstorm reasonable alternative interpretations of this evidence that could make it consistent with an alternative hypothesis. See Diagnostic Reasoning in chapter 7.

- **Information gaps.** Are there gaps in the available information, or is some of the information so dated that it may no longer be valid? Is the absence of information readily explainable? How

should absence of information affect the team's confidence in its conclusions?

- **Missing evidence.** Is there evidence that one would expect to see in the regular flow of intelligence or open-source reporting if the analytic judgment is correct, but is not there?

- **Anomalous evidence.** Is there any anomalous item of evidence that would have been important if it had been believed or if it could have been related to the issue of concern, but was rejected because it was not deemed important at the time or its significance was not known? If so, try to imagine how this item might be a key clue to an emerging alternative hypothesis.

- **Changes in the broad environment.** Driven by technology and globalization, the world seems to be experiencing social, technical, economic, environmental, and political changes at a faster rate than ever before in history. Might any of these changes play a role in what is happening or will happen? More broadly, what key forces, factors, or events could occur independently of the issue under study that could have a significant impact on whether the analysis proves to be right or wrong?

- **Alternative decision models.** If the analysis deals with decision making by a foreign government or nongovernmental organization (NGO), was the group's judgment about foreign behavior based on a rational actor assumption? If so, consider the potential applicability of other decision models, specifically that the action was or will be the result of bargaining between political or bureaucratic forces, the result of standard organizational processes, or the whim of an authoritarian leader.[17] If information for a more thorough analysis is lacking, consider the implications of that for confidence in the team's judgment.

- **Cultural expertise.** If the topic being analyzed involves a foreign or otherwise unfamiliar culture or subculture, does the

team have or has it obtained cultural expertise on thought processes in that culture?[18]

- **Deception.** Does another country, NGO, or commercial competitor about which the team is making judgments have a motive, opportunity, or means for engaging in deception to influence U.S. policy or to change your organization's behavior? Does this country, NGO, or competitor have a history of engaging in denial, deception, or influence operations?

After responding to these questions, the analysts take off their black hats and reconsider the appropriate level of confidence in the team's previous judgment. Should the initial judgment be reaffirmed or modified?

Potential Pitfalls

The success of this technique depends in large measure on the team members' willingness and ability to make the transition from supporters to critics of their own ideas. Some individuals lack the intellectual flexibility to do this well. It must be clear to all members that they are no longer performing the same function as before. They should view their task as an opportunity to critique an analytic position taken by some other group (themselves, but with a different hat on).

To emphasize the different role analysts are playing, Structured Self-Critique meetings should be scheduled exclusively for this purpose. The meetings should be led by a different person from the usual leader, and, preferably, held at a different location. It will be helpful if an experienced facilitator is available to lead the meeting(s). This formal reframing of the analysts' role from advocate to critic is an important part of helping analysts see an issue from a different perspective.

Relationship to Other Techniques

Structured Self-Critique was developed in large part as an alternative to Devil's Advocacy and Team A/Team B Analysis. The techniques share the same objective, but Structured Self-Critique engages all the members of the group in a team effort to find flaws in the analysis as opposed to asking one person or group to criticize another. When someone is designated to play the role of Devil's Advocate, that member will take one of the team's critical judgments or assumptions, reverse it, and then argue from that perspective against the team's conclusions. We believe it is more effective for the entire team to don the hypothetical black hat and play the role of critic. When only one team member—or a competing team—dons the black hat and tries to persuade the authors of the analysis that they are wrong, the authors almost always become defensive and resist the need to make changes. Sometimes, Devil's Advocates will find themselves acting out a role that they do not actually agree with, but their actions will still stir frictions within the group.

Origins of This Technique

Richards J. Heuer Jr. and Randolph Pherson developed Structured Self-Critique. A simpler version of this technique appears in Randolph H. Pherson, “Premortem Analysis and Structured Self-Critique,” in *Handbook of Analytic Tools and Techniques*, 5th ed. (Tysons, VA: Pherson Associates, LLC, 2019).

8.2.4 What If? Analysis

What If? Analysis posits that an event has occurred with the potential for a major positive or negative impact and then, with the benefit of “hindsight,” explains how this event could have come about and what the consequences might be.

When to Use It

This technique should be in every analyst's toolkit. It is an important technique for alerting decision makers to an event that could happen, even if it may seem unlikely at the present time. What If? Analysis serves a function like Foresight analysis—it creates an awareness that prepares the mind to recognize early signs of a significant change, and it may enable the decision maker to plan for that contingency. It is most appropriate when any of the following conditions are present:

- A mental model is well ingrained within the analytic or the client community that a certain event will not happen.
- The issue is highly contentious, either within the analytic community or among decision makers, and no one is focusing on what actions need to be considered to deal with or prevent an untoward event.
- Analysts perceive a need for others to focus on the possibility this event could happen and to consider the consequences if it does occur.

> *When analysts are too cautious in estimative judgments on threats, they brook blame for failure to warn. When too aggressive in issuing warnings, they brook criticism for "crying wolf."*
>
> —Jack Davis, "Improving CIA Analytic Performance: Strategic Warning," Sherman Kent School for Intelligence Analysis (September 2002)

What If? Analysis is a logical follow-up after any Key Assumptions Check that identifies an assumption critical to an important estimate but about which there is some doubt. In that case, the What If? Analysis would imagine that the opposite of this assumption is true. Analysis would then focus on ways this outcome could occur and what the consequences would be.

Value Added

Shifting the focus from asking whether an event will occur to imagining that it has occurred and then explaining how it might have happened opens the mind to think in different ways. What If? Analysis shifts the discussion from “How likely is it?” to these questions:

- How could it possibly come about?
- Could it come about in more than one way?
- What would be the impact?
- Has the possibility of the event happening increased?

The technique also gives decision makers

- a better sense of what they might be able to do today to prevent an untoward development from occurring or leverage an opportunity to advance their interests and
- a list of specific indicators to monitor and determine if a development may soon occur.

What If? Analysis is a useful tool for exploring unanticipated or unlikely scenarios that are within the realm of possibility and that would have significant consequences should they come to pass. Figure 8.2.4 is an example of this. It posits a dramatic development —the emergence of India as a new international hub for finance— and then explores how this scenario could occur. In this example, the

technique spurs the analyst to challenge traditional analysis and rethink the underlying dynamics of the situation.

The Method

- A What If? Analysis can be done by an individual or as a team project. The time required is about the same as that for drafting a short paper. It usually helps to initiate the process with a brainstorming session. Additional brainstorming sessions can be interposed at various stages of the process.



India's Success Story

Assume it is 2025. In sharp contrast to the rest of the world, India has remained relatively insulated from the global economic pressures of the past decade. Much to everyone's surprise, India is one of the world's strongest economies and is known for its continued growth and stability. Although India does not yet dominate global trade and continues to exhibit conservative economic policies, its careful stewardship of its own financial markets has made it a new international hub for finance.

How Did This Happen?

Indian economic policies have always been conservative and strongly controlled by New Delhi. As a result, India's industries have not participated fully in global trade, focusing more on the internal market. Throughout the 1990s and early 2000s, India's economy grew largely because the government eased restrictions on internal competition. When the global economy began to sag in 2008, India used its large foreign exchange reserves to prop up the rupee and institute import controls. The immediate impact was on China and South Korea, both of which had exported consumer goods—cell phones, refrigerators, fans, air conditioners, and televisions—to India. By cutting off imports, Indian producers of these same commodities reaped the benefits of the cessation of competition. Demand for quality consumer goods in India grew quickly, forcing Indian manufacturers to increase their production levels and improve their quality standards.

The Indian financial sector began to allow foreign banks to operate in India only in 2004 and then only under strict guidelines. A small number of Indians were only gradually beginning to use banks for savings. Mortgages were uncommon. Most Indians continued to use informal financial mechanisms. By 2009, India was largely left out of the global bank crisis.

Meanwhile, the financial crisis in Europe and North America continued unabated for several years. Bailouts and stimulus packages, although showing initial promise, failed to prompt a sustained economic recovery. With high unemployment, no purchasing power, and eroding confidence in the markets, businesses closed, bankruptcies soared, and the service sector declined. Chinese manufacturing for export markets, a critical part of China's economic growth in the 1990s and 2000s, evaporated, leaving China's boom cities struggling as workers flocked back to rural areas to eke out their living from the land.

Although these developments undercut India's role as an outsource center for Western companies, the resultant stable of unemployed Western-trained talent enabled Indian entrepreneurs to augment their ranks at a fraction of the previous cost. With a huge internal demand for goods and services, Indian entrepreneurs had room to grow and did.

Figure 8.2.4 What If? Scenario: India Makes Surprising Gains from the Global Financial Crisis

Source: This example was developed by Ray Converse and Elizabeth Manak, Pherson Associates, LLC.

- Begin by assuming that what could happen has occurred. Often it is best to pose the issue in the following way: "The *New York Times* reported yesterday that . . ." Be precise in defining both the event and its impact. Sometimes it is useful to posit the new contingency as the outcome of a specific triggering event, such as a natural disaster, an economic crisis, a major political miscalculation, or an unexpected new opportunity that vividly reveals a key analytic assumption is no longer valid.

- Develop at least one chain of argumentation—based on both evidence and logic—to explain how this outcome could have come about. In developing the scenario or scenarios, focus on what must occur at each stage of the process. Work backwards from the event to the present day. This is called "backwards thinking." Try to envision more than one scenario or chain of argument.

- Generate and validate a list of indicators or "observables" for each scenario that would help analysts detect whether events are starting to play out in a way envisioned by that scenario.

- Identify which scenarios deserve the most attention by taking into consideration the difficulty of implementation and the potential significance of the impact.
- Assess the level of damage or disruption that would result from a negative scenario and estimate how difficult it would be to overcome or mitigate the damage incurred.
- For new opportunities, assess how well developments could turn out and what can be done to ensure that such a positive scenario might occur.
- Monitor the indicators on a periodic basis.
- Report periodically on whether any of the proposed scenarios are beginning to emerge and why.

Relationship to Other Techniques

What If? Analysis is sometimes confused with the High Impact/Low Probability Analysis technique, as each considers low-probability events. However, only What If? Analysis uses the reframing technique of positing that a future event has happened and then works backwards in time to imagine how it could have happened. High Impact/Low Probability Analysis requires new or anomalous information as a trigger and then projects forward to what might occur and the consequences if it does.

Origins of This Technique

Analysts and practitioners have applied the term “What If? Analysis” to a variety of techniques for a long time. The version described here is based on Randolph H. Pherson, “What If? Analysis,” in *Handbook of Analytic Tools and Techniques,* 5th ed. (Tysons, VA: Pherson Associates, LLC, 2019) and training materials from the Department of Homeland Security, Office of Intelligence and Analysis.

A Cautionary Note

Scenarios developed using both the What If? Analysis and the High Impact/Low Probability Analysis techniques can often contain highly sensitive data requiring a very limited distribution of the final product. Examples are the following: How might a terrorist group launch a debilitating attack on a vital segment of the U.S. infrastructure? How could a coup be launched successfully against a friendly government? What could be done to undermine or disrupt global financial networks? Obviously, if an analyst identifies a major vulnerability that could be exploited by an adversary, extreme care must prevent that detailed description from falling into the hands of the adversary. An additional concern is that the more “brilliant” and provocative the scenario, the more likely it will attract attention, be shared with others, and possibly leak and be read by an adversary or competitor.

8.2.5 High Impact/Low Probability Analysis

High Impact/Low Probability Analysis provides decision makers with early warning that a seemingly unlikely event with major policy and resource repercussions might occur.

When to Use It

Analysts should use High Impact/Low Probability Analysis when they want to alert decision makers to the possibility that a seemingly long-shot development with a major policy or resource impact may be more likely than previously anticipated. Events that would have merited such treatment before they occurred include the devastation caused by Hurricane Katrina to New Orleans in August 2005 or Hurricane Maria, which struck Puerto Rico in September 2017—two of the costliest natural disasters in the history of the United States. In addition, the world would have benefited greatly if financial and political analysts respectively had used structured techniques to anticipate the global economic crisis in 2008 and the rapid rise of the Islamic State (ISIS). A variation of this technique, High Impact/Uncertain Probability Analysis, might be used to address the potential impact of an outbreak of H5N1 (avian influenza) or applied to a terrorist attack when intent is well established but there are multiple variations on how it might occur.

A High Impact/Low Probability study most often is initiated when some new and often fragmentary information suggests that an unanticipated event might be more likely to occur than thought previously. For example, analysts should pass decision makers a tip-off warning of a major information warfare attack or a serious terrorist attack on a national holiday even though solid evidence is lacking. The technique is also helpful in sensitizing analysts and decision makers to the possible effects of low-probability events and to stimulate them to think early on about measures that could avoid the danger or exploit the opportunity.

> *A thoughtful senior policy official has opined that most potentially devastating threats to U.S. interests start out being evaluated as unlikely. The key to effective intelligence-policy relations in strategic warning is for analysts to help policy*

officials in determining which seemingly unlikely threats are worthy of serious consideration.

—Jack Davis, “Improving CIA Analytic Performance: Strategic Warning,” Sherman Kent School for Intelligence Analysis, September 2002

Value Added

The High Impact/Low Probability Analysis format allows analysts to explore the consequences of an event—particularly one not deemed likely by conventional wisdom—without having to challenge the mainline judgment or to argue with others about the likelihood of an event. In other words, this technique provides a tactful way of communicating a viewpoint that some recipients might prefer not to hear.

The analytic focus is not on whether something *will* happen but to take it as a given that an event, which would have a major and unanticipated impact, *could* happen. The objective is to explore whether an increasingly credible case can be made for an unlikely event occurring that could pose a major danger—or offer great opportunities. The more nuanced and concrete the analyst's depiction of the plausible paths to danger, the easier it is for a decision maker to develop a package of policies to protect or advance the vital interests of his or her country or business.

High Impact/Low Probability Analysis helps protect analysts against some of the most common cognitive biases and misapplied heuristics, including assuming that others would act in the same way we would in similar circumstances (Mirror Imaging), accepting a given value of something unknown as a proper starting point for generating an assessment (Anchoring Effect), and ignoring conflicts within a group due to a desire for consensus (Groupthink). Use of the technique also helps counter the impact of several intuitive traps, including not addressing the impact of the absence of information on analytic conclusions (Ignoring the Absence of Information), failing to factor something into the analysis because the analyst lacks an appropriate category or "bin" for that item of information (Lacking Sufficient Bins), and focusing on a narrow range of alternatives representing marginal, not radical, change (Expecting Marginal Change).

The Method

An effective High Impact/Low Probability Analysis involves these steps:

- Clearly describe the unlikely event.
- Define the high-impact outcome precisely if this event occurs. Consider both the actual event and the secondary effects of the event.
- Identify recent information or reporting that suggests the possibility of the unlikely event occurring may be increasing.
- Postulate additional triggers that would propel events in this unlikely direction or factors that would greatly accelerate timetables, such as a botched government response, the rise of an energetic political challenger, a major terrorist attack, or a surprise electoral outcome.
- Develop one or more plausible pathways to explain how this seemingly unlikely event could unfold. Focus on the specifics of what must happen at each stage of the process for the train of events to play out.
- Generate and validate a list of indicators to help analysts and decision makers anticipate whether the scenarios were beginning to unfold.
- Identify factors that would deflect a bad outcome or encourage a positive outcome.
- Periodically review the indicators and report on whether the proposed scenarios may be emerging and why. Be alert to

events so unlikely that they did not merit serious attention but are beginning to emerge.

The last step in the process is extremely important. Periodic reviews of indicators provide analysts with useful signals that alert them to the possibility that prevailing mental models are no longer correct and an event previously considered unlikely now merits careful attention.

Potential Pitfalls

Analysts need to be careful when communicating the likelihood of unlikely events. The meaning of the word “unlikely” can be interpreted as meaning anywhere from 1 percent to 25 percent probability; “highly unlikely” may mean from 1 percent to 10 percent.[19] Clients receiving an intelligence report that uses words of estimative probability such as “very unlikely” will typically interpret the report as consistent with their own prior thinking. If the report says a terrorist attack against a specific foreign embassy within the next year is highly unlikely, it is possible that the analyst may be thinking of about a 10 percent possibility. A decision maker, however, may see that as consistent with his or her own thinking and assume the likelihood is less than 1 percent. Such a difference in likelihood can make the difference in deciding whether to order expensive contingency plans or enact proactive preventive countermeasures. When an analyst is describing the likelihood of an unlikely event, it is desirable to express the likelihood in numeric terms, either as a range (such as less than 5 percent or 10 to 20 percent) or as bettor’s odds (such as one chance in ten).

Figure 8.2.5 shows an example of an unlikely event—the outbreak of conflict in the Arctic Ocean—that could have major geopolitical consequences. Analysts can employ the technique to sensitize decision makers to the possible effects of the melting of Arctic ice and stimulate them to think about measures that could deal with the danger.

Relationship to Other Techniques

High Impact/Low Probability Analysis is sometimes confused with What If? Analysis. Both deal with low-probability or unlikely events.

- **What If? Analysis** does not require new or anomalous information to serve as a trigger. It reframes the question by positing that a surprise event has happened. It then looks backwards from that surprise event to map several ways it could have happened. It also tries to identify actions that, if taken in a timely manner, might have prevented it.
- **High Impact/Low Probability Analysis** is primarily a vehicle for warning decision makers that recent, unanticipated developments suggest that an event previously deemed highly unlikely may occur. Extrapolating on recent evidence or information, it projects forward to discuss what could occur and the consequences if the event does occur. It challenges the conventional wisdom.

Unlikely Event

Recent trends in the Arctic spur a military confrontation among regional players over conflicting claims to Arctic resources within the next five years.

Background

The United Nations Law of the Sea does not currently recognize any country as "owning" the North Pole or the Arctic Ocean surrounding it. The treaty, however, permits countries bordering the Arctic Ocean (Canada, Denmark, Norway, Russia, and the United States) to expand their claims beyond the permitted 200-mile economic zone if their continental shelf is geographically linked to the Arctic seabed. The United States has not ratified the treaty, however, and does not recognize any rights beyond the 200-mile economic zone or Canada's claim that the Northwest Passage represents internal Canadian waters to which it may limit access.

Events and Triggers

In 2001, Russia made an unsuccessful bid for more of the Arctic, and Canada and Denmark subsequently submitted claims on the region. Since 2006, North Atlantic Treaty Organization (NATO) forces, including Norwegian and Dutch troops, have conducted annual training exercises in the Arctic. Russia planted its flag on the seabed below the North Pole in 2007, raising concerns by other states that Russia was trying to claim more territory.

Polar melting is expanding access to untapped energy and mineral reserves that are increasingly attractive to both polar and nonpolar states in a resource-scarce world. Long-term overfishing could spur nations dependent on this source of protein to begin fishing in the Arctic Ocean as it becomes more accessible. The melting of Arctic ice is likely to open the Northwest Passage and the Northern Sea Route to year-round shipping in the coming years, undercutting the commercial utility of the Panama Canal and the Suez Canal.

Pathways to Unlikely Outcome

An almost certain race to tap the Arctic's newly available resources will increase the chances of a violent incident leading to conflict. For example, nonpolar states starved for resources could claim underwater energy reserves. Canada or Russia could require ships transiting the Arctic region to pay high "safety" and licensing fees. Fishing vessels of some polar states might harass those of other states, such as Japan.

Armed conflict could take many forms including the following: Russia versus NATO, extractive industries against nation-states, and polar states versus nonpolar states. A possible armed grab for resources by Russia, for example, and a move to exert control over Northern Sea Route shipping lanes could undermine existing alliances and open the door to resource conflict with other Arctic border states. If the "Battle over the Arctic" becomes a clarion call in various national media, pressure will grow on all the players to assert their "sovereign rights," possibly ushering in a new era of interstate tension and conflict.

Indicators to Watch For

- Russian calls to renegotiate the treaty limiting land claims in the Arctic.
- Canada or Russia increase patrols in Arctic waters and start searching ships to demonstrate that these are internal waterways.
- Russia, Iceland, or Greenland seek to control and tax ship access to the Arctic.
- Border states send "scientific teams" year-round to key Arctic locations.
- More nations plant their flags in Arctic waters.
- Special oil carriers and drilling platforms are designed and built for the Arctic.

Factors to Encourage Positive Outcome

- International bodies or regional states propose new legal principles to reflect changed circumstances caused by sea ice melting.
- Support grows for the creation of an international ecological zone that sets parameters for resource sharing.

Figure 8.2.5 High Impact/Low Probability Scenario: Conflict in the Arctic[20]

Source: This example was developed by Pherson Associates, LLC.

Origins of This Technique

The description here is based on Randolph H. Pherson, “High Impact/Low Probability Analysis,” in *Handbook of Analytic Tools and Techniques,* 5th ed. (Tysons, VA: Pherson Associates, LLC, 2019); Globalytica, LLC, training materials; and Department of Homeland Security, Office of Intelligence and Analysis training materials. Tools needed to create your own chart can be found at https://www.mindtools.com/pages/article/newPPM_78.htm.

8.2.6 Delphi Method

Delphi is a method for eliciting ideas, judgments, or forecasts from a group of experts who may be geographically dispersed. It is different from a survey in that there are two or more rounds of questioning. After the first round of questions, a moderator distributes all the answers and explanations of the answers to all participants, often anonymously. The expert participants are then given an opportunity to modify or clarify their previous responses, if so desired, based on what they have seen in the responses of the other participants. A second round of questions builds on the results of the first round, drills down into greater detail, or moves to a related topic. The technique allows flexibility by increasing the number of rounds of questions.

When to Use It

The RAND Corporation developed the Delphi Method at the beginning of the Cold War in the 1950s to forecast the impact of new technology on warfare. It was also used to assess the probability, intensity, or frequency of future enemy attacks. In the 1960s and 1970s, Delphi became widely known and used as a method for futures research, especially forecasting long-range trends in science and technology. Futures research is like intelligence analysis in that the uncertainties and complexities one must deal with often preclude the use of traditional statistical methods, so explanations and forecasts must be based on the experience and informed judgments of experts.

Over the years, Delphi has been used in a wide variety of ways, and for an equally wide variety of purposes. Although many Delphi projects have focused on developing a consensus of expert judgment, a variant called Policy Delphi is based on the premise that the decision maker is *not* interested in having a group make a consensus decision, but rather in having the experts identify alternative policy options and present all the supporting evidence for and against each option. That is the rationale for describing Delphi as a reframing technique. It can be used to identify a set of divergent opinions, many of which may be worth exploring.

One group of Delphi scholars advises that the Delphi technique "can be used for nearly any problem involving forecasting, estimation, or decision making"—if the problem is not so complex or so new as to preclude the use of expert judgment. These Delphi advocates report using it for diverse purposes that range from "choosing between options for regional development, to predicting election outcomes, to deciding which applicants should be hired for academic positions, to predicting how many meals to order for a conference luncheon."[21]

Value Added

We believe the development of Delphi panels of experts on areas of critical concern should be standard procedure for outreach to experts outside an analyst's organization, particularly in the intelligence community because of its more insular work environment. In the United States, the Office of the Director of National Intelligence (ODNI) encourages intelligence analysts to consult with relevant experts in academia, business, and NGOs in Intelligence Community Directive No. 205, on Analytic Outreach, dated July 2008.

As an effective process for eliciting information from outside experts, Delphi has several advantages:

- Outside experts can participate remotely, thus reducing time and travel costs.
- Delphi can provide analytic judgments on any topic for which outside experts are available. That means it can be an independent cross-check of conclusions reached in-house. If the same conclusion is reached in two analyses using different analysts and different methods, confidence in the conclusion is increased. If the conclusions disagree, this is also valuable information that may open a new avenue of research.
- Delphi identifies any outliers who hold an unusual position. Recognizing that the majority is not always correct, researchers can then focus on gaining a better understanding of the grounds for any views that diverge significantly from the consensus. In fact, identification of experts who have an alternative perspective and are qualified to defend it might be the objective of a Delphi project.
- The process by which panel members are provided feedback from other experts and are given an opportunity to modify their

responses makes it easy for participants to adjust their previous judgments in response to new evidence.

- In many Delphi projects, the experts remain anonymous to other panel members so that no one can use his or her position of authority, reputation, or personality to influence others. Anonymity also facilitates the expression of opinions that go against the conventional wisdom and may not otherwise be expressed.

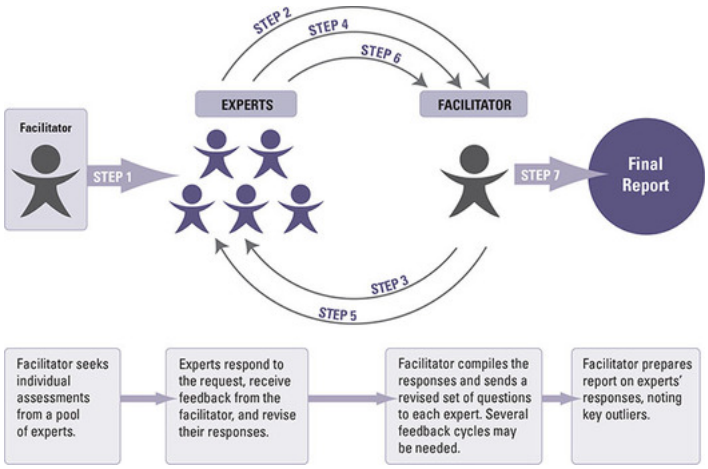
- The anonymous features of the Delphi Method substantially reduce the potential for Groupthink. They also make it more difficult for any participant with strong views based on his or her past experiences and worldview to impose such views on the rest of the group (Projecting Past Experiences). The requirement that the group of experts engage in several rounds of information sharing also helps mitigate the potential for Satisficing.

The Delphi Method can help protect analysts from falling victim to several intuitive traps, including giving too much weight to first impressions or initial data, especially if they attract our attention and seem important at the time (Relying on First Impressions). It also protects against the tendency to continue holding to an analytic judgment when confronted with a mounting list of evidence that contradicts the initial conclusion (Rejecting Evidence).

The Method

In a Delphi project, a moderator or analyst sends a questionnaire to a panel of experts usually in different locations. The experts respond to these questions and are asked to provide short explanations for their responses. The moderator collates the results from the first questionnaire and sends the collated responses back to all panel members, asking them to reconsider their responses based on what they see and learn from the other experts' responses and explanations. Panel members may also be asked to answer another set of questions. This cycle of question, response, and feedback continues through several rounds using the same or a related set of questions. It is often desirable for panel members to remain anonymous so that they are not unduly influenced by the responses of senior members. This method is illustrated in Figure 8.2.6.

Examples



Description

Figure 8.2.6 Delphi Technique

To show how Delphi can be used for intelligence analysis, we have developed three illustrative applications:

- **Evaluation of another country's policy options.** The Delphi project manager or moderator identifies several policy options that a foreign country might choose. The moderator then asks a panel of experts on the country to rate the desirability and feasibility of each option, from the other country's point of view, on a five-point scale ranging from "Very Desirable" or "Feasible" to "Very Undesirable" or "Definitely Infeasible." Panel members also identify and assess any other policy options that should be considered and identify the top two or three arguments or items of evidence that guided their judgments. A collation of all responses is sent back to the panel with a request for members to do one of the following: reconsider their position in view of others' responses, provide further explanation of their judgments, or reaffirm their previous response. In a second round of questioning, it may be desirable to list key arguments and items of evidence and ask the panel to rate them on their validity and their importance, again from the other country's perspective.

- **Analysis of alternative hypotheses.** A panel of outside experts is asked to estimate the probability of each hypothesis in a set of mutually exclusive hypotheses where the probabilities must add up to 100 percent. This could be done as a stand-alone project or to double-check an already completed Analysis of Competing Hypotheses (chapter 7). If two analyses using different analysts and different methods arrive at the same conclusion, confidence in the conclusion can increase. If the analyses disagree, that may also be useful to know, as one can then seek to understand the rationale for the different judgments.

- **Warning analysis or monitoring a situation over time.** The facilitator asks a panel of experts to estimate the probability of a future event. This might be either a single event for which the analyst is monitoring early warning indicators or a set of scenarios for which the analyst is monitoring milestones to determine the direction in which events seem to be moving. A Delphi project that monitors change over time can be managed in two ways. One is to have a new round of questions and responses at specific intervals to assess the extent of any change. The other is what is called either Dynamic Delphi or Real-Time Delphi, where participants can modify their responses at any time as new events occur or as a participant submits new information.[22] The probability estimates

provided by the Delphi panel can be aggregated to furnish a measure of the significance of change over time. They can also be used to identify differences of opinion among the experts that warrant further examination.

Potential Pitfalls

A Delphi project involves administrative work to identify the experts, communicate with panel members, and collate and tabulate their responses through several rounds of questioning. The use of Delphi by intelligence organizations can pose additional obstacles, such as ensuring that the experts have appropriate security clearances or requiring them to meet with the analysts in approved office spaces. Another potential pitfall is that overenthusiastic use of the technique can force consensus when it might be better to present two competing hypotheses and the evidence supporting each position.

Origins of This Technique

The origin of Delphi as an analytic method was described above under “When to Use It.” The following references were useful in researching this topic: Murray Turoff and Starr Roxanne Hiltz, “Computer Based Delphi Processes,” 1996, http://web.njit.edu/~turoff/Papers/delphi3.html; and Harold A. Linstone and Murray Turoff, *The Delphi Method: Techniques and Applications* (Reading, MA: Addison-Wesley, 1975). A 2002 digital version of Linstone and Turoff’s book is available online at http://is.njit.edu/pubs/delphibook; see in particular the chapter by Turoff on “The Policy Delphi” (http://is.njit.edu/pubs/delphibook/ch3b1.pdf).

For more recent information on validity and optimal techniques for implementing a Delphi project, see Gene Rowe and George Wright, “Expert Opinions in Forecasting: The Role of the Delphi Technique,” in *Principles of Forecasting,* ed. J. Scott Armstrong (New York: Springer Science+Business Media, 2001).

Several software programs are available for using the Delphi Method; for example, one can be found at http://armstrong.wharton.upenn.edu/delphi2. Distributed decision support systems now publicly available to support virtual teams include some functions necessary for Delphi as part of a larger package of analytic tools.

8.3 CONFLICT MANAGEMENT TECHNIQUES

Challenge techniques support the identification and confrontation of opposing views. That is, after all, their purpose. This raises two important questions, however. First, how can confrontation be managed so that it becomes a learning experience rather than a battle between determined adversaries? Second, in an analysis of any topic with a high degree of uncertainty, how can one decide if one view is wrong or if both views have merit and need to be discussed in an analytic report? This section offers a conceptual framework and seven useful techniques for dealing with analytic conflicts.

A widely distributed article in the *Harvard Business Review* stresses that improved collaboration among organizations or organizational units with different interests can be achieved only by accepting and actively managing the inevitable—and desirable—conflicts between these units:

> The disagreements sparked by differences in perspective, competencies, access to information, and strategic focus . . . actually generate much of the value that can come from collaboration across organizational boundaries. Clashes between parties are the crucibles in which creative solutions are developed. . . . So instead of trying simply to reduce disagreements, senior executives need to embrace conflict and, just as important, institutionalize mechanisms for managing it.[23]

The most common procedures for dealing with differences of opinion have been to force a consensus, minimize the differences, or—in the U.S. Intelligence Community—add a dissenting footnote to an

estimate. We believe these practices are suboptimal, at best. We hope they will become increasingly rare as our analytic communities embrace greater collaboration early in the analytic process, rather than endure mandated coordination at the *end* of the process after all parties are locked into their positions. One of the principal benefits of using Structured Analytic Techniques for intraoffice and interagency collaboration is that these techniques identify differences of opinion at the start of the analytic process. This gives time for the differences to be at least understood, if not resolved, at the working level before management becomes involved.

How one deals with conflicting analytic assessments or estimates depends, in part, upon one's expectations about what is achievable. Mark Lowenthal has written persuasively of the need to recalibrate expectations of what intelligence analysis can accomplish.[24] More than in any other discipline, intelligence analysts typically work with incomplete, ambiguous, and potentially deceptive evidence. Combine this with the fact that intelligence analysts are seeking to understand human behavior, which is difficult to predict even in our own culture. It should not be surprising that intelligence analysis sometimes turns out to be "wrong."

Acceptance of the basic principle that it is okay for analysts to be uncertain, because they are dealing with uncertain matters, helps to set the stage for appropriate management of conflicting views. In some cases, one position will be refuted and rejected. In other cases, two or more positions may be reasonable assessments or estimates, usually with one more likely than the others. In such cases, conflict is mitigated when it is recognized that each position has some value in covering the full range of options.

Earlier in this chapter, we noted that an assessment or estimate that is properly described as "probable" has about a one-in-four chance of being wrong. This has clear implications for appropriate action when analysts hold conflicting views. If an analysis meets rigorous standards yet conflicting views remain, decision makers are best served by an analytic product that deals directly with the uncertainty

rather than minimizing or suppressing it. The greater the uncertainty, the more appropriate it is to go forward with a product that discusses the most likely assessment or estimate and gives one or more alternative possibilities. Some intelligence services have even required that an analysis or assessment cannot go forward unless the analyst can demonstrate that he or she has considered alternative explanations or scenarios.

Factors to be considered when assessing the amount of uncertainty include the following:

- An estimate of the future generally has more uncertainty than an assessment of a past or current event.
- Mysteries, for which there are no knowable answers, are far more uncertain than puzzles, for which an answer does exist if one could only find it.[25]
- The more assumptions that are made, the greater the uncertainty. Assumptions about intent or capability, and whether they have changed, are especially critical.
- Analysis of human behavior or decision making is far more uncertain than analysis of technical data.
- The behavior of a complex dynamic system is more uncertain than that of a simple system. The more variables and stakeholders involved in a system, the more difficult it is to foresee what might happen.

If the decision is to go forward with a discussion of alternative assessments, the next step might be to produce any of the following:

- A comparative analysis of opposing views in a single report. This calls for analysts to identify the sources and reasons for the

uncertainty (e.g., assumptions, ambiguities, knowledge gaps), consider the implications of alternative assessments or estimates, determine what it would take to resolve the uncertainty, and suggest indicators for future monitoring that might provide early warning of a given alternative emerging.

- An analysis of alternative scenarios, as described in chapter 9.
- A What If? Analysis or High Impact/Low Probability Analysis, as described in this chapter.
- A report that is clearly identified as a “second opinion” or “alternative perspective.”

8.3.1 Adversarial Collaboration

Adversarial Collaboration is an agreement between opposing parties about how they will work together to resolve or at least gain a better understanding of their differences. Adversarial Collaboration is a relatively new concept championed by Daniel Kahneman, the psychologist who along with Amos Tversky initiated much of the research on cognitive biases described in Heuer's *Psychology of Intelligence Analysis*. Kahneman received a Nobel Prize in 2002 for his research on behavioral economics, and he wrote an intellectual autobiography in connection with this work in which he commented as follows on Adversarial Collaboration:

> One line of work that I hope may become influential is the development of a procedure of *adversarial collaboration*, which I have championed as a substitute for the format of critique-reply-rejoinder in which debates are currently conducted in the social sciences. Both as a participant and as a reader, I have been appalled by the absurdly adversarial nature of these exchanges, in which hardly anyone ever admits an error or acknowledges learning anything from the other. Adversarial collaboration involves a good-faith effort to conduct debates by carrying out joint research—in some cases there may be a need for an agreed arbiter to lead the project and collect the data. Because there is no expectation of the contestants reaching complete agreement at the end of the exercise, adversarial collaboration will usually lead to an unusual type of joint publication, in which disagreements are laid out as part of a jointly authored paper.[26]

Kahneman's approach to Adversarial Collaboration involves agreement on empirical tests for resolving a dispute and conducting

those tests with the help of an impartial arbiter. A joint report describes the tests, states what both sides agree has been learned, and provides interpretations of the test results on which they disagree.[27]

> *Truth springs from argument amongst friends.*
>
> —David Hume, Scottish philosopher

Although differences of opinion on intelligence judgments can seldom be resolved through empirical research, the Adversarial Collaboration concept can, nevertheless, be adapted to apply to the work of analysts. Analysts—and their managers—can agree to use a variety of techniques to reduce, resolve, more clearly define, or explain their differences. These are grouped together here under the overall heading of Adversarial Collaboration.

When to Use It

Adversarial Collaboration should be used only if both sides are open to discussion of an issue. If one side is fully locked into its position and has repeatedly rejected the other side's arguments, this technique is unlikely to be successful. Structured Debate is more appropriate to use in these situations because it includes an independent arbiter who listens to both sides and then decides.

Value Added

Adversarial Collaboration can help opposing analysts see the merit of another group's perspective. If successful, it will help both parties gain a better understanding of what assumptions or evidence are behind their opposing opinions on an issue and to explore the best way of dealing with these differences. Can one side be shown to be wrong, or should both positions be reflected in any report on the subject? Can there be agreement on indicators to show the direction in which events seem to be moving?

A key advantage of Adversarial Collaboration techniques is that they bring to the surface critical items of evidence, logic, and assumptions that the other side had not factored into its own analysis. This is especially true for evidence that is inconsistent with or unhelpful in supporting either side's lead hypothesis.

The Method

Six approaches to Adversarial Collaboration are described here. What all have in common is the requirement to understand and address the other side's position rather than simply dismiss it. Mutual understanding of the other side's position is the bridge to productive collaboration. These six techniques are not mutually exclusive; in other words, one might use several of them for any specific project.

8.3.1.1 The Method: Key Assumptions Check

The first step in understanding what underlies conflicting judgments is a Key Assumptions Check, as described in chapter 7. Evidence is always interpreted in the context of a mental model about how events normally transpire in a given country or situation, and a Key Assumptions Check is one way to make a mental model explicit. If a Key Assumptions Check has not already been done, each side can apply this technique and then share the results with the other side.

Discussion should then focus on the rationale for each assumption and suggestions for how the assumption might be either confirmed or refuted. If the discussion focuses on the probability of Assumption A versus Assumption B, it is often helpful to express probability as a numerical range—for example, 65 percent to 85 percent for probable. When analysts go through these steps, they sometimes discover they are not as far apart as they thought. The discussion should focus on refuting the other side's assumptions rather than supporting one's own.

8.3.1.2 The Method: Analysis of Competing Hypotheses

When opposing sides are dealing with a collegial difference of opinion, with neither side firmly locked into its position, Analysis of

Competing Hypotheses (ACH), described in chapter 7, may be a good structured format for helping to identify and discuss differences. One important benefit of ACH is that it pinpoints the exact sources of disagreement. Both parties agree on a set of hypotheses and then rate each item of evidence or relevant information as consistent or inconsistent with each hypothesis. When analysts disagree on these consistency ratings, the differences are often quickly resolved. When not resolved, the differences often point to previously unrecognized assumptions or to some interesting rationale for a different interpretation of the evidence. One can also use ACH to trace the significance of each item of relevant information in supporting the overall conclusion.

The use of ACH may not result in the elimination of all the differences of opinion, but it can be a big step toward understanding these differences and determining what might be reconcilable through further intelligence collection or research. The analysts can then make a judgment about the potential productivity of further efforts to resolve the differences. ACH may not be helpful, however, if two sides are already locked into their positions. It is all too easy in ACH for one side to interpret the evidence and enter assumptions in a way that deliberately supports its preconceived position. To challenge a well-established mental model, other challenge or conflict management techniques may be more appropriate.

8.3.1.3 The Method: Argument Mapping

Argument Mapping, which was described in chapter 7, maps the logical relationship between each element of an argument. Two sides might agree to work together to create a single Argument Map with the rationales both for and against a given conclusion. Such an Argument Map will show where the two sides agree, where they diverge, and why. The visual representation of the argument makes it easier to recognize weaknesses in opposing arguments. This technique pinpoints the location of any disagreement and could serve as an objective basis for mediating a disagreement. An

alternative approach might be to create, compare, and discuss the merits of alternative, contrasting Argument Maps.

8.3.1.4 The Method: Mutual Understanding

When analysts in different offices or agencies disagree, the disagreement is often exacerbated by the fact that they have a limited understanding of the other side's position and logical reasoning. The Mutual Understanding approach addresses this problem directly.

> *There are two ways to measure the health of a debate: the kinds of questions being asked and the level of listening.*
>
> —David A. Garvin and Michael A. Roberto, "What You Don't Know about Making Decisions," *Harvard Business Review* (September 2001)

After an exchange of information on their positions, the two sides meet with a facilitator, moderator, or decision maker. Side 1 is required to explain to Side 2 its understanding of Side 2's position. Side 1 must do this in a manner that satisfies Side 2 that its position is appropriately represented. Then the roles are reversed, and Side 2 explains its understanding of Side 1's position. This mutual exchange is often difficult to do without carefully listening to and understanding the opposing view and what it is based upon. Once each side accurately understands and represents the other side's position, both sides can more collegially discuss their differences rationally and with less emotion. Experience shows that this technique normally prompts some movement of the opposing parties toward common ground.[28]

8.3.1.5 The Method: Joint Escalation

When disagreement occurs within an analytic team, the disagreement is often referred to a higher authority. This escalation often makes matters worse. What typically happens is that a frustrated analyst takes the problem up to his or her boss, briefly explaining the conflict in a manner that is clearly supportive of the analyst's own position. The analyst then returns to the group armed with the boss's support. However, the opposing analyst(s) have also gone to their bosses and come back with support for their solution. Each analyst is then locked into what has become "my manager's view" of the issue. An already thorny problem has become even more intractable. If the managers engage each other directly, both will quickly realize they lack a full understanding of the problem and must factor in what their counterparts know before trying to resolve the issue.

This situation can be avoided by an agreement among team members, or preferably an established organization policy, that requires joint escalation.[29] The analysts should be required to prepare a joint statement describing the disagreement and to present it jointly to their superiors. This requires each analyst to understand and address, rather than simply dismiss, the other side's position. It also ensures that managers have access to multiple perspectives on the conflict, its causes, and various paths for resolution.

Just the need to prepare such a joint statement discourages escalation and often leads to an agreement. The proponents of this approach report their experience that "companies that require people to share responsibility for the escalation of a conflict often see a decrease in the number of problems that are pushed up the management chain. Joint escalation helps create the kind of accountability that is lacking when people know they can provide their side of an issue to their own manager and blame others when things don't work out."[30]

8.3.1.6 The Method: The Nosenko Approach

Yuri Nosenko was a Soviet intelligence officer who defected to the United States in 1964. Whether he was a true defector or a Soviet plant was a subject of intense and emotional controversy within the CIA for more than a decade. In the minds of some, this historic case is still controversial.

At a critical decision point in 1968, the leadership of the CIA's Soviet Bloc Division set up a three-man team to review all the evidence and make a recommendation for the division's action in this case. The amount of evidence is illustrated by the fact that just one single report arguing that Nosenko was still under Soviet control was 1,000 pages long. The team consisted of one leader who was of the view that Nosenko was a Soviet plant, one leader who believed that he was a bona fide defector, and an experienced officer who had not previously been involved but was inclined to think Nosenko might be a plant.

The interesting point here is the ground rule that the team was instructed to follow. After reviewing the evidence, each officer identified those items of evidence thought to be of critical importance in making a judgment on Nosenko's bona fides. Any item that one officer stipulated as critically important then had to be addressed by the other two members.

It turned out that fourteen items were stipulated by at least one of the team members and had to be addressed by the others. Each officer prepared his own analysis, but they all had to address the same fourteen issues. Their report became known as the "Wise Men" report.

The team did not come to a unanimous conclusion. However, it was significant that the thinking of all three moved in the same direction. When the important evidence was viewed from the perspective of searching for the truth, rather than proving Nosenko's guilt or innocence, the case that Nosenko was a plant began to unravel. The officer who had always believed that Nosenko was bona fide felt he could now prove the case. The officer who was relatively new to the case changed his mind in favor of Nosenko's bona fides. The officer

who had been one of the principal analysts and advocates for the position that Nosenko was a plant became substantially less confident in that conclusion. There were now adequate grounds for management to make the decision.

The ground rules used in the Nosenko case can be applied in any effort to abate a long-standing analytic controversy. The key point that makes these rules work is the requirement that each side must directly address the issues important to the other side and thereby come to understand the other's perspective. This process guards against the common propensity of analysts to make their own arguments and then simply dismiss those of the other side as unworthy of consideration.[31]

8.3.2 Structured Debate

Structured Debate is a planned debate between analysts or analytic teams that hold opposing points of view on a specific issue. The debate is conducted according to set rules and before an audience, which may be a “jury of peers” or one or more senior analysts or managers.

When to Use It

Structured Debate is called for when a significant difference of opinion exists within or between analytic units or within the decision-making community. It can also be used effectively when Adversarial Collaboration has been unsuccessful or is impractical, and a choice must be made between two opposing opinions or a decision to go forward with a comparative analysis of both. Structured Debate requires a significant commitment of analytic time and resources. A long-standing policy issue, a critical decision that has far-reaching implications, or a dispute within the analytic community that is obstructing effective interagency collaboration would be grounds for making this type of investment in time and resources.

Value Added

In the method proposed here, each side presents its case in writing to the opposing side; then, both cases are combined in a single paper presented to the audience prior to the debate. The oral debate then focuses on *refuting* the other side's position. Glib and personable speakers can always make arguments for their own position sound persuasive. Effectively refuting the other side's position is a different ball game, however. The requirement to refute the other side's position brings to the debate an important feature of the scientific method: that the most likely hypothesis is the one with the least evidence against it as well as good evidence for it. (The concept of refuting hypotheses is discussed in chapter 7.)

> *He who knows only his own side of the case, knows little of that. His reasons may be good, and no one may have been able to refute them. But if he is equally unable to refute the reasons on the opposite side, if he does not so much as know what they are, he has no ground for preferring either opinion.*
>
> —John Stuart Mill, *On Liberty* (1859)

The goal of the debate is to decide what to tell the client. If neither side can effectively refute the other, then arguments for and against both sides should be in the report. Customers of intelligence analysis gain more benefit by weighing well-argued conflicting views than from reading an assessment that masks substantive differences among analysts or drives the analysis toward the lowest common denominator. If participants routinely interrupt one another or pile on rebuttals before digesting the preceding comment, the objective of Structured Debate is defeated. The teams are engaged in emotional conflict rather than constructive debate.

The Method

Start by defining the conflict to be debated. If possible, frame the conflict in terms of competing and mutually exclusive hypotheses. Ensure that all sides agree with the definition. Then follow these steps:

- An individual is selected, or a group identified, who can develop the best case for each hypothesis.
- Each side writes up the best case from its point of view. This written argument must be structured with an explicit presentation of key assumptions, key pieces of evidence, and careful articulation of the logic behind the argument.
- Each side presents the opposing side with its arguments, and the two sides are given time to develop counterarguments to refute the opposing side's position.

Next, conduct the debate phase in the presence of a jury of peers, senior analysts, or managers who will provide guidance after listening to the debate. If desired, an audience of interested observers might also watch the debate.

- The debate starts with each side presenting a brief (maximum five minutes) summary of the argument for its position. The jury and the audience are expected to have read each side's full argument.
- Each side then presents to the audience its *rebuttal* of the other side's written position. The purpose here is to proceed in the oral arguments by systematically *refuting* alternative hypotheses rather than by presenting more evidence to support one's own

argument. This is the best way to evaluate the strengths of the opposing arguments.

- After each side has presented its rebuttal argument, the other side is given an opportunity to refute the rebuttal.

- The jury asks questions to clarify the debaters' positions or gain additional insight needed to pass judgment on the debaters' positions.

- The jury discusses the issue and passes judgment. The winner is the side that makes the best argument refuting the other side's position, not the side that makes the best argument supporting its own position. The jury may also recommend possible next steps for further research or intelligence collection efforts. If neither side can refute the other's arguments, it may be because both sides have a valid argument; if that is the case, both positions should appear in any subsequent analytic report.

Relationship to Other Techniques

Structured Debate is like the Team A/Team B technique that has been taught and practiced throughout the intelligence community. Structured Debate differs from Team A/Team B Analysis in its focus on refuting the other side's argument. Use of the technique also reduces the chances that emotions overshadow the process of conflict resolution. The authors have dropped Team A/Team B Analysis and Devil's Advocacy from the third edition of this book because they believe neither is an appropriate model for how analysis should be conducted.[32]

Origins of This Technique

The history of debate goes back to the Socratic dialogues in ancient Greece, and even earlier. Many different forms of debate have evolved since then. Richards J. Heuer Jr. formulated the idea of focusing the debate on refuting the other side’s argument rather than supporting one’s own.

NOTES

1. Rob Johnston, *Analytic Culture in the U.S. Intelligence Community* (Washington, DC: CIA Center for the Study of Intelligence, 2005), 64.

2. Stephen J. Coulthart, "Improving the Analysis of Foreign Affairs: Evaluating Structured Analytic Techniques" (PhD diss., University of Pittsburgh, 2015), http://d-scholarship.pitt.edu/26055/1/CoulthartSJ_ETD2015.pdf

3. Reframing is like the Problem Restatement technique Morgan Jones described in his book *The Thinker's Toolkit* (New York: Three Rivers Press, 1995). Jones observed that "the moment we define a problem our thinking about it quickly narrows considerably." We create a frame through which we view the problem and that tends to obscure other interpretations of the problem. A group can change that frame of reference, and challenge its own thinking, simply by redefining the problem.

4. For more information about this application, see the *Applied Critical Thinking Handbook, 7.0* (Fort Leavenworth, KS: University of Foreign Military and Cultural Studies, 2015), https://fas.org/irp/doddir/army/critthink.pdf.

5. Kesten Green and J. Scott Armstrong, "Structured Analogies for Forecasting," in *International Journal of Forecasting*, Vol. 23, Issue 3, July–September 2007, pp. 365–376, and www.forecastingprinciples.com/paperpdf/Structured_Analogies.pdf

6. This technique should not be confused with Edward de Bono's Six Thinking Hats technique.

7. Richards J. Heuer Jr., *Psychology of Intelligence Analysis* (Washington, DC: CIA Center for the Study of Intelligence, 1999; reprinted by Pherson Associates, LLC, 2007), 134–138.

8. The description of how to conduct a Red Hat Analysis has been updated since publication of the first edition to capture insights provided by Todd Sears, a former Defense Intelligence Agency analyst, who noted that Mirror Imaging is unlikely to be overcome simply by sensitizing analysts to the problem. The value of a structured technique like Red Hat Analysis is that it requires analysts to think first about what would motivate them to act before articulating why a foreign adversary would act differently.

9. Peter Schwartz, *The Art of the Long View* (New York: Doubleday, 1991).

10. Paul Bedard, "CIA Chief Claims Progress with Intelligence Reforms," *U.S. News and World Report*, May 16, 2008.

11. Donald P. Steury, ed., *Sherman Kent and the Board of National Estimates: Collected Essays* (Washington, DC: CIA Center for the Study of Intelligence, 1994), 133.

12. Gary Klein, *Sources of Power: How People Make Decisions* (Cambridge, MA: MIT Press, 1998), 71.

13. Gary Klein, *Intuition at Work: Why Developing Your Gut Instinct Will Make You Better at What You Do* (New York: Doubleday, 2002), 91.

14. Charlan J. Nemeth and Brendan Nemeth-Brown, "Better Than Individuals? The Potential Benefits of Dissent and Diversity for Group Creativity," in *Group Creativity: Innovation through Collaboration*, eds. Paul B. Paulus and Bernard A. Nijstad (New York: Oxford University Press, 2003), 63.

15. Leon Panetta, "Government: A Plague of Incompetence," *Monterey County Herald*, March 11, 2007, F1.

16. Gregory F. Treverton, "Risks and Riddles," *Smithsonian Magazine*, June 2007.

17. For information about these three decision-making models, see Graham T. Allison and Philip Zelikov, *Essence of Decision*, 2nd ed. (New York: Longman, 1999).

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27. Richards J. Heuer Jr. is grateful to Steven Rieber of the Office of the Director of National Intelligence, Office of Analytic Integrity and Standards, for referring him to Kahneman’s work on Adversarial Collaboration.

28. Richards J. Heuer Jr. is grateful to Jay Hillmer of the Defense Intelligence Agency for sharing his experience in using this technique to resolve coordination disputes.

29. Weiss and Hughes, “Want Collaboration?”

30. Ibid.

31. This discussion is based on Richards J. Heuer Jr., “Nosenko: Five Paths to Judgment,” in *Inside CIA’s Private World: Declassified Articles from the Agency’s Internal Journal, 1955–1992*, ed. H. Bradford Westerfield (New Haven, CT: Yale University Press, 1995).

32. The term Team A/Team B is taken from a historic analytic experiment conducted in 1976. A team of CIA Soviet analysts (Team A) and a team of outside critics (Team B) prepared competing assessments of the Soviet Union’s strategic military objectives. This exercise was characterized by entrenched and public warfare between long-term adversaries. In other words, the historic legacy of Team A/Team B is exactly the type of trench warfare between opposing sides that we need to avoid. The 1976 experiment did not achieve its goals, and it is not a model that most analysts familiar with it would want to follow. We recognize that some Team A/Team B exercises can be fruitful if carefully managed but believe the Reframing Techniques described in this chapter are better ways to proceed.

Descriptions of Images and Figures

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New information is acquired while going up a cable car in a mountain. When a person skis down a gentle slope, twisting and turning along the way, they grind a new set of lenses, and outcome is more imaginative thinking. When a person goes straight down a steep slope, with same old cognitive destination, the outcome is speedy but predictable thinking.

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Your office has high influence in the thinking process. Your profession, and key factors, such as size, growth, clients, adversaries, suppliers, products, and technology have some influence. The world, and key forces such as globalization, identity, social stress, social media, big data, and artificial intelligence have little or no influence.

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Analogy based on shared attributes. The illustration shows a pentagon and a hexagon with two stars in each of them. An accompanying text reads, “Canadians and Americans speak English and eat pizza.”

Analogy based on function or relation. The illustration shows a small square, labeled A, a larger square, labeled B, a small triangle, labeled C, and a larger triangle, labeled D. Text reads, “A is to B as C is to D. A driver is to a car as a pilot is to an airplane.”

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The first coordinate system is titled, multiple attacks or insider. Data in each quadrant are as follows. Quadrant 1: Simultaneous. Contractor or visitor. Quadrant 2: Simultaneous. Staff employee.

Quadrant 3: Cascading. Staff employee. Quadrant 4: Cascading. Contractor or visitor. The second coordinate system is titled, multiple attacks or minor casualties. Data in each quadrant are as follows. Quadrant 1: Simultaneous. Disrupt Economy. Quadrant 2: Simultaneous. Spark terror. Quadrant 3: Cascading. Spark terror. Quadrant 4: Simultaneous. Spark terror.

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The first system is titled, multiple attacks or insider. Data in each quadrant are as follows. Quadrant 1: Attack plan 2. Quadrant 2: Story A. Simultaneous. Staff employee. Quadrant 3: Attack Plan 3. Quadrant 4: Story B. Cascading. Staff employee.

The second system is titled, multiple attacks or minor casualties. Data in the quadrant are as follows. Quadrant 1: Attack Plan 6. Quadrant 2: Attack Plan 5. Quadrant 3: Story B. Cascading. Spark terror. Quadrant 4: Attack Plan 8.

The third system is titled, multiple attacks or other strategies. Data in the quadrant are as follows. Quadrant 1: Attack Plan 14. Quadrant 2: Attack Plan 13. Quadrant 3: Attack Plan 15. Quadrant 4: Story B. Cascading. Water as weapon.

The fourth system is titled, multiple attacks or wastewater. Quadrant 1: Attack Plan 10. Quadrant 2: Attack Plan 9. Quadrant 3: Nightmare Attack Plan. Cascading. Treatment plants. Quadrant 4: Attack Plan 12.

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What caused our analysis to be so wrong? Did we consider alternative hypotheses? Did external influences affect the outcome? Did deception go undetected? Were our sources or key evidence unreliable? Was any contradictory evidence ignored? Did the absence of information mislead us? Were our key assumptions valid?

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There are seven steps. Steps 1, 3, and 5 are from the facilitator to the experts. Steps 2, 4, and 6 are from the experts to the facilitator. The facilitator prepares the final report in step 7. The technique flows as follows. Facilitator seeks individual assessments from a pool of experts. Experts respond to the request, receive feedback from the facilitator, and revise their responses. Facilitator compiles the responses and sends a revised set of questions to each expert. Several feedback cycles may be needed. Facilitator prepares report on experts' responses, noting key outliers.

CHAPTER 9 FORESIGHT TECHNIQUES

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9.11 Indicators Generation, Validation, and Evaluation [289 **]**

9.11.1 The Method: Indicators Generation [292 **]**

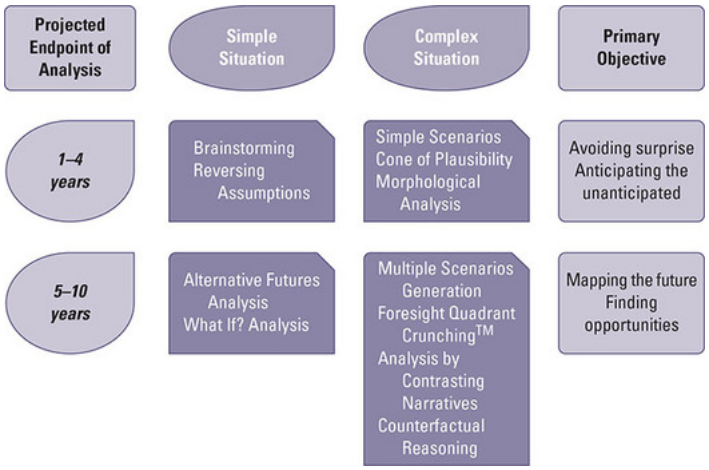
9.11.2 The Method: Indicators Validation [295 **]**

9.11.3 The Method: Indicators Evaluation [295 **]**

In the complex, evolving, uncertain situations that analysts and decision makers must deal with every day, the future is not easily predictable. Some events are intrinsically of low predictability. The best the analyst can do is to identify the driving forces that are likely to determine future outcomes and monitor those forces as they interact to become the future. Scenarios are a principal vehicle for doing this. Scenarios are plausible and provocative stories about how the future might unfold. When alternative futures are clearly outlined, decision makers can mentally rehearse these futures and ask themselves, “What should I be doing now to prepare for these futures?”

Anticipating future developments and implementing future-oriented policies is particularly challenging because of the increasing complexity of problems, the expanding number of stakeholders, and the growing interdependence among various actors, institutions, and events. Senior officials in the government and private sector expect analysts to alert them to emerging trends and unanticipated developments such as the rapid rise of the Islamic State (ISIS), the migration crisis in Europe, the Brexit vote in the United Kingdom, and the results of the 2016 presidential election in the United States.

Analysts can best perform this function by using Foresight Techniques—a family of imaginative structured techniques that infuse creativity into the analytic process. The techniques help decision makers better structure a problem and anticipate the unanticipated. Figure 9.0 lists eleven techniques described in this and other chapters, suggesting the best circumstances for using each technique. When the Foresight Techniques are matched with Indicators, they can help warn of coming dangers or expose new ways of responding to opportunities.



Description

Figure 9.0 Taxonomy of Foresight Techniques

Source: Pherson Associates, LLC, 2019.

The process of developing key drivers—and using them in combinations to generate a wide array of alternative trajectories—forces analysts to think about the future in ways they never would have contemplated if they relied only on intuition and their own expert knowledge. Generating a comprehensive list of key drivers requires organizing a diverse team that is knowledgeable in a wide variety of disciplines. A good guide for ensuring diversity is to engage a set of experts who can address all the elements of STEMPLES+, that is, the **S**ocial, **T**echnical, **E**conomic, **M**ilitary, **P**olitical, **L**egal, **E**nvironmental, and **S**ecurity dimensions of a problem plus possible additional factors such as Demographics, Religion, or Psychology.

We begin this chapter with a discussion of two techniques for developing a list of key drivers. Key Drivers Generation™ uses the Cluster Brainstorming technique to identify potential key drivers. The Key Uncertainties Finder™ is an extension of the Key Assumptions Check. We recommend using both techniques and melding their findings to generate a robust set of drivers. The authors' decades of experience in developing key drivers suggest that the number of mutually exclusive key drivers rarely exceeds four or five. Practice in using these two techniques will help analysts become proficient in the fourth of the Five Habits of the Master Thinker: identifying key drivers.

Scenarios provide a framework for considering multiple plausible futures by constructing alternative trajectories or stories about how a situation could unfold. As Peter Schwartz, author of *The Art of the Long View*, has argued, "The future is plural."[1] Trying to divine or predict a single outcome typically is a disservice to senior policy officials, decision makers, and other clients. Generating several scenarios (for example, those that are most likely, unanticipated, or most dangerous) can be more helpful because it helps focus attention on the underlying forces and factors—or key drivers—that are most likely to determine how the future will unfold. When High Impact/Low Probability scenarios are included, analysts can use scenarios to examine assumptions, identify emerging trends, and deliver useful warning messages. Foresight Techniques help analysts manage complexity and uncertainty by adding rigor to the foresight process. They are based on the premise that generating numerous stories about how the future will evolve will increase the practitioner's sensitivity to outlier scenarios, reveal new opportunities, and reduce the chances of surprise. By postulating different scenarios, analysts can identify the multiple ways in which a situation might evolve. This process can help decision makers develop plans to take advantage of whatever opportunities the future may hold—or, conversely, to avoid or mitigate risks.

> *It is vitally important that we think deeply and creatively about the future, or else we run the risk of being surprised and unprepared. At the same time, the future is uncertain, so we must prepare for multiple plausible futures, not just the one we expect to happen. Scenarios contain the stories of these multiple futures, from the expected to the wildcard, in forms that are analytically coherent and imaginatively engaging. A good scenario grabs us by the collar and says, "Take a good look at this future. This could be your future. Are you going to be ready?"*
>
> — Peter Bishop, Andy Hines, and Terry Collins,"The Current State of Scenario Development," *Foresight* (March 2007)

Foresight Techniques are most useful when a situation is complex or when the outcomes are too uncertain to trust a single prediction. When decision makers and analysts first come to grips with a new situation or challenge, a degree of uncertainty always exists about how events will unfold. At the point when national policies or long-term corporate strategies are in the initial stages of formulation, Foresight Techniques can have a strong impact on decision makers' thinking.

One benefit of Foresight Techniques is that it provides an efficient mechanism for communicating complex ideas, typically described in a scenario with a short and "catchy" label. These labels provide a lexicon for thinking and communicating with other analysts and decision makers about how a situation or a country is evolving. Examples of effective labels include "Red Ice," which describes Russia's takeover of a melting Arctic Ocean, or "Glueless in Havana," which describes the collapse of the Cuban government and its replacement by the Russian mafia.

Scenarios do not predict the future, but a good set of scenarios bounds the range of possible futures for which a decision maker may need to be prepared. Scenarios can be used as a strategic planning tool that brings decision makers and stakeholders together with experts to envisage the alternative futures for which they must plan.[2]

When analysts are thinking about scenarios, they are rehearsing the future so that decision makers can be prepared for whatever direction that future takes. Instead of trying to estimate the most likely outcome and being wrong quite often, scenarios provide a framework for considering multiple plausible futures. Trying to divine or predict a single outcome is usually a fool's errand. By generating several scenarios, the decision makers' attention is shifted to the key drivers that are most likely to influence how a situation will develop.

Analysts have learned from experience that involving decision makers in a scenarios workshop is an effective way to communicate the results of this technique and to sensitize them to important uncertainties. Most participants find the process of developing scenarios much more useful than any written report or formal briefing. Those involved in the process often benefit in several ways. Experience has shown that scenarios can do the following:

- Suggest indicators to monitor for signs that a specified future is becoming more or less likely.
- Help analysts and decision makers anticipate what would otherwise be surprising developments by forcing them to challenge assumptions and consider plausible "wild-card" scenarios or discontinuous events.
- Produce an analytic framework for calculating the costs, risks, and opportunities represented by different outcomes.
- Provide a means for weighing multiple unknown or unknowable factors and presenting a set of plausible outcomes.
- Stimulate thinking about opportunities that can be leveraged or exploited.

- Bound a problem by identifying plausible combinations of uncertain factors.

When decision makers or analysts from different disciplines or organizational cultures are included on the team, new insights invariably emerge as new relevant information and competing perspectives are introduced. Analysts from outside the organizational culture of an analytic unit are likely to see a problem in different ways. They are likely to challenge key working assumptions and established mental models of the analytic unit and avoid the trap of expecting only incremental change. Involving decision makers, or at least a few individuals who work in the office of the ultimate client or decision maker, can bring invaluable perspective and practical insights to the process.

When analysts look well into the future, they usually find it extremely difficult to do a simple, straight-line projection, given the high number of variables they need to consider. By changing the "analytic lens" through which the future is viewed, analysts are also forced to reevaluate their assumptions about the priority order of key factors driving the issue. By pairing the key drivers to create sets of mutually exclusive scenarios, scenario techniques help analysts think about the situation from sometimes counterintuitive perspectives, often generating several unexpected and dramatically different potential future worlds.

By engaging in a multifaceted and systematic examination of an issue, analysts create a more comprehensive set of alternative futures. This enables them to maintain records about each alternative and track the potential for change, thus gaining greater confidence in their overall assessment.

The amount of time and effort required depends upon the specific technique used. A single analyst can use Reversing Assumptions, Simple Scenarios, What If? Analysis, and Cone of Plausibility without any technical or methodological support, although a group effort typically yields more diverse and creative results. Various forms of Brainstorming, Key Drivers Generation™, and Key Uncertainties Finder™ require a group and a facilitator but can be done in an hour or two. The time required for Foresight Quadrant Crunching™, Alternative Futures Analysis, Multiple Scenarios Generation, Morphological Analysis, and Counterfactual Reasoning varies, but these techniques usually require a team of experts to spend several days working together on the project. Analysis by Contrasting Narratives and often Multiple Scenarios Generation involve engaging decision makers directly in the process. How the technique is applied will also vary depending on the topic and the target client. For this reason, we strongly recommend engaging a facilitator who is knowledgeable about Foresight Techniques to save time and ensure a high-quality product.

Criteria should be established for choosing which scenarios are the most important to bring to the attention of the decision maker or ultimate client. The list should be tailored to the client's needs and should fully answer the focal question asked at the beginning of the exercise. Five criteria often used in selecting scenarios follow:

- **Downside Risk.** This criterion addresses the question most often asked: "How bad can it get?" The response should be a credible scenario that has a reasonable chance of occurring and should require the development of a contingency plan for avoiding, mitigating, or recovering if the selected scenario comes to pass. A "nightmare scenario," also described as a High Impact/Low Probability scenario, is usually best portrayed in a tone box or text box in the paper and not as its own stand-alone scenario.

- **Mainline Assessment.** Most clients will usually ask, "What is most likely to happen?" The honest answer is usually, "We do not really know; it depends on how the various key drivers play out in influencing future developments." Although the purpose of Foresight analysis is to show that several scenarios are possible, scenarios can usually be ranked in order from most to least likely to occur based on current trends and reasonable key assumptions. Providing a mainline scenario also establishes a convenient baseline for conducting further analysis and deciding what actions are critical.

- **New Opportunity.** Every Foresight workshop should include pathways that show decision makers how they can fashion a future or futures more to their liking. This can be accomplished by including one or more scenario that showcases new opportunities or by including a section describing how a bad outcome can be mitigated or remedied. Every adversity comes with an opportunity, and the Foresight processes discussed in this chapter can be just as effective in developing positive, opportunities-based scenarios as in describing all the bad things that can happen.

- **Emerging Trend.** Often when conducting a Foresight workshop, new factors will appear or new trends will be identified that analysts or decision makers had previously ignored. These new trends, relationships, or dynamics often are integral to or reflected in several of the scenarios and can be collapsed into a single scenario that best illustrates the significance of—and opportunities presented by—the new trend.

- **Recognizable Anchor.** If the client does not believe any of the scenarios of the Foresight analysis exercise are credible or consistent with the client's experience or convictions, then the recipient will likely disregard the entire process and ignore key findings or discoveries made. On the other hand, recipients who find a scenario that resonates with their current worldview will anchor their understanding of the exercise on that scenario and more easily understand the alternatives.

One of the greatest challenges in applying Foresight Techniques is to generate attention-deserving scenarios that are comprehensive, mutually exclusive, and optimally support the needs of the primary client. A frequent question is, "How many scenarios should we create?" Past practice suggests that the optimal number is four, because any other number has built-in drawbacks:

- One scenario is a prediction that invariably will not come true.

- Two scenarios suggest an artificial binary process.

- Three scenarios introduce the Goldilocks effect, often implying that the "middle" scenario is an appropriate compromise.

- Five or more scenarios are usually too many for a decision maker to process cognitively.

Scenarios workshops will most likely fail if the group conducting the exercise is not highly diverse, with representatives from a variety of disciplines, organizations, and even cultures to avoid the trap of Groupthink. Foresight analysis can be a powerful instrument for overcoming well-known cognitive biases and heuristics such as the Anchoring Effect, Groupthink, and Premature Closure. Scenarios techniques also mitigate the intuitive traps of thinking of only one likely (and predictable) outcome instead of acknowledging that several outcomes are possible (Assuming a Single Solution), focusing on a narrow range of alternatives representing marginal—and not radical—change (Expecting Marginal Change), and failing to factor something into the analysis because the analyst lacks an appropriate category or "bin" for that item of information (Lacking Sufficient Bins).

Users of Foresight Techniques often find that members of the "futures group or study group" have difficulty thinking outside of their comfort zone, resisting instructions to look far into the future, or to explore or suggest concepts that do not fall within their area of expertise. Techniques that have worked well to pry participants out of such analytic pitfalls are to (1) define a time period for the estimate (such as five or ten years) that one cannot easily extrapolate from current events, or (2) post a list of concepts or categories (such as the STEMPLES+ list of **S**ocial, **T**echnical, **E**conomic, **M**ilitary, **P**olitical, **L**egal, **E**nvironmental, and **S**ecurity, plus other factors such as Demographic, Religious, or Psychological) to stimulate thinking about an issue from different perspectives. Analysts involved in the process should have a thorough understanding of the subject matter and possess the conceptual skills necessary to identify the key drivers and assumptions that are likely to remain valid throughout the period of the assessment.

Identification and monitoring of indicators or signposts can provide early warning of the direction in which the future is heading, but these early signs are not obvious.[3] Indicators take on meaning only in the context of a specific scenario with which they are associated. The prior identification of a scenario and related indicators can create an awareness that prepares the mind to recognize early signs of significant change. Change sometimes happens so gradually that analysts do not notice it, or they rationalize it as not being of fundamental importance until it is too obvious to ignore. After analysts take a position on an issue, they typically are slow to change their minds in response to new evidence. By going on the record in advance to specify what actions or events would be significant and might change their minds, analysts can avert this type of rationalization.

The time required to use Foresight Techniques (such as Multiple Scenarios Generation, Foresight Quadrant Crunching™, or Counterfactual Reasoning) ranges from a few days to several months, depending on the complexity of the problem, scheduling logistics, and the number of participants involved in the process.[4] Most of the techniques involve several stages of analysis and employ different techniques to (1) identify key drivers, (2) generate permutations to reframe how the topic could evolve, (3) convert them into scenarios, (4) establish indicators for assessing the potential for each proposed alternative trajectory, and (5) use Decision Support Techniques to help policymakers and decision makers shape an action agenda.

This chapter addresses the first three stages. Decision Support Techniques such as the Opportunities Incubator™ and the Impact Matrix that can be used to implement stage 5 are described in the next chapter. In a robust Foresight exercise, several weeks may pass between each of these stages to provide time to effectively capture, reflect on, and refine the results of each session.

OVERVIEW OF TECHNIQUES

Key Drivers Generation™ should be used at the start of a Foresight exercise to assist in the creation of key drivers. These key drivers should be mutually exclusive, fundamental to the issue or problem under study, and usually not obvious to the uninformed.

Key Uncertainties Finder™ should also be used at the start of a Foresight analysis exercise to assist in the creation of a list of key drivers. When possible, the results of the Key Uncertainties Finder™ process should be melded with the drivers generated by Key Drivers Generation™ to create a more robust and cross-checked list of key drivers.

Reversing Assumptions is a simple technique. The process is to assume that a key assumption is no longer valid and then explore the implications of this change by generating a new, alternative scenario.

Simple Scenarios is a quick and easy way for an individual analyst or a small group of analysts to generate multiple scenarios or trajectories. It starts with the current analytic line and then explores other alternatives, often employing the Cluster Brainstorming technique.

Cone of Plausibility works well with a small group of experts who define a set of assumptions and key drivers, establish a baseline scenario, and then modify the assumptions and drivers to create plausible alternative scenarios and wild cards.

Alternative Futures Analysis is a systematic and imaginative procedure that engages a group of experts in using a 2-×-2 matrix defined by two key drivers to generate a set of mutually exclusive scenarios. The technique often includes academics and decision makers and requires the support of a trained facilitator.

Multiple Scenarios Generation can handle a much larger number of scenarios than Alternative Futures Analysis. It also requires a facilitator, but the use of this technique can greatly reduce the chance that events could play out in a way that was not foreseen as a possibility.

Morphological Analysis is useful for dealing with complex, nonquantifiable problems for which little data are available and the chances for surprise are significant. It is a generic method for systematically identifying and considering all possible relationships in a multidimensional, highly complex, usually nonquantifiable problem space. Users need training and practice in this method, and a facilitator experienced in Morphological Analysis may be necessary.

Counterfactual Reasoning considers what might happen if an alternative possibility were to occur rather than attempting to determine if the lead scenario itself is probable. It is designed to answer the question “How could things have been different in the past and what does that tell us about what to expect in the future?” Use of an experienced facilitator is also highly recommended.

Analysis by Contrasting Narratives is a method for analyzing complex problems by identifying a set of narratives associated with entities involved in the problem.[5] This includes the strategic narrative of the primary client of the analysis, the adversary, and a third party. The process involves having analysts and working-level decision makers collaborate to further their understanding of a problem.

Several techniques that can be used to generate scenarios also perform other functions. They are listed below and are described in other chapters:

- **Simple Brainstorming** is a simple and well-established mechanism described in chapter 6 to stimulate creative thinking about alternative ways the future might unfold. The brainstorming session should be a structured process that

follows specific rules.[6] A downside risk for using brainstorming to generate scenarios is that there is no guarantee that the scenarios generated are mutually exclusive. The tendency is to draw heavily from past experiences and similar situations, thus falling victim to the Availability Heuristic.

- **Cluster Brainstorming** is a silent brainstorming technique described in chapter 6 that can be used to generate scenarios. Participants generate ideas using self-stick notes that are arrayed in clusters, with each cluster suggesting a different scenario.

- **What If? Analysis** (also referred to as Backwards Thinking) is scenarios analysis in reverse. Participants posit an outcome and then develop scenarios to explain what had to occur for that outcome to have happened. It has also been categorized as a Reframing Technique and is described in chapter 8.

- **Foresight Quadrant Crunching™** was developed in 2013 by Randolph Pherson as a variation on Multiple Scenarios Generation and the Key Assumptions Check. It adopts a different approach to generating scenarios by Reversing Assumptions, and it is described along with its companion technique, Classic Quadrant Crunching™, in chapter 8.

Indicators are used in Foresight analysis to provide early warning of some future event. They are often paired with scenarios to identify which of several possible scenarios is developing. They also are useful in measuring change toward an undesirable condition, such as political instability, or a desirable condition, such as economic reform. Analysts can use a variety of structured techniques to generate indicators, which should be validated using the five characteristics of a good indicator. Indicators Evaluation is a process that helps analysts assess the diagnostic power of an indicator.

9.1 KEY DRIVERS GENERATION™

Key Drivers Generation™ uses the Cluster Brainstorming technique to generate a list of candidate key drivers needed to conduct a Foresight exercise.

When to Use It

Key Drivers Generation™ should be used at the start of a Foresight exercise to assist in the creation of key drivers. A key driver is defined as a basic force or factor, such as economic growth, popular support, conflict versus cooperation, or globalization, that affects behavior, performance, or strategy now or in the future. Items on the list of key drivers should be **M**utually **E**xclusive and **C**omprehensively **E**xhaustive (MECE). A robust set of key drivers should be fundamental to the issue or problem; the list often is not obvious to the uninformed.

Value Added

Key Drivers Generation™ is one of two techniques that have proved helpful in developing rigorous lists of key drivers. The other technique is the Key Uncertainties Finder™, which adapts elements of the Key Assumptions Check. Both techniques are particularly effective in countering the impact of the Anchoring Effect, Availability Heuristic, and Hindsight Bias. They also help mitigate the influence of intuitive traps such as Assuming Inevitability, overrating the role of internal determinants of behavior and underestimating the importance of situational factors (Overrating Behavioral Factors), and failing to accurately assess the likelihood of an event when faced with statistical facts and ignoring prior probabilities or base rates (Ignoring Base Rate Probabilities).

The Method

Key Drivers Generation™ follows specific rules and procedures to stimulate new ideas and concepts, emphasizing the use of silence and “kinetic brainstorming” with self-stick notes.

Stage I: Cluster Brainstorming Exercise (see more detailed instructions in chapter 6)

- Gather a small group of individuals who are working the issue along with a few “outsiders” who bring an independent perspective.
- Pass out self-stick notes and marker pens.
- Formulate the question and write it on a whiteboard or easel. A Key Drivers Generation™ focal question usually begins with “What are all the (things/forces and factors/circumstances) that would help explain . . .?”
- Ask the participants to write down their responses on self-stick notes. The facilitator collects them and reads the responses out loud. Only the facilitator speaks during this initial information-gathering stage of the exercise.
- The facilitator sticks the notes on the wall or whiteboard. As the facilitator calls out the responses, participants are urged to build on one another’s ideas.
- After several pauses in idea generation, facilitators ask three to five participants to arrange the self-stick notes into affinity groups (basically grouping the ideas by like concept). Group members do not talk while doing this.

- If the topic is sufficiently complex, ask a second small group to rearrange the notes into a more coherent pattern. They cannot speak.
- This group—or a third group—then picks a word that best describes each grouping. This group can discuss how the self-stick notes were arranged and what would constitute the best label to assign to each affinity group.
- Participants then discuss which affinity groups are the best candidates for conversion to key drivers. Create a list of four to six candidate drivers.

Stage II: Find the Key Drivers

- Identify which affinity groups represent or suggest a critical variable—something that is certain to influence how the situation under consideration would evolve over time.
- Make a list of four to six critical variables that would best serve as key drivers to use in conducting a Foresight analysis.
- If the group has also conducted a Key Uncertainties Finder™ exercise, examine both sets of key drivers and meld them into a single list of four or five drivers.
- Determine if the final list of key drivers meets the following requirements:
    - Mutually exclusive—items do not overlap or are not variants of the same issue.
    - Cover most, if not all, of the STEMPLES+ criteria (**S**ocial, **T**echnical, **E**conomic, **M**ilitary, **P**olitical, **L**egal,

Environmental, and **S**ecurity, plus other factors such as Demographic, Religious, or Psychological).

- Revise the list as appropriate and add a new driver if a major dimension of the problem is not covered by the list of drivers.

9.2 KEY UNCERTAINTIES FINDER™

The Key Uncertainties Finder™ transforms the results of a Key Assumptions Check exercise into a list of candidate key drivers needed to conduct a Foresight exercise.

When to Use It

The Key Uncertainties Finder™ should be used at the start of a Foresight exercise to assist in the creation of a list of key drivers. In the business world, a key driver is defined as a basic force or factor affecting performance. The definition used in intelligence analysis is broader: basic forces and factors (economic growth, popular support, conflict versus cooperation, globalization) that affect behavior, performance, or strategy now or in the future. Key drivers are not nations, regions, or labels, such as “Russia,” “cyber,” or “increased military spending.” When compiling a list of key drivers, the list should reflect the following characteristics:

- **Mutually Exclusive.** Each key driver does not share the same basic dynamic as another driver.
- **Fundamental.** Each key driver affects performance or behavior or strategy.
- **Nonobvious.** At least one listed key driver illustrates a dynamic that is not immediately obvious.

Value Added

The Key Uncertainties Finder™ adapts elements of the Key Assumptions Check to generate a list of key drivers needed in a Foresight analysis. It is one of two techniques that have proved helpful in developing rigorous lists of key drivers for generating alternative scenarios. The other technique is Key Drivers Generation™, which builds on Cluster Brainstorming.

When conducting a Key Assumptions Check, some of the unsupported assumptions often turn out to be key uncertainties—things we initially thought to be true but were not when critically examined. In most cases, these key uncertainties can also be described as critical variables in determining how a situation might evolve or what trajectory evolves over time.

The Method

Stage I: Conduct a Key Assumptions Check Exercise (see more detailed instructions in chapter 7)

- Gather a small group of individuals who are working the issue along with a small number of “outsiders” who can come to the table with an independent perspective.
- Review the definition of a key assumption: a supposition of something as true for another condition or development to be true. It can also be a fact or statement that analysts tend to take for granted.
- On a whiteboard or an easel, list all the key assumptions that participants can generate about the topic.
- After developing a complete list, go back and critically examine each assumption.

Stage II: Find the Key Uncertainties

- Identify the unsupported assumptions on the list; ask if they can be characterized as key uncertainties.
- Review the key uncertainties and ask if they could also be described as critical variables. A critical variable should have specific end points that bound the phenomenon along a continuous spectrum.

Stage III: Convert the Key Uncertainties into Key Drivers

- Make a list of the four to six key uncertainties that would best serve as key drivers used in a Foresight exercise.
- If the group has also conducted a Key Drivers Generation™ exercise, compare both sets of key drivers and meld them into a single list of four to five drivers.
- Determine if the final list of key drivers meets the following requirements:
    - Mutually exclusive
    - Cover most, if not all, of the STEMPLES+ criteria (**S**ocial, **T**echnical, **E**conomic, **M**ilitary, **P**olitical, **L**egal, **E**nvironmental, and **S**ecurity, plus other factors such as Demographic, Religious, or Psychological)
- Revise the list as appropriate and add a new driver if a major dimension of the problem is not covered by the list of drivers.

9.3 REVERSING ASSUMPTIONS

Reversing Assumptions challenges established mindsets by reframing key elements of the problem. The technique involves identifying a key assumption, assuming the reverse is true, and assessing how the overall assessment would change if the key assumption were not true.

When to Use It

Reversing Assumptions is a simple but highly effective technique analysts and decision makers can use to explore the significance of key assumptions and generate alternative scenarios. Individuals or a group can use the technique without a facilitator. The technique usually is employed at the start of a project but can prove just as useful for testing working hypotheses and analytic judgments throughout the production process.

The Method

The method is straightforward:

- Make a list of key assumptions.
- Identify one or more solid assumptions that underpin the analysis.
- Assume that—for whatever reason—the assumption is incorrect, and the contrary assumption has turned out to be true.
- Ask how reversing that key assumption would change the expected outcome.
- If the impact would be significant, ask if a credible case—no matter how unlikely—could be made that the selected key assumption could turn out to be untrue. Articulate the circumstances under which this could happen.
- Convert the case into an alternative scenario.

The process can be repeated for several key assumptions, generating a set of plausible alternative scenarios.

9.4 SIMPLE SCENARIOS

The Simple Scenarios technique is a brainstorming process designed to generate multiple scenarios by manipulating the strengths of a set of key drivers.

When to Use It

Simple Scenarios is a relatively straightforward technique. An analyst working alone can use this technique as well as a group or a team. There is no need for a coach or a facilitator to conduct the process or exercise but having one available enriches the outcome. The lack of structure in the brainstorming process does not guarantee that all the scenarios generated are mutually exclusive, so the results may not be optimal. Participants also may fall into the trap of drawing too heavily from past experiences and similar situations.

The Method

Here are the steps for using this technique:

- Clearly define the focal issue and the specific goals of the futures exercise.
- Make a list of forces, factors, and events that are likely to influence the future using Simple Brainstorming or Cluster Brainstorming techniques.
- Organize the forces, factors, and events related to one another into five to ten affinity groups that are the likely driving forces in determining how the focal issue will evolve.
- Label each of these drivers and write a brief description of each. For example, analysts used the technique to forecast the future of the fictional country of Caldonia, which was facing a chronic insurgency and a growing threat from narcotics traffickers. Six drivers were identified using Cluster Brainstorming.
- Generate a matrix, as shown in Figure 9.4, with a list of drivers down the left side. The columns of the matrix are used to describe scenarios. Each scenario is assigned a value for each driver. The values are strong or positive (+), weak or negative (–), and blank if neutral or no change. In Figure 9.4, participants identified the following six key drivers and then rated them.
    - **Government effectiveness.** To what extent does the government exert control over all populated regions of the country and effectively deliver services?
    - **Economy.** Does the economy sustain positive growth?
    - **Civil society.** Can nongovernmental and local institutions provide appropriate services and security to the population?
    - **Insurgency.** Does the insurgency pose a viable threat to the government? Is it able to extend its dominion over greater portions of the country?
    - **Drug trade.** Is there a robust drug-trafficking economy?
    - **Foreign influence.** Do foreign governments, international financial organizations, or nongovernmental organizations provide military or economic assistance to the government?

	Best Case: An Imperfect Peace	Worst Case: Fragmentation	Mainline: Descent into Order	Additional Scenario: Pockets of Civility
Government effectiveness	+	–	–	–
Economy	+	–	–	+
Civil society		–	+	+
Insurgency	–	+	+	
Drug trade		+		+
Foreign influence	+			

Figure 9.4 Simple Scenarios

Source: Pherson Associates, LLC, 2019.

- Generate at least four different scenarios—a best case, worst case, mainline, and at least one other by assigning different values (+, 0, –) to each driver. In this case, four scenarios were created by varying the impact of six drivers: “Fragmentation” represents the downside scenario, “Descent into Order” the mainline assessment, “An Imperfect Peace” a new opportunity, and “Pockets of Civility” focuses on the strength of civil society.
- Reconsider the list of drivers. Is there a better way to conceptualize and describe the drivers? Are there important forces that have not been included? Look across the matrix to see the extent to which each driver discriminates among the scenarios. If a driver has the same value across all scenarios, it is not discriminating and should be deleted.
- Ask if the set of selected scenarios is complete. To stimulate thinking about other possible scenarios, consider the key assumptions made in deciding on the most likely scenario. What if some of these assumptions turn out to be invalid? If they are invalid, how might that affect the outcome, and are such outcomes included in the available set of scenarios?
- For each scenario, write a one-page story to describe what that future looks like and/or how it might come about. The story should illustrate the interplay of the drivers.
- For each scenario, describe the implications for the decision maker.
- Generate and validate a list of indicators, or “observables,” for each scenario that would aid in discovering that events are starting to play out in a way envisioned by that scenario.
- Monitor the list of indicators on a regular basis.
- Report periodically on which scenario appears to be emerging and why.

Origins of This Technique

Pherson Associates, LLC, developed the model of Simple Scenarios in the late 1990s to support scenarios work done for the U.S. State Department and the U.S. Intelligence Community.

9.5 CONE OF PLAUSIBILITY

Cone of Plausibility is a structured process using key drivers and assumptions to generate a range of plausible alternative scenarios that help analysts and decision makers imagine various futures and their effects. The value of Cone of Plausibility lies in showcasing the drivers that are shaping current and future events.

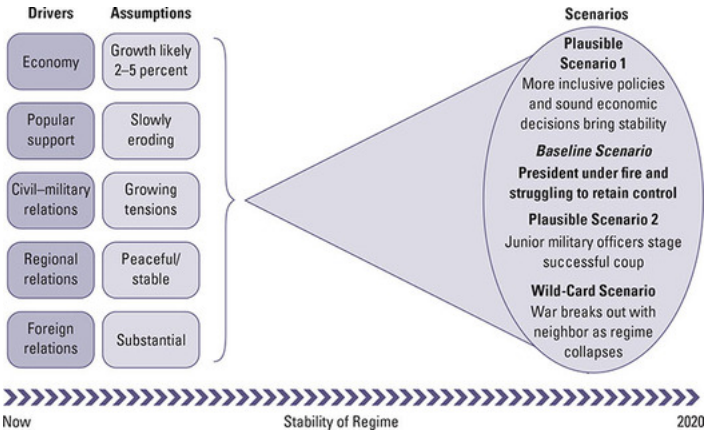
When to Use It

The Cone of Plausibility can be used to explore how well or how poorly events might unfold, thereby bounding the range of possibilities for the decision maker.[7] It helps the decision maker focus on scenarios that are plausible—and fall inside the cone—and implausible—and fall outside the cone. Dramatic, but unlikely, or "possible" scenarios that fall outside the cone can be displayed separately in text boxes alongside the narrative. The technique also is highly effective for strategic warning.

The Method

The steps in the technique are as follows (see Figure 9.5):

- Convene a small group of experts with some diversity of background. Define the issue at hand and set the time frame of the assessment. A common question to ask is, “What will X (e.g., a country, regime, issue) look like in Y (e.g., two months, five years, twenty years)?”
- Identify the drivers that are key factors or forces and thus most useful in defining the issue and shaping the current environment. Analysts in various fields have created mnemonics to guide their analysis of key drivers. One of the most common is PEST, which signifies **P**olitical, **E**conomic, **S**ocial, and **T**echnological variables. Other analysts have combined PEST with legal, military, environmental, psychological, or demographic factors to form abbreviations such as STEEP, STEEPLE, or PESTLE.[8] We recommend using STEMPLES+ (**S**ocial, **T**echnical, **E**conomic, **M**ilitary, **P**olitical, **L**egal, **E**nvironmental, and **S**ecurity, plus other factors such as Demographic, Religious, or Psychological).
- Write the drivers as neutral statements that should be valid throughout the period of the assessment. For example, write “the economy,” not “declining economic growth.” Be sure you are listing true drivers and not just describing important players or factors relevant to the situation. The technique works best when four to six drivers are generated.
- Make assumptions about how the drivers are most likely to play out over the time frame of the assessment. Be as specific as possible; for example, say, “The economy will grow 2–4 percent annually over the next five years,” not simply that “The economy will improve.” Generate only one assumption per driver.



Description

Figure 9.5 Cone of Plausibility

- Generate a baseline scenario from the list of key drivers and key assumptions. This is often a projection from the current situation forward, adjusted by the assumptions you are making about future behavior. The scenario assumes that the drivers and their descriptions will remain valid throughout the period. Write the scenario as a future that has come to pass and describe how it came about. Construct one to three alternative scenarios by changing an assumption or several of the assumptions that you included in your initial list. Often it is best to start by looking at those assumptions that appear least likely to remain true. Consider the impact that change is likely to

have on the baseline scenario and describe this new end point and how it came about. Also consider what impact changing one assumption would have on the other assumptions on the list.

- We recommend making at least one of these alternative scenarios an opportunities scenario, illustrating how a positive outcome that is significantly better than the current situation could plausibly be achieved. Often it is also desirable to develop a scenario that captures the full extent of the downside risk.
- Generate a possible wild-card scenario by radically changing the assumption that you judge as the least likely to change. This should produce a High Impact/Low Probability scenario (see chapter 8) that may not have been considered otherwise.

Origins of This Technique

Cone of Plausibility is a well-established technique used by intelligence analysts in several countries. It is a favorite of analysts working in Canada and the United Kingdom. For additional insight and visuals on the Cone of Plausibility, visit https://prescient2050.com/the-cone-of-plausibility-can-assist-your-strategic-planning-process/.

9.6 ALTERNATIVE FUTURES ANALYSIS

Alternative Futures Analysis is a systematic method for identifying alternative trajectories by developing plausible but mind-stretching “stories” based on critical uncertainties to inform and illuminate decisions, plans, and actions today.

When to Use It

Alternative Futures Analysis and Multiple Scenarios Generation (the next technique to be described) differ from the previously described techniques in that they are usually larger projects that rely on a group of experts, often including decision makers, academics, and other outside experts. They use a more systematic process and usually require the assistance of a knowledgeable facilitator.

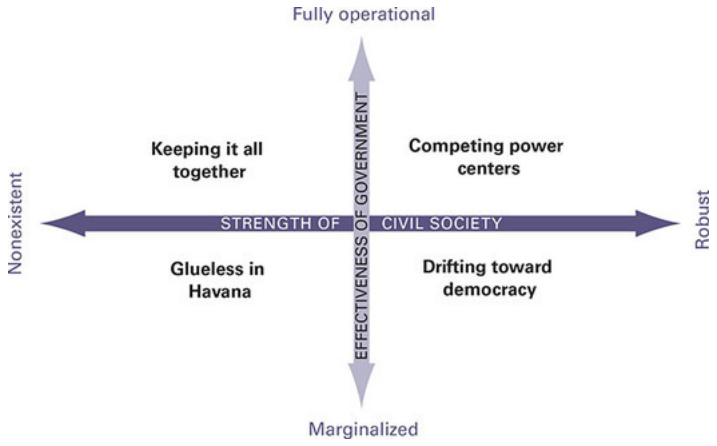
Alternative Futures Analysis is limited in that participants define a future world based on only two driving forces. Each driving force is a spectrum with two extremes, and these drivers combine to make four possible scenarios. Multiple Scenarios Generation has no such limitation other than the practical limitations of time and complexity.

A team of experts can spend hours or days using the technique to organize, brainstorm, and develop multiple futures. A large, multi-day effort often demands the special skills of trained facilitators knowledgeable in the mechanics of Alternative Futures Analysis. The technique has proven highly effective in helping decision makers and policymakers contemplate multiple futures, challenge their assumptions, and anticipate surprise developments by identifying “unknown unknowns.” “Unknown unknowns” are best defined as those factors, forces, or players that one did not realize were important or influential before commencing the exercise.

The Method

The steps in the Alternative Futures Analysis process are as follows:

- Clearly define the focal issue and the specific goals of the futures exercise.
- Brainstorm to identify the key forces, factors, or events most likely to influence how the issue will develop over a specified time period.
- If possible, group these various forces, factors, or events to form two critical drivers that are expected to determine the future outcome. In the example on the future of Cuba (Figure 9.6), the two key drivers are “Effectiveness of Government” and “Strength of Civil Society.” If there are more than two critical drivers, do not use this technique—use the Multiple Scenarios Generation technique, which can handle a larger number of drivers.
- As shown in the Cuba example, define the two ends of the spectrum for each driver.
- Draw a 2-×-2 matrix. Label the two ends of the spectrum for each driver.
- Note that the square is now divided into four quadrants. Each quadrant represents a scenario generated by a combination of the two drivers. Now give a name to each scenario and write it in the relevant quadrant.
- Generate a narrative story of how each hypothetical scenario might come to pass. Include a hypothetical chronology of key dates and events for each scenario.
- Describe the implications of each scenario, should it develop.



Description

Figure 9.6 Alternative Futures Analysis: Cuba

Source: Pherson Associates, LLC, 2019.

- Generate and validate a list of indicators, or “observables,” for each scenario that would help determine whether events are starting to play out in a way envisioned by that scenario.
- Monitor the list of indicators on a regular basis.

- Report periodically on which scenario appears to be emerging and why.

Origins of the Technique

A team at the Royal Dutch Shell Company developed a robust alternative futures methodology in the 1980s. In *The Art of the Long View*, Peter Schwartz provides a detailed description of the process and the power of the technique. Use of the technique usually requires the assistance of a team of knowledgeable facilitators.

9.7 MULTIPLE SCENARIOS GENERATION

Multiple Scenarios Generation is a systematic method for brainstorming multiple explanations of how a situation may develop when considerable uncertainty and several underlying key drivers are present.

When to Use It

Multiple Scenarios Generation is a useful technique for exploring the many ways a situation might evolve, anticipating surprise developments, and generating field requirements when dealing with little concrete information and/or a highly ambiguous or uncertain threat. In counterterrorism, analysts can use it to identify new vulnerabilities, and to assess, anticipate, and prioritize possible attacks and attack methods. It also can be an investigative tool, providing an ideal framework for developing indicators and formulating requirements for field collectors and researchers.

Value Added

The Multiple Scenarios Generation process helps analysts and decision makers expand their imagination and avoid surprise by generating large numbers of potential scenarios. This sensitizes them to possible new outcomes and makes them more likely to consider outlying data that suggest events are unfolding in a way not previously imagined. The challenge for the analyst is to identify just three or four major themes that emerge from the process. Thus, the true value of the technique is to provide a palette of ideas from which analysts can develop attention-deserving themes.

The Method

Multiple Scenarios Generation applies the collective knowledge and imagination of a group of experts to identify a set of key drivers (forces, factors, or events) that are likely to shape an issue and arrays them in different paired combinations to generate robust sets of potential scenarios.

Multiple Scenarios Generation is like Alternative Futures Analysis (described above) except that with this technique, you are not limited to two critical drivers that generate four scenarios. By using multiple 2-×-2 matrices pairing every possible combination of multiple drivers, you can create many possible scenarios. Doing so helps ensure nothing has been overlooked. Once generated, the scenarios can be screened quickly without detailed analysis of each one. After becoming aware of the variety of possible scenarios, analysts are more likely to pay attention to outlying data that would suggest that events are playing out in a way not previously imagined.

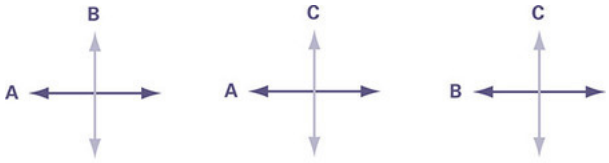
Training and an experienced team of facilitators are needed to use this technique. Here are the basic steps:

- Clearly define the focal issue and the specific goals of the futures exercise.
- Brainstorm to identify the key forces, factors, or events most likely to influence how the issue will develop over a specified time period—often five or ten years.
- Define the two ends of the spectrum for each driver.
- Pair the drivers in a series of 2-×-2 matrices.
- Develop a story or two for each quadrant of each 2-×-2 matrix.
- From all the scenarios generated, select those most deserving of attention because they illustrate compelling and challenging futures not yet under consideration.
- Develop and validate indicators for each scenario that could be tracked to determine which scenario is starting to develop.
- Report periodically on which scenario appears to be emerging and why.

The technique is illustrated by exploring the focal question, “What is the future of the insurgency in Iraq?” (See Figure 9.7a.) Here are the steps:

- Convene a group of experts (including some creative thinkers who can challenge the group’s mental model) to brainstorm the forces and factors that are likely to determine the future of the insurgency in Iraq.
- Select those factors or drivers whose outcome is the hardest to predict or for which analysts cannot confidently assess how the driver will influence future events. In the Iraq example, three drivers meet these criteria:
    - The role of neighboring states (e.g., Syria, Iran)
    - The capability of Iraq’s security services (military and police)
    - The political environment in Iraq

- Define the ends of the spectrum for each driver. For example, the neighboring state could be stable and supportive at one end and unstable and disruptive at the other end of the spectrum.
- Pair the drivers in a series of 2-×-2 matrices, as shown in Figure 9.7a.
- Develop a story or a couple of stories describing how events might unfold for each quadrant of each 2-×-2 matrix. For example, in the 2-×-2 matrix defined by the role of neighboring states and the capability of Iraq's security forces, analysts would describe how the insurgency would function in each quadrant on the basis of the criteria defined at the far end of each spectrum. In the upper-left quadrant, the criteria would be stable and supportive neighboring states but ineffective internal security capabilities (see Figure 9.7b). In this "world," one might imagine a regional defense umbrella that would help to secure the borders. Another possibility is that the neighboring states would have the Shiites and Kurds under control, with Sunnis, who continue to harass the Shia-led central government, as the only remaining insurgents.

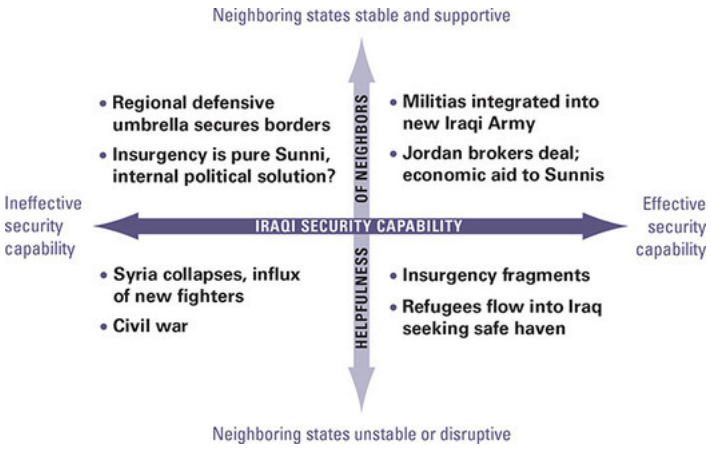


Key Drivers

A. The role of neighboring states (e.g., Syria, Iran)
B. The capability of Iraq's security forces (military and police)
C. The political environment in Iraq

Description

Figure 9.7A Multiple Scenarios Generation: Future of the Iraq Insurgency



Description

Figure 9.7B Future of the Iraq Insurgency: Using Spectrums to Define Potential Outcomes

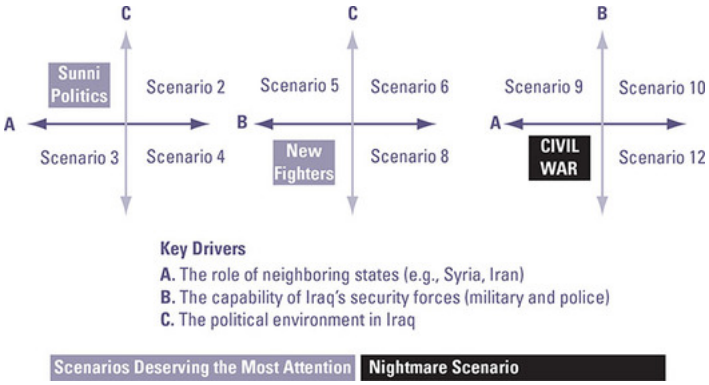
- Review all the stories generated and select those most deserving of attention. For example, which scenario
    - presents the greatest challenges to Iraqi and U.S. decision makers?

    - raises concerns that have not been anticipated?
    - surfaces new dynamics that should be addressed?
    - suggests new collection needs?

- Select a few scenarios that might be described as “wild cards” (High Impact/Low Probability developments) or “nightmare scenarios” (see Figure 9.7c).
- Consider what decision makers might do to prevent bad scenarios from occurring or enable good scenarios to develop.
- Generate and validate a list of key indicators to help monitor which scenario story best describes how events are beginning to play out.
- Report periodically on which scenario appears to be emerging and why.

Origins of This Technique

Multiple Scenarios Generation is described in Randolph H. Pherson, *Handbook of Analytic Tools and Techniques*, 5th ed. (Tysons, VA: Pherson Associates, LLC, 2019). For information on other approaches to scenarios analysis, see Randolph H. Pherson, "Leveraging the Future with Foresight Analysis," *The International Journal of Intelligence, Security, and Public Affairs* (Fall 2018), and Andy Hines, "The Current State of Scenario Development: An Overview of Techniques," *Foresight* 9, no. 1 (March 2007). The Multiple Scenarios Generation illustrations are drawn from a report prepared by Alan Schwartz (PolicyFutures, LLC), "Scenarios for the Insurgency in Iraq," *Special Report* 174 (Washington, DC: United States Institute of Peace, October 2006).



Description

Figure 9.7C Selecting Attention-Deserving and Nightmare Scenarios

9.8 MORPHOLOGICAL ANALYSIS

Morphological Analysis is a method for systematically structuring and examining all the possible relationships in a multidimensional, highly complex, usually nonquantifiable problem space. The basic idea is to identify a set of variables and then examine all possible combinations of these variables.

Morphological Analysis is a generic method used in a variety of disciplines. For intelligence analysis, it helps prevent surprise by generating many feasible outcomes for any complex situation. This exercise reduces the chance that events will play out in a way that the analyst has not previously imagined and considered. Specific applications of this method are Quadrant Crunching™ (described in chapter 8), Multiple Scenarios Generation (in this chapter), and Quadrant Hypothesis Generation (chapter 7). This technique needs training and practice for its successful application, and a facilitator with experience in Morphological Analysis is highly desirable.

When to Use It

Morphological Analysis is most useful for dealing with complex, nonquantifiable problems for which little information is available and the chances for surprise are great. It can be used, for example, to identify possible variations of a threat, possible ways a crisis might occur between two countries, possible ways a set of driving forces might interact, or the full range of potential outcomes in any ambiguous situation. Morphological Analysis is generally used early in an analytic project, as it aims to identify all the possibilities, not to drill deeply into any specific possibility.

Morphological Analysis is typically used for looking ahead; it can also be used in an investigative context to identify the full set of possible explanations for some event.

Value Added

By generating a comprehensive list of possible outcomes, analysts are in a better position to identify and select those outcomes that seem most credible or that most deserve attention. This list helps analysts and decision makers focus on what actions need to be undertaken today to prepare for events that could occur in the future. Decision makers can then take the actions necessary to prevent or mitigate the effect of bad outcomes and help foster better outcomes. The technique can also sensitize analysts to High Impact/Low Probability developments, or “nightmare scenarios,” which could have significant adverse implications for influencing policy or allocation of resources.

The product of Morphological Analysis is often a set of potential noteworthy scenarios, with indicators of each, plus the intelligence collection requirements or research directions for each scenario. Another benefit is that Morphological Analysis leaves a clear audit trail about how the judgments were reached.

The Method

Morphological Analysis works by applying two common principles of creativity techniques: decomposition and forced association. Start by defining a set of key parameters or dimensions of the problem; then break down each of those dimensions further into relevant forms or states or values that the dimension can assume—as in the example described later in this section. Two dimensions can form a matrix and three dimensions a cube. In more complicated cases, multiple linked matrices or cubes may be needed to break the problem down into all its parts.

The principle of forced association then requires that every element be paired with and considered in connection with every other element in the morphological space. How that is done depends upon the complexity of the case. In a simple case, each combination may be viewed as a potential scenario or problem solution and examined from the point of view of its possibility, practicability, effectiveness, or other criteria. In complex cases, there may be thousands of possible combinations; computer assistance is required to handle large numbers of combinations. With or without computer assistance, it is often possible to quickly eliminate a large proportion of the combinations as not physically possible, impracticable, or undeserving of attention. This narrowing-down process allows the analyst to concentrate only on those combinations that are within the realm of the possible and most worthy of attention.

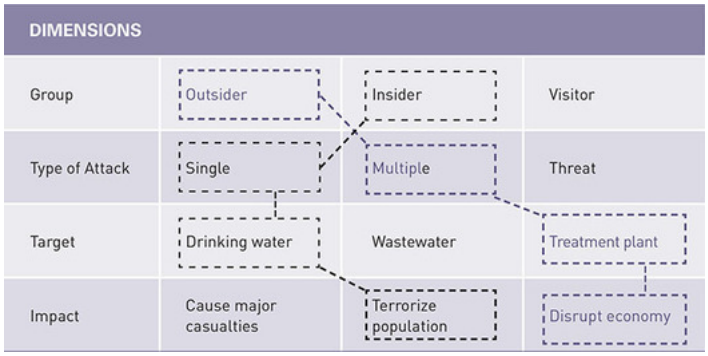
Example

Decision makers ask analysts to assess how a terrorist attack on the water supply might unfold. In the absence of direct information about specific terrorist planning for such an attack, a group of analysts uses Cluster Brainstorming or Mind Mapping to identify the following key dimensions of the problem: attacker, type of attack, target, and intended impact. For each dimension, the analysts identify as many elements as possible. For example, the group could be an outsider, an insider, or a visitor to a facility; the location could be an attack on drinking water, wastewater, or storm sewer runoff. The analysts then array this data into a matrix, illustrated in Figure 9.8, and begin to create as many permutations as possible using different combinations of the matrix boxes. These permutations allow the analysts to identify and consider multiple combinations for further exploration. One possible scenario is an outsider who carries out multiple attacks on a treatment plant to cause economic disruption. Another possible scenario is an insider who carries out a single attack on drinking water to terrorize the population.

Analysts interested in using a computerized version of Morphological Analysis should consult information produced by the Swedish Morphology Society (www.swemorph.com). Their website has detailed guidance and examples of the use of Morphological Analysis for futures research, disaster risk management, complex socio-technical problems, policy research, and other problems comparable to those faced by intelligence analysts.

Origins of This Technique

The current form of Morphology Analysis was developed by astronomer Fritz Zwicky and described in his book *Discovery, Invention, Research through the Morphological Approach* (Toronto: Macmillan, 1969). Basic information about this method is available from two well-known websites that provide information on creativity tools: http://creatingminds.org and www.mindtools.com. For more advanced information, see *General Morphological Analysis: A General Method for Non-Quantified Modeling* (1998); *Wicked Problems: Structuring Social Messes with Morphological Analysis* (2008); and *Futures Studies Using Morphological Analysis* (2009), all downloadable from the Swedish Morphology Society's website: http://www.swemorph.com. For further instruction on how to use Morphological Analysis, go to https://www.ideaconnection.com/thinking-methods/morphological-analysis-00026.html.



Description

Figure 9.8 Morphological Analysis: Terrorist Attack Options

Source: Pherson Associates, LLC, 2019.

9.9 COUNTERFACTUAL REASONING

Counterfactual Reasoning is the process of evaluating conditional claims about possible changes and their consequences.[9] The changes can be either alternative *past* possibilities that did not happen (but could have) or alternative *future* possibilities that are not expected to happen (but could). The technique considers what would or might happen *if* such changes (counter to the facts of what happened or counter to what is expected to happen) were to occur. But, it does *not* attempt to determine the extent to which the alternative possibility itself is probable.

When to Use It

Counterfactual Reasoning should be used when conducting a strategic assessment or supporting a strategic decision-making process. The purpose of the method is to help analysts recognize that any strategic analysis is grounded in a series of underlying claims about alternative possibilities, their consequences, and the relationships among them. The technique should be used when analysts need to answer basic questions such as

- How could things have been different in the past and what does this tell us about what to do today?
- How could things be different (than they are expected to be) in the future and what can be done to facilitate good outcomes and mitigate the impact of bad outcomes?

The method also provides a robust and systematic framework for using other structured techniques such as What If? Analysis, High Impact/Low Probability Analysis, Red Hat Analysis, and many Foresight Techniques.

Value Added

The primary purpose of Counterfactual Reasoning is to ground the analytic foundation of a strategic assessment by considering alternative possibilities, their consequences, and the relationships among them. Counterfactual Reasoning is essential to analysis and strategy because all strategic assessment and/or decision making presupposes counterfactual claims. Every strategic question has embedded assumptions about the consequences of possible challenges the decision maker might face. These assumptions can be conceived of as counterfactuals of the form “If X were to occur, then Y would (or might) follow.”

Counterfactual Reasoning provides analysts with a rigorous process:

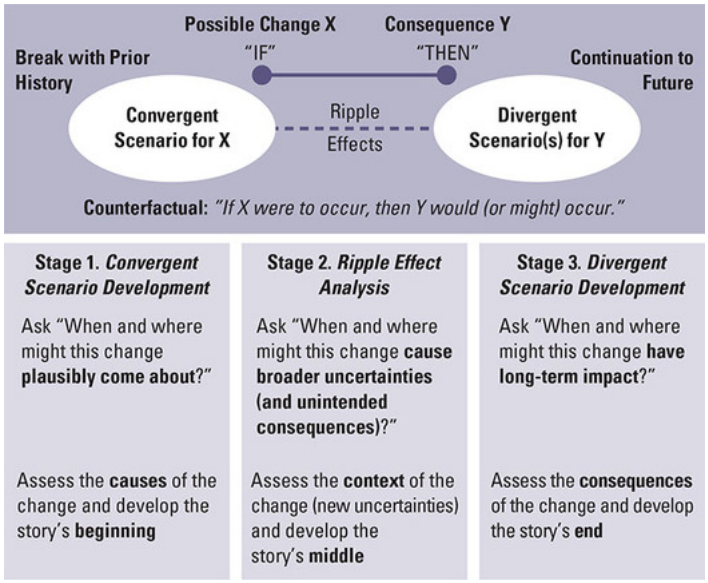
- Develop a detailed account of the causes, context, and consequences of a specific possible change or alternative.
- Integrate creative thinking into the analytic process while simultaneously guarding against speculation by employing a series of precise techniques.
- Open the analyst and decision maker up to a range of new possibilities to overcome deterministic biases such as Hindsight Bias and the practitioners’ intuitive trap of Assuming Inevitability.

The Method

Counterfactual Reasoning explores a specific possible change in three progressive stages that ask the following:

- **Stage 1:** "When and where might this change *plausibly come about?*"
- **Stage 2:** "When and where might this change *cause broader uncertainties (and unexpected consequences)?*"
- **Stage 3:** "When and where might this *have long-term impact?*"

If one conceives of the possible change as a narrative or story, then the stages correspond to developing the beginning, middle, and end of the story (see Figure 9.9). The first two stages can sometimes be counterintuitive and, as a result, they are often overlooked by analysts.



Description

Figure 9.9 Three Stages of Counterfactual Reasoning

Stage One: “Convergent Scenario Development”— The Beginning and Causes of the Change

There is rarely just one way that a possible change can happen. Instead, typically many paths could lead to the change. Whenever analysts consider an “if . . . then” statement, they should avoid assuming that they already know how the possibility (i.e., the “if”) would come to be. Instead, they should develop and assess multiple possible scenarios that start differently, but all “converge” on that possibility. The most plausible of these scenarios will be the analyst’s chosen “back story” for the possibility: the most reasonable way that it could happen. It is what happens prior to the “if” in a standard statement: “If X were to occur, then Y would (or might) follow.” It constitutes the first part of a counterfactual conditional.

- For an alternative possible future change, this scenario begins at the present and charts a precise, postulated future sequence of events that ends when the change happens or “If X were to occur.”

- For an alternative possible past change, the scenario begins at the first place at which history is imagined to be different than it was and then charts a precise sequence of events (which also change history) that ends at the moment when the possibility (X) fully comes to be.

Obviously, the ideal scenario back story for the possible change would be the most plausible one. To develop a plausible account, analysts should first identify the reasons why the change itself is (or was) unlikely. Then, they should identify the reasons why the change is (or was) still possible nonetheless. Using these reasons, analysts should develop possible “triggering events” that could weaken the

reasons why the change is unlikely and/or strengthen the reasons why the change is still possible. The resulting scenarios can be a single such event, or a series of distinct events that lead stepwise or converge to produce the change. Usually, the less time covered by the scenario the better. The more recent the history is to a scenario coming to be, the more likely it would merit consideration by the decision maker.

Three key characteristics of good convergent scenarios are that they (1) are shorter in temporal length, (2) have triggering events that are themselves as plausible as possible, and (3) require a fewer number of triggering events. Once constructed, the convergent scenarios should be assessed relative to each other and rated in terms of plausibility by applying the three criteria. The chosen scenario represents the official assessed “back story” of the possible change as the analysts consider it further.

Stage Two: “Ripple Effect Analysis”— The Middle and (Broader) Context of the Change

When analysts imagine a possible change to what happened in the past or to what is expected to happen in the future, it is easy for them to assume that its effects will be narrow. But, change often extends well beyond the reach of what is anticipated, especially when other actors start to respond to the initial change and thereby create a broader “ripple effect” of unintended consequences. In many narratives, it is in the “middle” of the story that everything gets more complicated as the actors begin to experience the broader and deeper consequences of what happened at the beginning. Analysts have to explore these possible consequences before they can develop a viable account of the longer-term impact of their imagined change. This is what happens *between* the “if” and the “then” in a standard statement: “If X were to occur, then Y would (or might) follow.”

To search for possible “ripple effects,” analysts should first locate several major actors, causal forces, or trends that *are not* major players or factors in the scenario they developed for Stage 1 but *are* likely to interact with the change after it begins to have impact. Second, the analysts should identify what is currently expected of those major actors (or what they actually did in the past). Third, the analysts should consider how those actors might act differently assuming all the changes imagined in Stage 1:

- How do the events of that scenario create a “new world” for these actors?
- How might these actors respond in ways that are different from what analysts currently expect them to do (or what they did in the past)?

- In what ways can the analysts no longer assume these actors will maintain the “status quo” given the imagined changes?

The most significant possible alternative ways these actors might respond represent “new uncertainties” or possible “unintended consequences” that should be taken seriously. Note that analysts are not (at this point) projecting what these actors would do but are only identifying the significant ways in which they might plausibly act differently. They are locating possible “ripple effects”—what analysts can no longer assume will still happen.

Stage Three: "Divergent Scenario Development"—The End and Consequences of the Change

The task for the analyst in Stage 3 is to examine all possible consequences of the change's back story (Stage 1) and the further changes that might follow it (Stage 2). A key tenet of the methodology is that the evaluation of the longer-term consequences of a change (what happens after the "then") should be done only *after* considering both how the change would come to be (what happens before the "if"), and how it might generate new uncertainties (what happens between the "if" and the "then").

To identify the range of outcomes that follow (or "diverge") from a possible change, analysts should look for possible interactions between the events of the convergent scenario (Stage 1) and the possible new uncertainties generated by it (Stage 2). Divergent scenarios are selected based on what would be useful for a decision maker to consider when conducting a full-fledged strategic assessment.

To this end, it is important to know what sorts of consequences the decision maker believes are worth thinking about, what decisions the outcomes are related to, and the nature of the connection between the decision and the consequences. The analyst should distinguish between outcomes that occur in one possible scenario from those that occur across a wide range of possible scenarios. The former are consequences that "might plausibly follow" and the latter are consequences that "would probably follow." Note that it is important for analysts to *always* put the conclusions of Counterfactual Reasoning in the form of a conditional claim such as "If X were to occur, then Y would (or might) follow," and *never* simply as "Y would (or might) follow."

Relationship to Other Techniques

Counterfactual Reasoning is implicit in most strategic assessments because any proposed scenario or response to a situation presumes that certain things would or might have to occur for that scenario to play out. Several Structured Analytic Techniques mirror some of the basic processes of Counterfactual Reasoning. The Key Assumptions Check, for example, employs some of the principles of Counterfactual Reasoning in that it prompts analysts to challenge their underlying assumptions about what might have caused something to occur in the past or would make it occur in the future.

What If? Analysis focuses its attention mostly on the same subject as the first stage of Counterfactual Reasoning, emphasizing the need to develop a "back story" to explain how a posited outcome emerged. An analyst could (theoretically) use What If? Analysis to do the first stage of Counterfactual Reasoning, or vice versa. Red Hat Analysis also generates a specific back story by simulating how an adversary would deal with a particular situation. Counterfactual Reasoning, however, goes further by exploring the implications or consequences of that scenario for the decision maker.

High Impact/Low Probability Analysis relates more to the third stage of Counterfactual Reasoning by focusing on the consequences of a specific—but low-probability—scenario. Similarly, the function of most Foresight Techniques, such as Multiple Scenarios Generation and the Cone of Plausibility, is to identify a set of plausible futures and their consequences by applying a systematic process to generate a set of comprehensive and mutually exclusive alternative scenarios. An analyst could (theoretically) use one of these methods to do the third stage of Counterfactual Reasoning (as long as they integrate the outcomes of Stages 1 and 2), or vice versa.

Origins of This Technique

The origin of counterfactual thinking has philosophical roots and can be traced back to early philosophers such as Aristotle and Plato. In the seventeenth century, the German philosopher Gottfried Wilhelm Leibniz argued that there could be an infinite number of alternate worlds, so long as they were not in conflict with laws of logic.[10] More recently, counterfactual thinking has gained interest from a psychological perspective. Daniel Kahneman and Amos Tversky pioneered the study of counterfactual thought, showing that people tend to think “if only” more often about exceptional events than about normal events.[11] Noel Hendrickson has pioneered the application of counterfactual thinking to intelligence analysis and teaches the technique as one of his four core courses in advanced reasoning methods for intelligence analysts at James Madison University.[12]

9.10 ANALYSIS BY CONTRASTING NARRATIVES

Analysis by Contrasting Narratives is a recently developed methodology for analyzing complex problems by identifying the narratives associated with entities involved in the problem.[13] This includes the strategic narrative associated with the primary client of the analysis, be it an intelligence consumer or a corporate executive. The process involves having analysts and decision makers work collaboratively to further their understanding of a problem. This melding of the expertise of both analysts and decision makers is also an effective practice in Multiple Scenarios Generation workshops and other Foresight exercises.

When to Use It

Analysis by Contrasting Narratives seeks to answer strategic-level questions such as, “Who has what power, on what level, in what setting, over what audience, to attribute what meaning of security, in what form of discourse, which supports what interests, and motivates what action, by whom?” The technique helps analysts understand how a decision maker’s perception of a threat differs from that of an adversary or from that of other geopolitical state or non-state actors. It also focuses attention on the identities of an adversary, whether they may be changing over time, and to what extent the decision makers’ own statements and actions could have undercut their own policy objectives.

The technique is most typically used on complex intelligence problems characterized by sets of interacting events, themes, or entities that are evolving in a dynamic social context. It is useful in analyzing trends in international terrorism, weapons proliferation, and cyber security, and complex counterintelligence, political instability, and Digital Disinformation issues. The narratives can be considered as separate case studies focused on distinct entities, often at different levels (individual, group, or institution).

Value Added

Analysis by Contrasting Narratives engages analysts, working-level policymakers and decision makers, and trusted external subject matter experts in a joint effort to study a topic and develop working narratives relating to a common issue. The narratives reflect the perspectives of the key decision maker(s), the adversary or competitor, and other stakeholders or entities associated with the issue.

The method requires the development and interpretation of distinct narratives by those who can remain critically distant and objective while being sufficiently informed on the topic. It can broaden the analytic spectrum at an initial stage to prompt further analysis and drive additional collection efforts.

A key benefit of the technique is that it increases the diversity of perspectives an analyst can bring to understanding the root causes of an event and the circumstances surrounding it. By highlighting the significance of differing narratives, analysts can consider multiple interpretations as they reframe the intelligence issue or analytic problem. As the developer of the methodology explains, “Rather than telling truth to power, this thesis ‘Analysis by Contrasting Narratives’ argues that intelligence analysis should strive to consider the most relevant truths to serve power.”[14]

The method recognizes that the world has become much more complex. As analysis expands beyond traditional military, political, and economic issues to environmental, social, technical, and cyber domains, there is growing need for analytic techniques that involve more adaptive sense making, flexible organizational structures, direct engagement with the decision maker, and liaising with nontraditional intelligence and academic partners.

Analysis by Contrasting Narratives differs from many traditional forms of intelligence analysis in that it seeks to integrate the perceptions of the policymaker or decision maker into the analysis of the behavior of adversaries and other hostile entities. By engaging the decision maker in the analytic process, the method can also reflect and interactively assess the impact of a decision maker's actions on the problem at hand.

The Method

The methodology consists of two phases: (1) basic analytic narratives are identified, and (2) the narratives are analyzed to assess their development, looking for effects of statements and actions across multiple social domains. A central focus lies with articulations of difference, expressing (or critiquing) an “us-against-them” logic to enable or legitimize particular security policies or decisions.

Phase I: Developing Contrasting Narratives

- Create a basic timeline that defines key events to be studied in all the narratives.
- Develop at least three narratives reflecting the perspective of (1) those who have power or influence over how the issue plays out —a macro narrative—and (2) entities that can reflect critically on actions taken by key players but who lack power to act to influence the situation—a micro narrative. Primary candidates for macro narratives are the adversary or competitor in the scenario and the decision maker and his or her coterie who are the clients for the study.
- For each narrative,
    - Construct a timeline, based on key words, of all significant events.
    - Select texts (articles, public statements) produced by the central actors that are related to the major events in the timeline. For institutional actors, the texts usually are generated by the leadership. In a personal narrative, the texts would be produced by that person. It is possible for

new key events to be added to the basic timeline as the analysis progresses.

    - Analyze the meaning constructed in texts regarding threats and security through the type of grammar (e.g., declaring), lexicon (e.g., metaphors, synonyms, stereotypes), and visual aspects of signs and images used.

    - Examine the settings, involving ways of communicating (to various audiences), social roles, identities, and power relations.

    - Consider the background context, including cultural, religious, and socio-political factors.

- For macro narratives, focus on threat articulations in and through statements and actions. For micro narratives, identify commentary on these threat articulations to reveal internal tensions and inconsistencies.

Phase II: Comparing and Contrasting the Narratives

- Analyze and link the macro narratives. Ask, “To what extent are statements and actions in one narrative reflected in another narrative?”

- Use the micro narratives to enhance, contrast, or highlight additional events and factors of influence.

- Explore:

    - What facilitating conditions and drivers, or factors and events, account for the overall transformation of narratives from beginning to end? How do these elements relate?

    - How do the beginning points of the analysis for each narrative differ?
    - How do the analytic end states for each narrative differ?
    - How do statements and actions resonate with various audiences? Is an audience formal (granting executive powers) or moral (legitimizing statements and actions)? Are the audiences institutionalized, or forming in and through the narrative? Is their response hostile or supportive, sympathetic, and understanding? Is the impact on the audience fluctuating or gradual?
    - What key factors and events, such as material and ideational circumstances, intentions, statements, and actions, add or diminish momentum of threat articulations?

- Overall, explain how courses of action are shaped and produce multiple effects within and across social domains. For example, ask,

    - Does ideology fuel the process of identification of others and the self?
    - Are conflicts between entities a reflection of inherent structural factors or perceptions of a physical threat to self?
    - Are people being portrayed in negative ways to suit ideological, political, religious, or economic norms?

Analysis by Contrasting Narratives can be graphically displayed with diagrams, creating one for each macro narrative. Key events for a narrative are listed vertically in chronological order. On the left, factors are depicted that add momentum to these events and the overall security dynamic in the narrative. Factors removing

momentum are listed on the right. Each narrative has its own color that is also used to highlight related factors in other narratives, visualizing the extent to which narratives influence each other.

Relationship to Other Techniques

Analysis by Contrasting Narratives incorporates elements of Reframing Techniques such as Red Hat Analysis, Premortem Analysis, and Structured Self-Critique and several challenge approaches including Team A/Team B Analysis and Devil's Advocacy.

- The method is like Red Hat Analysis in that both techniques aim to widen cultural empathy and understanding of a problem. Red Hat Analysis differs from Analysis by Contrasting Narratives, however, in that it is more likely to assume that the opposing sides view the conflict in much the same way.

- Devil's Advocacy involves having someone who did not participate in the analysis challenge the analytic judgments and the process that produced them whereas Analysis by Contrasting Narratives is a more collaborative process. Rather than posing a narrative and a counter-narrative, Analysis by Contrasting Narratives seeks to understand narratives associated with a multitude of actors.

- The method differs from challenge techniques in that it engages the decision maker as a participant in the analytic process rather than presenting the decision maker with several options from which to choose.

Origins of This Technique

The Analysis by Contrasting Narratives methodology was developed by Peter de Werd, an assistant professor in intelligence and security at the Netherlands Defence Academy. His PhD dissertation, “Critical Intelligence: Analysis by Contrasting Narratives, Identifying and Analyzing the Most Relevant Truths,” provides a detailed description of both the theory underlying this new approach to analysis and the method itself.[15]

9.11 INDICATORS GENERATION, VALIDATION, AND EVALUATION

Indicators are a preestablished set of observable phenomena that are periodically reviewed to track events, spot emerging trends, validate a hypothesis, and warn of unanticipated change. An indicator list is a preestablished set of observable or potentially observable actions, conditions, facts, or events whose simultaneous occurrence would argue strongly that a phenomenon is present or is highly likely to occur. Indicators can be monitored to obtain tactical, operational, or strategic warnings of some future development that, if it were to occur, would have a major impact.

> *The central mission of intelligence analysis is to warn U.S. officials about dangers to national security interests and to alert them to perceived openings to advance U.S. policy objectives. Thus the bulk of analysts' written and oral deliverables points directly or indirectly to the existence, characteristics, and implications of threats to and opportunities for U.S. national security.*
>
> —Jack Davis, "Strategic Warning: If Surprise Is Inevitable, What Role for Analysis?" (January 2003)

The identification and monitoring of indicators are fundamental tasks of analysis, as they are the principal means of avoiding surprise. When used in intelligence analysis, they usually are forward looking and are often described as estimative, anticipatory, or foresight indicators. In the law enforcement community, indicators are more often used to assess whether a target's activities or behavior are consistent with an established pattern. These indicators look backward and are often described as descriptive or diagnostic indicators.

When to Use It

Indicators provide an objective baseline for tracking events, instilling rigor into the analytic process, and enhancing the credibility of the final product. The indicator list can become the basis for investigating a situation or directing collection efforts and routing relevant information to all interested parties. In the private sector, indicators can track whether a new business strategy is working or whether a low-probability scenario is developing that offers new commercial opportunities.

Indicator lists can serve as a baseline for generating collection requirements or establishing research priorities. They can also be the basis for the analyst's filing system to track developing events.

Descriptive or diagnostic indicators are best used to help the analyst assess whether there are grounds to believe that a specific action is taking place. They provide a systematic way to validate a hypothesis or help substantiate an emerging viewpoint. Figure 9.11 is an example of a list of descriptive indicators, in this case pointing to a clandestine drug laboratory.

A classic application of anticipatory indicators is to seek early warning of some undesirable event, such as a military attack or a nuclear test by a foreign country. Today, indicators are often paired with scenarios to identify which of several possible scenarios is developing. Analysts also use indicators to measure change that points toward an undesirable condition, such as political instability or an economic slowdown, or toward a desirable condition, such as economic reform or the potential for market growth. Analysts can use this technique whenever they need to track a specific situation to monitor, detect, or evaluate change over time.

Value Added

The human mind sometimes sees what it expects to see and can overlook the unexpected. Identification of indicators prepares the mind to recognize early signs of significant change. Change often happens so gradually that analysts do not see it, or they rationalize signs of change as not important until they are too obvious to ignore. Once analysts take a position on an issue, they can be reluctant to change their minds in response to new evidence. Analysts can avoid this type of rationalization by specifying beforehand the threshold for what actions or events would be significant and might cause them to change their minds.

- Noxious odors associated with chemical/industrial use—ammonia, ether, solvents; strong or prolonged odor
- Exhaust fans on house or outbuilding constantly running or running in cold weather
- All windows darkened or covered
- Windows sealed and/or painted
- Abnormal use of electricity and water
- High electric and/or water bills
- Purchase of large quantities of chemicals from hardware and other stores such as
  - Acetone in multi-gallon lots
  - Sodium hydroxide products (e.g., "Drano") by the case
- Purchase of lab supplies or equipment
- Purchase of key chemicals (ether, etc.) or glassware from or through local companies
- Delivery frequently being made by parcel services of glassware, chemicals, etc.

Figure 9.11 Descriptive Indicators of a Clandestine Drug Laboratory

Source: Pamphlet from ALERT Unit, New Jersey State Police, 1990; republished in *The Community Model*, Counterdrug Intelligence Coordinating Group, 2003.

Defining explicit criteria for tracking and judging the course of events makes the analytic process more visible and available to scrutiny by others, thus enhancing the credibility of analytic judgments. Including an indicator list in the finished product helps decision makers track future developments and builds a more concrete case for the analytic conclusions.

Preparation of a detailed indicator list by a group of knowledgeable analysts is usually a good learning experience for all participants. It can be a useful medium for an exchange of knowledge between analysts from different organizations or those with different types of expertise—for example, analysts who specialize in a country and those who are knowledgeable in a given field, such as military mobilization, political instability, or economic development.

When analysts or decision makers are sharply divided over (1) the interpretation of events (for example, political dynamics in Saudi Arabia or how the conflict in Syria is progressing), (2) the guilt or innocence of a “person of interest,” or (3) the culpability of a counterintelligence suspect, indicators can help depersonalize the debate by shifting attention away from personal viewpoints to more objective criteria. Strong emotions are often diffused and substantive disagreements clarified if both sides can agree on a set of criteria before the fact that show developments are—or are not—moving in a particular direction or a person’s behavior suggests guilt or innocence.

The process of developing indicators forces the analyst to reflect and explore all that might be required for a specific event to occur. The process can also ensure greater objectivity if two sets of indicators are developed: one pointing to a likelihood that the scenario will emerge and another showing that it is not emerging.

Indicators help counteract Hindsight Bias because they provide a written record that more accurately reflects what the analyst was thinking at the time rather than relying on that person's memory. Indicators can help analysts overcome the tendency to judge the frequency of an event by the ease with which instances come to mind (Availability Heuristic) and the tendency to predict rare events based on weak evidence or evidence that easily comes to mind (Associative Memory). Indicators also help analysts avoid the intuitive traps of ignoring information that is inconsistent with what one wants to see (Ignoring Inconsistent Evidence), continuing to hold to a judgment when confronted with a mounting list of contradictory evidence (Rejecting Evidence), and assuming something is inevitable, for example, if the indicators an analyst had expected to emerge are not actually realized (Assuming Inevitability).

9.11.1 The Method: Indicators Generation

Analysts can develop indicators in a variety of ways. The method can range from a simple process to a sophisticated team effort. For example, with minimum effort, analysts can jot down a list of things they would expect to see if a given situation were to develop as feared or foreseen. Or analysts could work together to define multiple variables that would influence a situation and then rank the value of each variable based on incoming information about relevant events, activities, or official statements.

When developing indicators, clearly define the issue, question, outcome, or hypothesis and then generate a list of activities, events, or other observables that you would expect to see if that issue or outcome emerged. Think in multiple dimensions using STEMPLES+ (**S**ocial, **T**echnical, **E**conomic, **M**ilitary, **P**olitical, **L**egal, **E**nvironmental, and **S**ecurity, plus Demographic, Religious, Psychological, or other factors) to stimulate new ways of thinking about the problem. Also consider analogous sets of indicators from similar or parallel circumstances.

Indicators can be derived by applying a variety of Structured Analytic Techniques, depending on the issue at hand and the frame of analysis.[16] For example, analysts can use

- **Cluster Brainstorming or Mind Mapping** to generate signposts. A signpost could be a new development, a specific event, or the announcement of a new policy or decision that would be likely to emerge as a scenario unfolds.
- **Circleboarding™** to identify all the dimensions of a problem. It prompts the analyst to explore the Who, What, How, When, Where, Why, and So What of an issue.
- **Key Assumptions Check** to surface key variables or key uncertainties that could determine how a situation unfolds.
- **Gantt Charts** or **Critical Path Analysis** to identify markers. Markers are the various stages in a process (planning, recruitment, acquiring materials, surveillance, travel, etc.) that note how much progress the group has made toward accomplishing the task. Analysts can identify one or more markers for each step of the process and then aggregate them to create a chronologically ordered list of indicators.
- **Decision Trees** to reveal critical nodes. The critical nodes displayed on a Decision Tree diagram can often prove to be useful indicators.
- **Models** to describe emerging phenomena. Analysts can identify indicators that correspond to the various components or stages of a model that capture the essence of dynamics such as political instability, civil-military actions presaging a possible coup, or ethnic conflict. The more indicators observed, the more likely that the phenomenon represented by the model is present.
- **Structured Analogies** to flag what caused similar situations to develop. When historical or generic examples of the topic under study exist, analysis of what created these analogous situations can be the basis for powerful indicators of how the future might evolve.

When developing indicators, analysts should take time to carefully define each indicator. It is also important to establish what is “normal” for that indicator.

Consider the indicators as a set. Are any redundant? Have you generated enough? The set should be comprehensive, consistent, and complementary. Avoid the temptation of creating too many indicators; collectors, decision makers, and other analysts usually ignore long lists.

After completing your list, review and refine it, discarding indicators that are duplicative and combining those that are similar. See Figure 9.11.1 for a sample list of anticipatory or foresight indicators.

The following developments would signal that a given scenario is unfolding.
Scenario One: Treading Water
• A prime minister with weak reform credentials takes office as part of a compromise between the president and the political opposition.
• A full but divided Parliament is seated but incapable of passing major legislation.
• The government meets basic International Monetary Fund (IMF) standards but fails to qualify for budget aid.
• The president maintains some rhetorical support for modernization but declines to take forceful action.
• The police demonstrate the ability to cope with sporadic demonstrations but make slow progress in developing their overall capabilities.
Scenario Two: The Unraveling of Democracy
• The president publicly retreats from his commitment to structural reforms.
• The government violates its agreement with the IMF, leading to a significant decrease in aid pledged by other major international donors.
• Public demonstrations draw thousands of participants and persist for several days.
• Extremist groups resurface, or revolutionary groups call for alternative approaches to government.
• Police step up repressive tactics or, conversely, abandon their posts en masse.
• Successive prime ministers and their cabinets are forced to resign.
• Upcoming legislative elections are cancelled or postponed indefinitely.
Scenario Three: Turning the Corner
• Parliament accepts a pro-reform prime minister and passes legislation on a regular basis.
• Some state-owned industries are privatized, and the government workforce is scaled back, leading to the disbursement of large portions of international aid.
• The benefits of modernization and accompanying aid become more apparent, and leading opposition politicians tone down their antireform rhetoric.
• Legislative elections occur as planned with little violence and are pronounced free and fair by international experts.
• Business leaders announce new private investments capable of generating permanent jobs numbering in the tens of thousands.
• Instances of human rights violations by the police decrease dramatically.

Figure 9.11.1 Using Indicators to Track Emerging Scenarios in Zambria

Source: Pherson Associates, LLC, 2019.

9.11.2 The Method: Indicators Validation

Good indicators possess five key characteristics: they should be observable and collectible, valid, reliable, stable, and unique.[17] Discard those that are found wanting. The first two characteristics are required for every indicator. The third and fourth characteristics are extremely important but cannot always be satisfied. The fifth characteristic is key to achieving a high degree of diagnosticity for a set of indicators but is the most difficult goal to achieve.

- **Observable and collectible.** The analyst should have good reason to expect that the indicator can be observed and reported by a reliable source. To monitor change over time, an indicator needs to be collectible over time. It must be legal and not too costly to collect.
- **Valid.** An indicator must be clearly relevant to the end state the analyst is trying to predict or assess. It must accurately measure the concept or phenomenon at issue.
- **Reliable.** Data collection must be consistent when comparable methods are used. Those observing and collecting the information must observe the same thing. This requires precise definition of each indicator.
- **Stable.** An indicator must be useful over time to allow comparisons and to track events. Ideally, the indicator should be observable early in the evolution of a development so that analysts and decision makers have time to react accordingly.
- **Unique.** An indicator should measure only one thing and, in combination with other indicators, point only to the phenomenon being studied. Valuable indicators are those that are consistent with a specified scenario or hypothesis and inconsistent with

alternative scenarios or hypotheses. Indicators Evaluation, described next, can be used to check the diagnosticity of indicators.

Remember that indicators must be tangibly defined to be objective and reliable. For example, “growing nervousness” or “intent to do harm” would fail the test, but “number of demonstrators” or “purchase of weapons” would pass.

9.11.3 The Method: Indicators Evaluation

The best way to assess the diagnosticity of indicators used to distinguish among different scenarios is to employ the Indicators Evaluation methodology. Indicators Evaluation helps ensure the credibility of the analysis by identifying and dismissing non-diagnostic indicators or those defined as indicators that would be present for multiple scenarios or hypotheses.

- The ideal indicator is highly likely or consistent for the scenario or hypothesis to which it is assigned and highly unlikely or inconsistent for all other alternatives.
- A non-diagnostic indicator would be observed in every scenario or hypothesis, suggesting that it may not be particularly useful in determining whether a specific scenario or a particular hypothesis is true.
- Most indicators fall somewhere in between.

Application of the Indicators Evaluation method helps identify the most-diagnostic indicators for each scenario or hypothesis—which are most deserving of monitoring and collection (see Figure 9.11.3a).

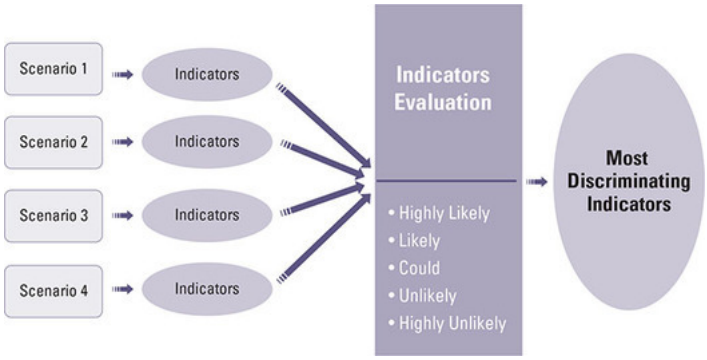


Figure 9.11.3A Indicators Evaluation

Source: Pherson Associates, LLC, 2019.

Employing Indicators Evaluation to identify and dismiss non-diagnostic indicators can increase the credibility of an analysis. By applying the method, analysts can rank order their indicators from most to least diagnostic and decide how far up the list they want to draw the line in selecting the indicators used in the analysis. In some circumstances, analysts might discover that most or all the indicators for a given scenario are also consistent with other scenarios, forcing them to brainstorm a new and better set of indicators for that scenario. If analysts find it difficult to generate independent lists of diagnostic indicators for two scenarios, it may be that the scenarios are not sufficiently dissimilar, suggesting the two scenarios should be combined.

Indicators Evaluation can help overcome mindsets by showing analysts how a set of indicators that point to one scenario may also point to others. It can also show how some indicators, initially perceived to be useful or diagnostic, may not be. By placing an indicator in a broader context against multiple scenarios, the technique helps analysts focus on which one(s) are useful and diagnostic instead of simply supporting a given scenario.

The Method

The first step is to fill out a matrix like that used for Analysis of Competing Hypotheses.

- List the alternative scenarios along the top of the matrix (as is done for hypotheses in Analysis of Competing Hypotheses).
- List indicators generated for all the scenarios down the left side of the matrix (as is done with relevant information in Analysis of Competing Hypotheses).
- In each cell of the matrix, assess the status of that indicator against the noted scenario. Would you rate the indicator as
    - Highly Likely to appear?
    - Likely to appear?
    - Could appear?
    - Unlikely to appear?
    - Highly Unlikely to appear?

Indicators developed for the home scenario should be either “Highly Likely” or “Likely.”

- After assessing the likelihood of all indicators against all scenarios, assign a score to each cell. If the indicator is “Highly Likely” in the home scenario as we would expect it to be, then other cells for that indicator should be scored as follows for the other scenarios:
    - Highly Likely is 0 points
    - Likely is 1 point
    - Could is 2 points
    - Unlikely is 4 points
    - Highly Unlikely is 6 points
- If the indicator is deemed “Likely” in the home scenario, then the cells for the other scenarios for that indicator should be scored as follows:
    - Highly Likely is 0 points
    - Likely is 0 points
    - Could is 1 point
    - Unlikely is 3 points

    - Highly Unlikely is 5 points

- Tally up the scores across each row; the indicators with the highest scores are the most diagnostic or discriminating.
- Once this process is complete, re-sort the indicators for each scenario so that the most discriminating indicators are displayed at the top and the least discriminating indicators at the bottom.

    - The most discriminating indicator is “Highly Likely” to emerge in its scenario and “Highly Unlikely” to emerge in all other scenarios.
    - The least discriminating indicator is “Highly Likely” to appear in all scenarios.
    - Most indicators will fall somewhere in between.

- The indicators with the most “Highly Unlikely” and “Unlikely” ratings are the most discriminating.
- Review where analysts differ in their assessments and decide if adjustments are needed in their ratings. Often, differences in how an analyst rates an indicator can be traced back to different assumptions about the scenario when the analysts were doing the ratings.
- Decide whether to retain or discard indicators that have no “Unlikely” or “Highly Unlikely” ratings. In some cases, an indicator may be worth keeping if it is useful when viewed in combination with a cluster of indicators.
- Develop additional—and more diagnostic indicators—if a large number of initial indicators for a given scenario have been eliminated.
- Recheck the diagnostic value of any new indicators by applying the Indicators Evaluation technique to them as well.

Analysts should think seriously before discarding indicators determined to be non-diagnostic. For example, an indicator might not have diagnostic value on its own but be helpful when viewed as part of a cluster of indicators. An indicator that a terrorist group “purchased guns” would not be diagnostic in determining which of the following scenarios were likely to happen: armed attack, hostage taking, or kidnapping; knowing that guns had been purchased could be critical in pointing to an intent to commit an act of violence or even to warn of the imminence of the event. Figure 9.11.3b explores another reason for not discarding a non-diagnostic indicator. It is called the INUS (Insufficient but Nonredundant/Unnecessary but Sufficient) Condition.

A final argument for not discarding non-diagnostic indicators is that maintaining and publishing the list of non-diagnostic indicators could prove valuable to collectors. If analysts initially believed the indicators would be helpful in determining whether a specific scenario was emerging, then collectors and other analysts working the issue, or a similar issue, might come to the same conclusion. For these reasons, facilitators of the Indicators Validation and Evaluation techniques believe that the list of non-diagnostic indicators should also be published to alert other analysts and collectors to the possibility that they might also assume an indicator was diagnostic when it turned out on further inspection not to be.

If you take the time to develop a robust set or sets of anticipatory or foresight indicators (see Figure 9.11.3c), you must establish a regimen for monitoring and reviewing the indicators on a regular basis. Analysts should evaluate indicators on a set schedule—every week or every month or every quarter—and use preestablished criteria when doing so. When many or most of the indicators assigned to a given scenario begin to “light up,” this should prompt the analyst to alert the broader analytic community and

key decision makers interested in the topic. A good set of indicators will give you advance warning of which scenario is about to emerge and where to concentrate your attention. It can also alert you to unlikely or unanticipated developments in time for decision makers to take appropriate action.

In some circumstances, several different sets of indicators functioning as a group will indicate that a scenario is about to emerge. In such cases, it is possible to construct several potential pathways that would lead to an event such as a military coup or an economic crisis. A different set of indicators should be created that corresponds to each possible pathway.

Indicators need to be treated as a set when a single indicator in the set is insufficient in and of itself to cause the event but is nonredundant (because it is unique and not part of any other set) and part of an unnecessary but sufficient condition for the event to occur. This is known as the INUS Condition (**I**nsufficient but **N**onredundant/**U**nnecessary but **S**ufficient)—a term coined by J. L. Mackie.[18] Mackie's classic example of an INUS Condition is a short circuit. A short circuit is insufficient to cause the fire on its own (one also needs oxygen and some flammable material) but is a nonredundant part (it does not form a part of any other cluster of indicators) of an unnecessary cluster (other clusters can cause a house fire operating independently of the short circuit) but sufficient (without the short circuit the other indicators in a given cluster cannot cause the fire).

Figure 9.11.3B The INUS Condition[18]

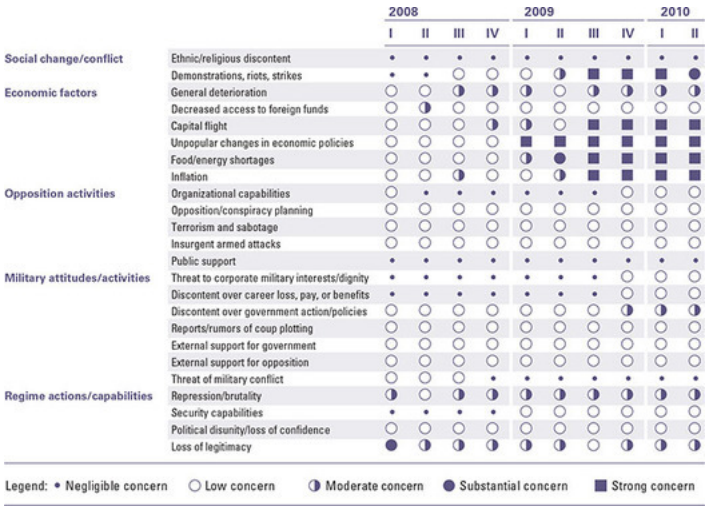
Any indicator list used to monitor whether something has happened, is happening, or will happen implies at least one alternative scenario or hypothesis—that it has not happened, is not happening, or will not happen. Many indicators that a scenario or hypothesis is happening are just the opposite of indicators that it is not happening; some are not. Some are consistent with two or more scenarios or hypotheses. Therefore, an analyst should prepare separate lists of indicators for each scenario or hypothesis. For example, consider indicators of an opponent's preparations for a military attack where there may be three hypotheses—no attack, attack, and feigned intent to attack with the goal of forcing a favorable negotiated solution. Almost all indicators of an imminent attack are also consistent with the hypothesis of a feigned attack. The analyst must identify indicators capable of diagnosing the difference between true intent to attack and feigned intent to attack. The mobilization of reserves is such a diagnostic indicator. It is so costly that it is not usually undertaken unless there is a strong presumption that the reserves will be needed.

After creating the indicator list or lists, the analyst or analytic team should regularly review incoming reporting and note any changes in the indicators. To the extent possible, the analyst or the team should decide well in advance which critical indicators, if observed, will serve as early-warning decision points. In other words, if a certain indicator or set of indicators is observed, it will trigger a report advising of some modification in the analysts' appraisal of the situation.

Techniques for increasing the sophistication and credibility of an indicator list include the following:

- Establishing a scale for rating each indicator.
- Providing specific definitions of each indicator.
- Rating the indicators on a scheduled basis (e.g., monthly, quarterly, annually).
- Assigning a level of confidence to each rating.
- Providing a narrative description for each point on the rating scale, describing what one would expect to observe at that level.
- Listing the sources of information used in generating the rating.

Figure 9.11.3c is an example of a complex indicators chart that incorporates the first three techniques listed above.



Description

Figure 9.11.3C Zambria Political Instability Indicators

Potential Pitfalls

The quality of indicators is critical, as poor indicators lead to analytic failure. For these reasons, analysts must periodically review the validity and relevance of an indicator list. Narrowly conceived or outdated indicators can reinforce analytic bias, encourage analysts to discard new evidence, and lull consumers of information inappropriately. Indicators can also prove to be invalid over time, or they may turn out to be poor “pointers” to what they were supposed to show. By regularly checking the validity of the indicators, analysts may also discover that their original assumptions were flawed. Finally, if an opponent learns what indicators are on your list, the opponent may make operational changes to conceal what you are looking for or arrange for you to see contrary indicators.

Relationship to Other Techniques

Indicators are closely related to many other techniques. Some form of brainstorming is commonly used to draw upon the expertise of various analysts to create indicators reflecting different perspectives and different specialties. The development of alternative scenarios should always involve the development and monitoring of indicators that point toward a given scenario unfolding or evolving. What If? Analysis and High Impact/Low Probability Analysis depend upon the development and use of indicators. Indicators are often entered as items of relevant information in Analysis of Competing Hypotheses, as discussed in chapter 7.

Origins of These Techniques

The identification and monitoring of indicators of military attack is one of the oldest forms of intelligence analysis. The discussion here is based on Randolph H. Pherson and John Pyrik, *Analyst's Guide to Indicators* (Tysons, VA: Pherson Associates, LLC, 2018), and Randolph H. Pherson, *Handbook of Analytic Tools and Techniques*, 5th ed. (Tysons, VA: Pherson Associates, LLC, 2019). Cynthia M. Grabo's book *Anticipating Surprise: Analysis for Strategic Warning* (Lanham, MD: University Press of America, 2004) is a classic text on the development and use of indicators. A useful compendium of violent extremist mobilization indicators published by the U.S. Director of National Intelligence (DNI) describes indicators in terms of four criteria: diagnosticity, category of behavior, observability, and time sensitivity. See *Homegrown Violent Extremist Mobilization Indicators*, 2019 edition, accessible at https://www.dni.gov/index.php/nctc-newsroom/nctc-resources/item/1945-homegrown-violent-extremist-mobilization-indicators-2019.

The Indicators Evaluation methodology was developed by Randolph Pherson, Grace Scarborough, Alan Schwartz, and Sarah Beebe, Pherson Associates, LLC. It was first published as the Indicators Validator® in Randolph H. Pherson, *Handbook of Analytic Tools and Techniques*, 3rd ed. (Reston, VA: Pherson Associates, LLC, 2008).

NOTES

1. Peter Schwartz, *The Art of the Long View: Planning for the Future in an Uncertain World* (New York: Doubleday, 1991).

2. See, for example, Brian Nichiporuk, *Alternative Futures and Army Force Planning: Implications for the Future Force Era* (Santa Monica, CA: RAND Corporation, 2005).

3. A comprehensive review of how to generate, validate, and evaluate the diagnosticity of indicators can be found in Randolph H. Pherson and John Pyrik, *Analyst's Guide to Indicators* (Tysons, VA: Pherson Associates LLC, 2018).

4. Randolph H. Pherson, "Leveraging the Future with Foresight Analysis," *The International Journal of Intelligence, Security, and Public Affairs* 20, no. 2 (Fall 2018).

5. Peter Gijsbert de Werd, "Critical Intelligence: Analysis by Contrasting Narratives, Identifying and Analyzing the Most Relevant Truths" (PhD diss., Utrecht University, 2018), https://dspace.library.uu.nl/bitstream/handle/1874/373430/deWerd.pdf?sequence=1&isAllowed=y.

6. A fuller description of individual and group brainstorming techniques can be found in Randolph H. Pherson, *Handbook of Analytic Tools and Techniques*, 5th ed. (Tysons, VA: Pherson Associates LLC, 2019), 10–11.

7. The description of the Cone of Plausibility is taken from two government publications: (1) *Quick Wins for Busy Analysts, DI Futures and Analytic Methods (DI FAM)*, Professional Head of Defence Intelligence Analysis, United Kingdom Ministry of Defence, and (2) Gudmund Thompson, *Aide Memoire on Intelligence Analysis Tradecraft,* Version 4.02, Chief of Defence Intelligence, Director General of Intelligence Production, Canada. These sources are used

with the permission of the UK and Canadian governments, respectively.

8. STEEP stands for **S**ocial, **T**echnological, **E**conomic, **E**nvironmental, and **P**olitical; STEEP + 2 adds Psychological and Military; STEEPLE adds **L**egal and **E**thics to the original STEEP list; STEEPLED further adds **D**emographics; and PESTLE stands for **P**olitical, **E**conomic, **S**ocial, **T**echnological, **L**egal, and **E**nvironmental.

9. This description of Counterfactual Reasoning is drawn largely from Noel Hendrickson, *Reasoning for Intelligence Analysis* (Lanham, MD: Rowman & Littlefield, 2018), as well as his earlier "Counterfactual Reasoning: A Basic Guide for Analysts, Strategists, and Decision Makers," *The Proteus Monograph Series* 2, no. 5 (October 2008).

10. N. J. Roese and J. M. Olson, eds., *What Might Have Been: The Social Psychology of Counterfactual Thinking* (Hillsdale, NJ: Lawrence Erlbaum Associates, 1995).

11. D. Kahneman and A. Tversky, "The Simulation Heuristic," in *Judgment under Uncertainty: Heuristics and Biases*, eds. D. Kahneman, P. Slovic, and A. Tversky (New York: Cambridge University Press, 1982).

12. Noel Hendrickson, "Critical Thinking in Intelligence Analysis," *International Journal for Intelligence and Counterintelligence* 21, no. 4 (September 2008).

13. This discussion of Analysis by Contrasting Narratives is taken from de Werd's "Critical Intelligence."

14. Ibid, 15.

15. Ibid.

16. A robust discussion of the processes analysts use to generate, validate, and evaluate the diagnosticity of indicators can be found in Pherson and Pyrik, *Analyst's Guide to Indicators*.

17. A shorter description of Indicators Generation, Validation, and Evaluation can be found in Pherson, *Handbook of Analytic Tools and Techniques*, 5th ed., 48–50.

18. See J. L. Mackie, "Causes and Conditions," *American Philosophical Quarterly* 2, no. 4 (October 1965), 245–264.

Descriptions of Images and Figures

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1 to 4 years. Simple situation: Brainstorming, reversing, and assumptions. Complex situation: Simple scenarios, cone of plausibility, and morphological analysis. Primary objective: Avoiding surprises. Anticipating the unanticipated.

5 to 10 years. Simple situation: Alternative futures analysis, and what if analysis. Complex situation: Multiple scenarios, generation, foresight quadrant, crunching trademarked, and analysis by contrasting narratives and counterfactual reasoning. Primary objective: Mapping the future. Finding opportunities.

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The present drivers and assumptions lead to the multiple scenarios after a period of stable regime. The drivers and their corresponding assumptions are as follows. Economy: Growth likely 2 to 5 percent. Popular support: Slowly eroding. Civil-Military relations: Growing tensions. Regional relations: Peaceful and stable. Foreign relations: Substantial. The scenarios are as follows. Plausible Scenario 1: More inclusive policies and sound economic decisions bring stability. Baseline scenario. President under fire and struggling to retain control. Plausible scenario 2: Junior military officers stage successful coup. Wild-card scenario: War breaks out with neighbor as regime collapses.

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The effectiveness of the government is fully operational and marginalized. The strength of the civil society is nonexistent and robust. Fully operational and nonexistent: Keeping it all together. Fully operational and robust: Competing power centers. Marginalized and nonexistent: Glueless in Havana. Marginalized and robust: Drifting toward democracy.

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A. The role of neighboring states, example, Syria, Iran. B. The capability of Iraq’s security forces, such as military and police. C. The political environment in Iraq. In the first scenario, the key drivers are A and B. In the second scenario, the key drivers are A and C. In the third scenario, the key drivers are B and C.

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The key definers are Iraqi security capability, which are ineffective and effective, and the helpfulness of neighbors, which are stable and supportive, and unstable or disruptive. Neighboring states are stable and supportive and ineffective security capability: Regional defensive umbrella secures borders. Insurgency is pure Sunni, internal political solution? Neighboring states are stable and supportive and effective security capability: Militias integrated into new Iraqi Army. Jordan brokers deal; economic aid to Sunnis. Neighboring states are unstable or disruptive and ineffective security capability: Syria collapses, influx of new fighters. Civil wars. Neighboring states are unstable or disruptive and effective security capability: Insurgency fragments. Refugees flow into Iraq seeking safe haven.

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A. The role of neighboring states, example, Syria, Iran. B. The capability of Iraq’s security forces, such as military and police. C. The political environment in Iraq. In the first scenario, the key drivers are A and B. The Civil War is the nightmare scenario in the third quadrant. In the second scenario, the key drivers are A and C. Sunni politics in the second quadrant deserve the most attention. In the third scenario, the key drivers are B and C. New fighters in the third column deserve the most attention.

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The dimensions are group, type of attack, target, and impact. The first option is an outside group planning multiple attacks on the treatment plant for disrupting economy. The second option is an insider group planning a single type of attack on the drinking water for terrorizing the population. The third option is a visitor group planning a threatening type of attack on wastewater to cause major casualties.

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Convergent scenario for X changes to divergent scenario for Y due to ripple effects, or possible change X, if, is the consequence Y, then. Convergent scenario is the break with prior history. Divergent scenario is he continuation to failure. Counterfactual: If X were to occur, then Y would or might occur. Stage 1. Convergent scenario development. Ask, “When and where might this change plausibly come about?” Assess the causes of the change and develop the story’s beginning. Stage 2. Ripple Effect Analysis. Ask, “When and where might this change cause broader uncertainties and unintended consequences? Asses the context of the change or new uncertainties and develop the story’s middle. Stage 3. Divergent Scenario Development. Ask, “When and where might this change have long-term impact?” Assess the consequences of the change and develop the story’s end.

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A tabular representation of Zambria Political Instability Indicators lists the five main indicators, with sub-indicators, and their corresponding concerns for the first, second, third, and fourth quarters of 2008 and 2009 and the first and second quarters of 2010.

		2008				**2009**	
		First Quarter	**Second Quarter**	**Third Quarter**	**Fourth Quarter**	**First Quarter**	**Second Quarter**
Social change or conflict	Ethnic or religious discontent	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
	Demonstrations, riots, strikes	Negligible	Negligible	Low	Low	Low	Moderate
Economic factors	General deterioration	Low	Low	Moderate	Moderate	Moderate	Low
	Decreased access to foreign funds	Low	Moderate	Low	Low	Low	Low
	Capital flight	Low	Low	Low	Moderate	Moderate	Low

		2008				2009	
		First Quarter	**Second Quarter**	**Third Quarter**	**Fourth Quarter**	**First Quarter**	**Second Quarter**
	Unpopular changes in economic policies	Low	Low	Low	Low	Strong	Strong
	Food or energy shortages	Low	Low	Low	Low	Moderate	Substantial
	Inflation	Low	Low	Moderate	Low	Low	Moderate
Opposition activities	Organizational capabilities	Low	Negligible	Negligible	Negligible	Negligible	Negligible
	Opposition or conspiracy planning	Low	Low	Low	Low	Low	Low
	Terrorism and sabotage	Low	Low	Low	Low	Low	Low
	Insurgent armed attacks	Low	Low	Low	Low	Low	Low
	Public support	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
Military attitude or activities	Threat to corporate military interests or dignity	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
	Discontent over career loss, pay, or benefits	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible

		2008				2009	
		First Quarter	**Second Quarter**	**Third Quarter**	**Fourth Quarter**	**First Quarter**	**Second Quarter**
	Discontent over government action or policies	Low	Low	Low	Low	Low	Low
	Reports or rumors of coup plotting	Low	Low	Low	Low	Low	Low
	External support for government	Low	Low	Low	Low	Low	Low
	External support for opposition	Low	Low	Low	Low	Low	Low
	Threat of military conflict	Low	Low	Low	Negligible	Negligible	Negligible
Regime actions or capabilities	Repression or brutality	Moderate	Low	Moderate	Moderate	Moderate	Moderate
	Security capabilities	Negligible	Negligible	Negligible	Negligible	Low	Low
	Political disunity or loss of confidence	Low	Low	Low	Low	Low	Low
	Loss of legitimacy	Substantial	Moderate	Moderate	Moderate	Moderate	Moderate

CHAPTER 10 DECISION SUPPORT TECHNIQUES

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10.2 Bowtie Analysis [314 **]**

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10.9 Pros-Cons-Faults-and-Fixes [336 **]**

10.10 Complexity Manager [339 **]**

Managers, commanders, planners, and other decision makers all make choices or trade-offs among competing goals, values, or preferences. Because of limitations in human short-term memory, we usually cannot keep all the pros and cons of multiple options in mind at the same time. That causes us to focus first on one set of problems or opportunities and then another. This often leads to vacillation or procrastination in making a firm decision. Some Decision Support Techniques help overcome this cognitive limitation by laying out all the options and interrelationships in graphic form so that analysts can test the results of alternative options while keeping the problem as a whole in view. Other techniques help decision makers untangle the complexity of a situation or define the

opportunities and constraints in the environment in which the choice needs to be made.

> *The role of the analyst in the policymaking process is similar to that of the scout in relation to the football coach. The job of the scout is not to predict in advance the final score of the game, but to assess the strengths and weaknesses of the opponent so that the coach can devise a winning game plan. Then the scout sits in a booth with powerful binoculars, to report on specific vulnerabilities the coach can exploit.*
>
> —Douglas MacEachin, CIA Deputy Director for Intelligence, 1993–1995

It is usually not the analyst's job to make the choices or decide on the trade-offs, but analysts can and should use Decision Support Techniques to provide timely support to managers and decision makers who must make these choices. To engage in this type of client support, analysts must be aware of the operating environment of decision makers and anticipate how they are likely to approach an issue. Analysts also need to understand the dynamics of the decision-making process to recognize when and how they can be most useful. Most of the decision support techniques described here are used in both government and industry.

By using such techniques, analysts can see a problem from the decision maker's perspective. They can use these techniques without overstepping the limits of their role as analysts because the technique does not make the decision; it just structures all the relevant information in a format that makes it easier for the decision maker to make a choice.

The decision aids described in this chapter provide a framework for analyzing why or how a leader, group, organization, company, or country has made, or is likely to make, a decision. If analysts can describe an adversary's or a competitor's goals and preferences, it

will be easier to anticipate their actions. Similarly, when the decisions are known, the technique makes it easier to infer the adversary's or competitor's goals and preferences. Analysts can use these Decision Support Techniques to help the decision maker frame a problem instead of trying to predict the decision of a foreign government or competitor. Often, the best support an analyst can provide is to describe the forces that are most likely to shape a decision or an outcome. Knowledge of these key drivers then gives the decision maker a "head start" in trying to leverage the eventual outcome. (See chapter 9 for a discussion of Foresight Techniques.)

Caution is in order, however, whenever one attempts to predict or explain another person's decision, even if the person is of similar background. People do not always act rationally or in their own best interests. Their decisions are influenced by emotions and habits as well as by what others might think and values of which others may not be aware.

The same is true of organizations, companies, and governments. One of the most common analytic errors is to assume that an organization, company, or government will act rationally or in its own best interests. All intelligence analysts seeking to understand the behavior of another country should be familiar with Graham Allison's analysis of U.S. and Soviet decision making during the Cuban missile crisis.[1] It documents three different models for how governments make decisions—bureaucratic bargaining processes, standard organizational procedures, and the rational actor model.

Even if an organization, company, or government is making a rational decision, analysts may get their analysis wrong. Foreign entities typically view their own best interests quite differently from the way analysts from different cultures, countries, or backgrounds would see them. Also, organizations, companies, and governments do not always have a clear understanding of their own best interests, and often must manage a variety of conflicting interests.

Decision making and decision analysis are large and diverse fields of study and research. The decision support techniques described in this chapter are only a small sample of what is available, but they do meet many of the basic requirements for intelligence and competitive analysis.

By providing structure to the decision-making process, the Decision Support Techniques discussed in this chapter help analysts as well as decision makers avoid the common cognitive limitations of Premature Closure and Groupthink. Application of the techniques will often surface new options or demonstrate that a previously favored option is less optimal than originally thought. The natural tendency toward Mirror Imaging is more likely to be kept in check when using these techniques because they provide multiple perspectives for viewing a problem and envisioning the interplay of complex factors.

Decision Support Techniques help analysts overcome several practitioner's mental mistakes including the intuitive trap of Overrating Behavioral Factors when the role of internal determinants of behavior (personality, attitudes, beliefs) are given more weight than external or situational factors (constraints, forces, incentives). They also help counter the traps of overestimating the probability of multiple independent events occurring for an event or attack to take place (Overestimating Probability) and failing to factor something into the analysis because an appropriate category or "bin" is lacking (Lacking Sufficient Bins).

Techniques such as the Opportunities Incubator™, Bowtie Analysis, and Impact Matrix help decision makers decide how to implement the key findings of a Foresight analysis to either mitigate the impact of a bad scenario or increase the chances of a good scenario occurring. SWOT Analysis (Strengths, Weaknesses, Opportunities, and Threats) and Critical Path Analysis are basic tools of the competitive analysis profession. Decision Trees and the Decision Matrix use simple math to help analysts and decision makers calculate the most probable or preferred outcomes. Force Field Analysis, Pros-Cons-Faults-and-Fixes, and the Complexity Manager

can help decision makers understand the overarching context of a problem and identify the key forces and factors at play.

OVERVIEW OF TECHNIQUES

Opportunities Incubator™. A systematic method for identifying actions that can facilitate the emergence of positive scenarios and thwart or mitigate less desirable outcomes.

Bowtie Analysis. A technique for mapping causes and consequences of a disruptive event. It is particularly effective in identifying opportunities for decision makers to avoid undesirable developments and promote positive outcomes.

Impact Matrix. A management tool for assessing the impact of a decision on the organization by evaluating what impact a decision is likely to have on all key actors or participants in that decision. It gives the analyst or decision maker a better sense of how the issue is most likely to play out or be resolved in the future.

SWOT Analysis (Strengths, Weaknesses, Opportunities, and Threats). A 2-×-2 matrix used to develop a plan or strategy to accomplish a specific goal. In using this technique, the analyst first lists the Strengths and Weaknesses in the organization's ability to achieve a goal, and then balances them against lists of Opportunities and Threats in the external environment that would either help or hinder the organization from reaching the goal.

Critical Path Analysis. A modeling technique for identifying the critical stages required to move from a beginning to an end. It also is used for scheduling a set of project activities commonly used in conjunction with Program Evaluation and Review Technique (PERT) charts.

Decision Trees. A simple way to chart the range of options available to a decision maker, estimate the probability of each option, and show possible outcomes. The technique provides a useful landscape to organize a discussion and weigh alternatives but can also oversimplify a problem.

Decision Matrix. A simple but powerful device for making trade-offs between conflicting goals or preferences. An analyst lists the decision options or possible choices, the criteria for judging the options, the weights assigned to each of these criteria, and an evaluation of the extent to which each option satisfies each of the criteria. This process will show the best choice—based on the values the analyst or a decision maker puts into the matrix. By studying the matrix, one can also analyze how the best choice would change if the values assigned to the selection criteria were changed or if the ability of an option to satisfy a specific criterion were changed. It is almost impossible for an analyst to keep track of these factors effectively without such a matrix, as one cannot keep all the pros and cons in working memory at the same time. A Decision Matrix helps the analyst see the whole picture.

Force Field Analysis. A technique that analysts can use to help the decision maker identify the most effective ways to solve a problem or achieve a goal—and whether it is possible to do so. The analyst identifies and assigns weights to the relative importance of all the factors or forces that either help or hinder a solution to the problem or achievement of the goal. After organizing all these factors in two lists, pro and con, with a weighted value for each factor, the analyst or decision maker is in a better position to recommend strategies that would be most effective in either strengthening the impact of the driving forces or reducing the impact of the restraining forces.

Pros-Cons-Faults-and-Fixes. A strategy for critiquing new policy ideas. It is intended to offset the human tendency of analysts and decision makers to jump to conclusions before conducting a full analysis of a problem, as often happens in group meetings. The first step is for the analyst or the project team to make lists of Pros and Cons. If the analyst or team is concerned that people are being unduly negative about an idea, he or she looks for ways to “Fix” the Cons—that is, to explain why the Cons are unimportant or even to transform them into Pros. If concerned that people are jumping on the bandwagon too quickly, the analyst tries to “Fault” the Pros by exploring how they could go wrong. Usually, the analyst will either

“Fix” the Cons or “Fault” the Pros, but will not do both. Of the various techniques described in this chapter, this is one of the easiest and quickest to use.

Complexity Manager. A simplified approach to understanding complex systems—the kind of systems in which many variables are related to each other and may be changing over time. Government policy decisions are often aimed at changing a dynamically complex system. It is because of this dynamic complexity that many policies fail to meet their goals or have unforeseen and unintended consequences. Use the Complexity Manager to assess the chances for success or failure of a new or proposed policy, identify opportunities for influencing the outcome of any situation, determine what would need to change in order to achieve a specified goal, or recognize the potential for unintended consequences from the pursuit of a policy goal.

10.1 OPPORTUNITIES INCUBATOR™

The Opportunities Incubator™ is a systematic method for identifying actions that can facilitate positive outcomes and thwart or mitigate less desirable outcomes.

When to Use It

The technique is most useful for assisting decision makers when they are preparing for change or they want to shape how change will occur.

Value Added

The Opportunities Incubator™ helps senior officials and decision makers identify what actions would be most effective in preventing a negative scenario from occurring or fostering the emergence of a good scenario. The tool focuses attention on who is most affected by a given scenario and who has the capability and intent to influence an outcome.

The technique is helpful in mitigating the deleterious impact of cognitive biases such as Mirror Imaging, providing quick and easy answers to complex challenges (Mental Shotgun), and judging the desirability of a potential course of action by the ease with which the policy option comes to mind (Availability Heuristic). It also helps analysts avoid the pitfalls of failing to incorporate a policy option into an action plan because the analyst lacks a category or “bin” for such an option (Lacking Sufficient Bins), overestimating the probable impact of multiple independent actions occurring (Overestimating Probability), and giving too much credit to the role of behavioral factors (personality, attitudes, beliefs) and underestimating the impact of situational factors (constraints, time, incentives) on accomplishing a stated objective (Overrating Behavioral Factors).

The Method

After developing a set of scenarios, assess each scenario separately using the following steps (see Figure 10.1):

- Describe the scenario, projected trajectory, or anticipated outcome in one sentence.
- Determine your client's perception of the scenario, projected trajectory, or anticipated outcome. Use the following scale: Strongly Positive, Positive, Neutral, Negative, Strongly Negative.
- Identify the primary actors in the scenario who have a stake in the projected trajectory or anticipated outcome.
- Assess how much each actor might care about the scenario's projected outcome because of its positive or negative (perceived or real) impact on the actor's livelihood, status, prospects, and so forth. This assessment considers how motivated the actor may be to act, not whether the actor is likely to act or not. Use the scale: Very Desirable (DD), Desirable (D), Neutral (N), Undesirable (U), Very Undesirable (UU).
- Assess each actor's capability or resources to respond to the scenario using a High, Medium, or Low scale.
- Assess each actor's likely intent to respond to the scenario using a High, Medium, or Low scale.
- Identify the actors who should receive the most attention based on the following tiers:
    - 1st: DD or UU Level of Interest rating plus High ratings in both Capability and Intent
    - 2nd: High ratings in Capability and Intent
    - 3rd: DD or UU Level of Interest rating plus a High rating in either Capability or Intent
    - 4th: High rating in either Capability or Intent
    - 5th: All other actors
- Reorder the rows in the matrix so that the actors are listed from first to fifth tiers.
- Record the two to three key drivers that would most likely influence or affect each actor or the actor's response.
- Consider your client's perception and determine how and when he or she might act to influence favorably, counteract, or deter an actor's response. From this discussion, develop a list of possible actions the client can take.

Scenario: _____

Client Perception: _____

Actor Assessment						Client Strategy
Primary Actor	Level of Interest	Capability	Intent	Priority Tier	Driver(s)	
		H/M/L	H/M/L	1–5		

Preference Legend: DD = Very Desirable; D = Desirable; N = Neutral; U = Undesirable; UU = Very Undesirable

Figure 10.1 Opportunities Incubator™

Source: Globalytica, LLC, 2019.

Origins of This Technique

The Opportunities Incubator™ was developed by Globalytica, LLC, to provide a structured process decision makers can use to implement the key findings of a Foresight exercise. This technique and the Impact Matrix are the most common decision support tools used to conclude a Foresight exercise.

10.2 BOWTIE ANALYSIS

Bowtie Analysis is a technique for mapping causes and consequences of a disruptive event to facilitate the management of both risks and opportunities.

The technique was first developed for the oil and gas industry but has evolved into a generic method for assisting decision makers in proactively managing potential hazards and anticipated opportunities. Analysts can use the method to enhance their understanding of causal relationships through mapping both anticipatory and reactive responses to a disruptive event.

The Bowtie's logical flow can make the analysis of risks and opportunities more rapid and efficient. The graphical "bowtie" display also makes it easier for analysts to communicate the interaction and relative significance of causes and consequences of a disruptive event, whether it presents a hazard or an opportunity.

When to Use It

Bowtie Analysis is used when an organization needs to thoroughly examine its responses to a potential or anticipated disruptive event. Traditionally, industry has used it to establish more control over a potential hazard and improve industrial safety, but it is also useful in identifying a potential opportunity. Bowtie Analysis helps analysts and decision makers understand the causal relationships among seemingly independent events. Decision makers can use the technique to do the following:

- Evaluate their ability to control the occurrence of a risk event by identifying both measures to prevent the event from happening and responses for mitigating the harm it would do.
- Explore ways to ensure good things happen and accelerate the timing and benefits of a positive event.

In both cases, the process helps analysts and decision makers recognize weaknesses and strengths in the risk prevention structures and strategic planning processes of an adversary or their organization. It can also be a part of a lessons-learned process to assess why something happened in the past and identify opportunities that can be leveraged in the future.

Value Added

Bowtie Analysis forces a thorough assessment of causes and consequences of a disruptive event. It is adaptable to almost any organization and scalable for any level of risk or opportunity. The technique can be used either to evaluate possible causes and consequences of a risk or opportunity event or to investigate an organization's overall risk and profitability management system. It can also pinpoint elements of an organization's risk management system that need further development.

The method first evaluates the ability of an organization to prevent or control the occurrence of a risk event—or anticipate the emergence of an opportunity. If there is the potential for control, then the technique identifies the steps that can be taken to exercise that control. If there is little ability to control, then the method evaluates the potential impact of the event and describes what steps should be taken to mitigate the resulting damage. Similarly, Bowtie Analysis can help develop strategies for taking advantage of an upcoming event to optimize positive benefits for the organization.

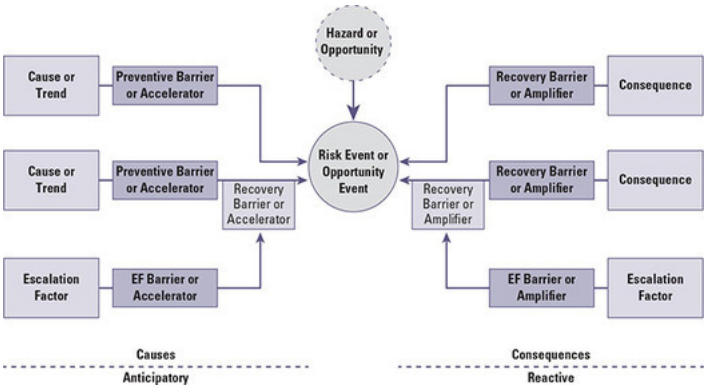
Bowtie graphics are an effective mechanism for conveying a risk or opportunity landscape because of their visual and logically flowing presentation. They are quickly understood and conducive to manipulation by decision makers as they consider options and construct strategies to either mitigate harm or capitalize on the potential for gain.

As with opportunities analysis, the technique is helpful in mitigating the impact of Mental Shotgun, the Availability Heuristic, and Satisficing, which is selecting the first answer that appears "good enough." The technique also helps counter the intuitive traps of Lacking Sufficient Bins, Overrating Behavioral Factors, and Assuming a Single Solution.

The Method

A Bowtie Analysis is conducted using the following steps (see Figure 10.2):

- **Risk or Opportunity Event.** Identify a hazard (something in or around the organization of a decision maker that has the potential to cause damage) or an opportunity (something that has the potential to bring positive benefits to the organization). If no specific hazard or opportunity comes readily to mind, begin by brainstorming ideas, then choose the one with the greatest potential for good or ill. Determine a possible event caused by the hazard or opportunity. This event is the Risk or Opportunity Event. It represents either a loss of control of the hazard or a favorable outcome of an opportunity. The event may be unprecedented, or it may have already occurred, in which case the organization can look to the past for root causes.



Description

Figure 10.2 Bowtie Analysis

- **Causes.** Make a list of threats or trends, placing them on the left and drawing connecting lines from each to the centered Risk/Opportunity Event. Threats/trends are potential causes of the Risk/Opportunity Event. Be specific (i.e., “weather conditions” can be specified as “slippery road conditions”) so that actionable preventive barriers in the case of threats, or accelerators for positive trends, can be created in a later step.

- **Consequences.** Make a similar list of consequences, placing them on the right and drawing connecting lines from each to the centered Risk/Opportunity Event. Consequences are results from the event. Continue to be specific. This will aid in identifying relevant recovery barriers or distributors to the consequences in a later step.

- **Preventive Barriers or Accelerators.** Focus on the causes on the left of the Bowtie. If the causes are threats, brainstorm barriers that would stop the threats from leading to the Risk Event. If the causes are trends, brainstorm accelerators that would quicken the occurrence of the Opportunity Event.

- **Recovery Barriers or Amplifiers.** Similarly, focus on the consequences on the right of the Bowtie. If the consequences are undesired, brainstorm barriers that would stop the Risk Event from leading to the worst-case consequences. If the consequences are desired, brainstorm amplifiers that would capitalize on the effects of the Opportunity Event.

- **Escalation Factor.** Brainstorm escalation factors and connect each to a barrier, accelerator, or amplifier. An escalation factor (EF) is anything that may cause a barrier to fail (e.g., “forgetting to

wear a seatbelt" is an escalation factor for a Risk Event because it impairs the effectiveness of the "wearing a seatbelt" recovery barrier) or enhances the positive effects of an accelerator or distributor (e.g., "getting all green lights" is an escalation factor for an Opportunity Event because it increases the effectiveness of the amplifier "going the maximum speed limit"). An escalation factor barrier stops or mitigates the impact of the escalation factor and its effects, while an escalation factor accelerator or amplifier intensifies the escalation factor and its effects.

Potential Pitfalls

Specificity is necessary to create actionable barriers, accelerators, and amplifiers in a Bowtie Analysis. However, a detailed Bowtie Analysis can present the impression that the authors have thought of all options or outcomes when they actually have not, as unanticipated options are often available to decision makers and unintended consequences result.

Relationship to Other Techniques

The Bowtie method is like Decision Tree analysis because both methods analyze chains of events to illustrate possible future actions. Bowtie Analysis also evaluates controls, or barriers, that an organization has in place. The Opportunities Incubator™ is another technique that can be used to facilitate positive outcomes and thwart or mitigate less desirable outcomes. It structures the process decision makers can use to develop strategies for leveraging or mitigating the impact of key drivers that influence primary actors, who are associated with differing levels of intent and capability.

Origins of This Technique

The University of Queensland, Australia, is credited with disseminating the first Bowtie diagrams at a lecture on hazard analysis in 1979. After the Piper Alpha offshore oil and gas platform explosion in 1988, the oil and gas industry adopted the technique to develop a systematic way of understanding the causal relationships among seemingly independent events and asserting control over the potentially lethal hazards in the industry. The versatile Bowtie Analysis technique is now in widespread use throughout a variety of industries, including chemicals, aviation, and health care. It is also used by several intelligence services. Additional resources on Bowtie Analysis can be found at https://www.cgerisk.com/knowledgebase/The_bowtie_method.

10.3 IMPACT MATRIX

The Impact Matrix identifies the key actors involved in a decision, their level of interest in the issue, and the impact of the decision on them. It is a technique managers use to gain a better sense of how well or how poorly a decision may be received, how it is most likely to play out, and what would be the most effective strategies to resolve a problem. Analysts can also use it to anticipate how decisions will be made in another organization or by a foreign leader.

When to Use It

The best time for a manager to use this technique is when a major new policy initiative is being contemplated or a mandated change is about to be announced. The technique helps managers identify where they are most likely to encounter both resistance and support. Intelligence analysts can also use the technique to assess how the public might react to a new policy pronouncement by a foreign government or a new doctrine posted on the internet by a political movement. Invariably, the technique will uncover new insights by focusing in a systematic way on all possible dimensions of the issue.

The matrix template makes the technique easy to use. Most often, an individual manager will apply the technique to develop a strategy for how he or she plans to implement a new policy or respond to a newly decreed mandate from superiors. Managers can also use the technique proactively before they announce a new policy or procedure. The technique can expose unanticipated pockets of resistance or support, as well as individuals to consult before the policy or procedure becomes public knowledge. A single intelligence analyst or manager can also use the technique, although it is usually more effective if done as a group process.

Value Added

The technique provides the user with a comprehensive framework for assessing whether a new policy or procedure will be met with resistance or support. A key concern is to identify any actor who will be heavily affected in a negative way. Those actors should be engaged early on or ideally before the policy is announced, in case they have ideas on how to make the new policy more digestible. At a minimum, they will appreciate that their views—either positive or negative—were sought out and considered. Support can be enlisted from those who will be strongly impacted in a positive way.

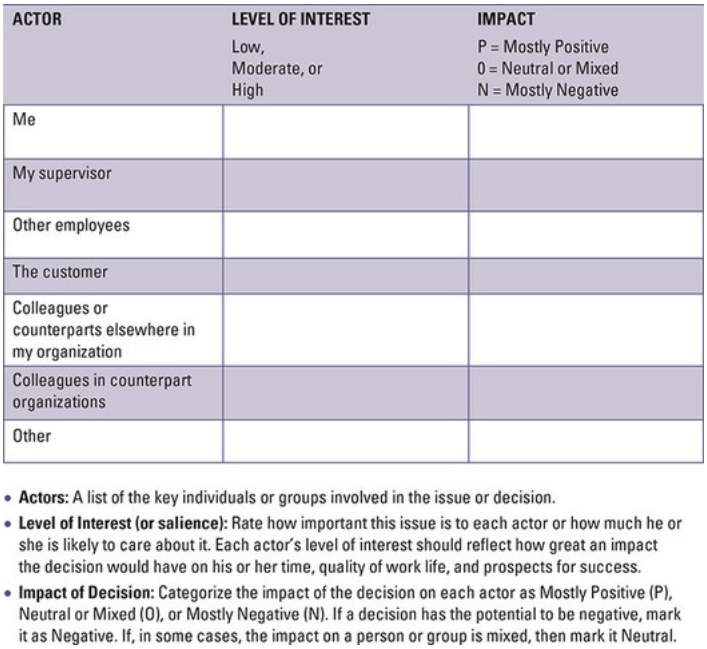
The Impact Matrix usually is most effective when used by a manager as he or she is developing a new policy. The matrix helps the manager identify who will be most affected, and he or she can consider whether this argues for either modifying the plan or modifying the strategy for announcing the plan.

The technique is helpful in reducing the impact of several of the most common cognitive biases and heuristics: Mirror Imaging, Mental Shotgun, and Groupthink. It also helps analysts avoid several common mental mindsets or intuitive traps, including Overrating Behavioral Factors, Lacking Sufficient Bins, and Overestimating Probability.

The Method

The Impact Matrix process involves the following steps (a template for using the Impact Matrix is provided in Figure 10.3):

- Identify all the individuals or groups involved in the decision or issue. The list should include me (usually the manager); my supervisor; my employees or subordinates; my client(s), colleagues, or counterparts in my office or agency; and counterparts in other agencies. If analyzing the decision-making process in another organization, the "me" becomes the decision maker.
- Rate how important this issue is to each actor or how much each actor is likely to care about it. Use a three-point scale: Low, Moderate, or High. The level of interest should reflect how great an impact the decision would have on such issues as each actor's time, quality of work life, and prospects for success.



ACTOR	LEVEL OF INTEREST Low, Moderate, or High	IMPACT P = Mostly Positive 0 = Neutral or Mixed N = Mostly Negative
Me		
My supervisor		
Other employees		
The customer		
Colleagues or counterparts elsewhere in my organization		
Colleagues in counterpart organizations		
Other		

- **Actors:** A list of the key individuals or groups involved in the issue or decision.
- **Level of Interest (or salience):** Rate how important this issue is to each actor or how much he or she is likely to care about it. Each actor's level of interest should reflect how great an impact the decision would have on his or her time, quality of work life, and prospects for success.
- **Impact of Decision:** Categorize the impact of the decision on each actor as Mostly Positive (P), Neutral or Mixed (O), or Mostly Negative (N). If a decision has the potential to be negative, mark it as Negative. If, in some cases, the impact on a person or group is mixed, then mark it Neutral.

Figure 10.3 Impact Matrix: Identifying Key Actors, Interests, and Impact

- Categorize the impact of the decision on each actor as Mostly Positive (P), Neutral or Mixed (O), or Mostly Negative (N). If a decision has the potential to be negative, mark it as negative. If in some cases the impact on a person or group is mixed, then either mark it as neutral or split the group into subgroups if specific subgroups can be identified.
- Review the matrix after completion and assess the likely overall reaction to the policy or decision.
- Develop an initial action plan.
- Identify where the decision is likely to have a major negative impact and consider the utility of prior consultations.
- Identify where the decision is likely to have a major positive impact and consider enlisting the support of key actors in helping make the decision or procedure work.

- Finalize the action plan reflecting input gained from consultations.
- Announce the decision and monitor reactions.
- Reassess the action plan based on feedback received on a periodic basis.

Origins of This Technique

The Impact Matrix was developed by Mary O'Sullivan and Randolph Pherson, Pherson Associates, LLC, and is taught in courses for mid-level managers in the government, law enforcement, and business.

10.4 SWOT ANALYSIS

SWOT Analysis is commonly used by all types of organizations to evaluate the **S**trengths, **W**eaknesses, **O**pportunities, and **T**hreats involved in any project or plan of action. The Strengths and Weaknesses are internal to the organization; Opportunities and Threats are characteristics of the external environment. It is a frequently used tool in competitive analysis.

When to Use It

After setting a goal or objective, use SWOT as a framework for collecting and organizing information in support of strategic planning and decision making to achieve the goal or objective. Information is collected to analyze the plan's Strengths and Weaknesses and the Opportunities and Threats present in the external environment that might affect attainment of the goal.

SWOT is easy to use. It is usually a group process, but a single analyst can also use it effectively. It is particularly effective as a cross-functional team-building exercise at the start of a new project. Businesses and organizations of all types use SWOT so frequently that a Google search on "SWOT Analysis" turns up more than one million hits.

Value Added

SWOT can generate useful information with relatively little effort. It brings information together in a framework that provides a good base for further analysis. It often points to specific actions that can or should be taken. Because the technique matches an organization's or plan's Strengths and Weaknesses against the Opportunities and Threats in the environment in which it operates, the plans or action recommendations that develop from the use of this technique are often highly practical.

SWOT helps analysts overcome, or at least reduce, the impact of seeking only the information that is consistent with the lead hypothesis, policy option, or business strategy (Confirmation Bias), accepting a given value of something as a proper starting point (Anchoring Effect), and Groupthink. It also helps analysts avoid the intuitive traps of Lacking Sufficient Bins, Overrating Behavioral Factors, and Overestimating Probability.

The Method

- Define the objective.
- Fill in the SWOT table by listing Strengths, Weaknesses, Opportunities, and Threats that are expected to facilitate or hinder achievement of the objective (see Figure 10.4). The significance of the attributes' and conditions' impact on achievement of the objective is far more important than the length of the list. It is often desirable to list the items in each quadrant in order of their significance or to assign them values on a scale of 1 to 5.
- Identify possible strategies for achieving the objective. This is done by asking the following questions:
    - How can we use each Strength?
    - How can we improve each Weakness?
    - How can we exploit each Opportunity?
    - How can we mitigate each Threat?

Strengths	Weaknesses
List attributes of the organization that are helpful in achieving the objective.	List attributes of the organization that are detrimental to achieving the objective.
Opportunities	*Threats*
List external conditions that are helpful to achieving the objective.	List external conditions that could be detrimental to achieving the objective.

Figure 10.4 SWOT Analysis

An alternative approach is to apply "matching and converting" techniques. Matching refers to matching Strengths with Opportunities to make the Strengths even stronger. Converting refers to matching Opportunities with Weaknesses to convert the Weaknesses into Strengths.

Potential Pitfalls

SWOT is simple, easy, and widely used, but it has limitations. It focuses on a single goal without weighing the costs and benefits of alternative means of achieving the same goal. In other words, SWOT is a useful technique if the analyst or group recognizes that it does not necessarily tell the full story of what decision should or will be made. There may be other equally good or better courses of action.

Another strategic planning technique, the TOWS Matrix, remedies one of the limitations of SWOT. The factors listed under **T**hreats, **O**pportunities, **W**eaknesses, and **S**trengths are combined to identify multiple alternative strategies that an organization might pursue.[2]

Relationship to Other Techniques

The factors listed in the Opportunities and Threats quadrants of a SWOT Analysis are the same as the outside or external factors the analyst seeks to identify during Outside-In Thinking (chapter 8). In that sense, there is some overlap between the two techniques.

Origins of This Technique

The SWOT technique was developed in the late 1960s at Stanford Research Institute as part of a decade-long research project on why corporate planning fails. It is the first part of a more comprehensive strategic planning program. It has been so heavily used over such a long period of time that several versions have evolved. Richards J. Heuer Jr. selected the version he believed the most appropriate for intelligence analysis. It comes from multiple internet sites, including the following: http://www.businessballs.com/swotanalysisfreetemplate.htm, http://en.wikipedia.org/wiki/SWOT_analysis, http://www.mindtools.com, http://www.valuebasedmanagement.net, and http://www.mycoted.com. Pros and cons for using this technique, along with interactive templates, can be found at https://www.mindtools.com/pages/article/newTMC_05.htm.

10.5 CRITICAL PATH ANALYSIS

Critical Path Analysis is a modeling technique for identifying the critical stages required to move from a beginning to an end point.

When to Use It

Critical Path Analysis is used for scheduling a set of project activities often in conjunction with **P**rogram **E**valuation and **R**eview **T**echnique (PERT) charts.

Value Added

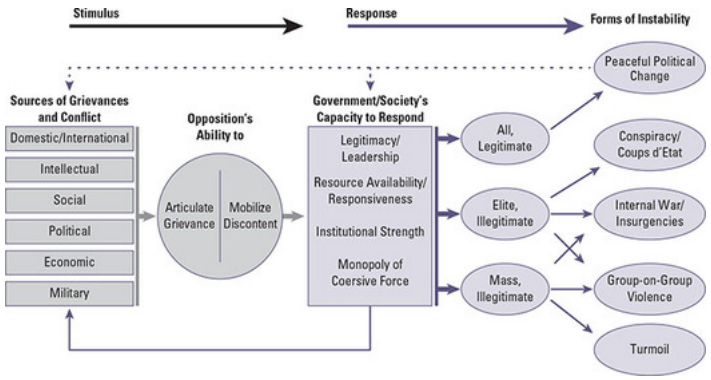
Critical Path Analysis uses a model to show the logical progression of events, the key nodes (or intersections) in the process, and the routes taken in getting from one state to others. Figure 10.5 provides an example of Critical Path Analysis used to describe how a country could move from a relatively stable state to different forms of political instability.

Critical Path Analysis can assist analysts in reducing the influence of several cognitive biases and heuristics, including Satisficing, the Availability Heuristic, and Premature Closure. It also helps analysts resist the intuitive traps of Overinterpreting Small Samples, Relying on First Impressions, and Projecting Past Experiences.

More detailed project models show the various paths of critical activities required to achieve a planned end point of a project. These models can be used to calculate the earliest, most feasible time each step of the process can commence and the latest time it needs to be concluded to avoid making the project longer. The process allows the analyst to determine which activities are critical to achieving the outcome in the minimal amount of time possible and which can be delayed without causing the time frame to be extended. A project can have several parallel critical or near critical paths.

The Method

- **Define the task.** Define the end point of the project.
- **Define the activities involved.** List all the components or activities required to bring the project to completion.
- **Calculate the time to do each task.** Indicate the amount of time (duration) it will take to perform the activity. This can be a set amount of time or a range from shortest to longest expected time.
- **Identify dependencies.** Determine which activities are dependent on other activities and the sequences that must be followed.
- **Identify pathways.** Identify various ways or combinations of activities that would enable accomplishment of the project.
- **Estimate time to complete.** Calculate how much time would be required for each path taken. This could be a set amount of time or a range.



Description

Figure 10.5 Political Instability Critical Path Analysis

- **Identify the optimal pathway.** Rank order the various pathways in terms of time required and select the pathway that requires the least amount of time. Identify which activities are critical to achieving this goal.
- **Identify key indicators.** Formulate expectations (theories) about potential indicators at each stage that could either expedite or impede progress toward achieving the end point of the project.
- **Generate a final product.** Capture all the data in a final chart and distribute it to all participants for comment.

Given the complexity of many projects, software is often used for project management and tracking. Microsoft Project is purposely built for this task. There are also free charting tools like yEd that are serviceable alternatives. Using this process, analysts can better recognize important nodes and associated key indicators.

10.6 DECISION TREES

Decision Trees establish chains of decisions and/or events that illustrate a comprehensive range of possible future decision points. They paint a landscape for the decision maker showing the range of options available, the estimated value or probability of each option, and the likely implications or outcomes of choosing each option.

When to Use It

Decision Trees can be used to do the following:

- Aid decision making by explicitly comparing options.
- Create a heuristic model of the decision-making process of the subject or adversary.
- Map multiple competing hypotheses about an array of possible actions.

A Decision Tree can help a decision maker resolve a difficult problem, or assess what options an adversary or competitor might choose to implement. In constructing a Decision Tree, analysts need to have a rich understanding of the operating environment in which the decision is being made. This can include knowledge of motives, capabilities, sensitivities to risk, current doctrine, and cultural norms and values.

Value Added

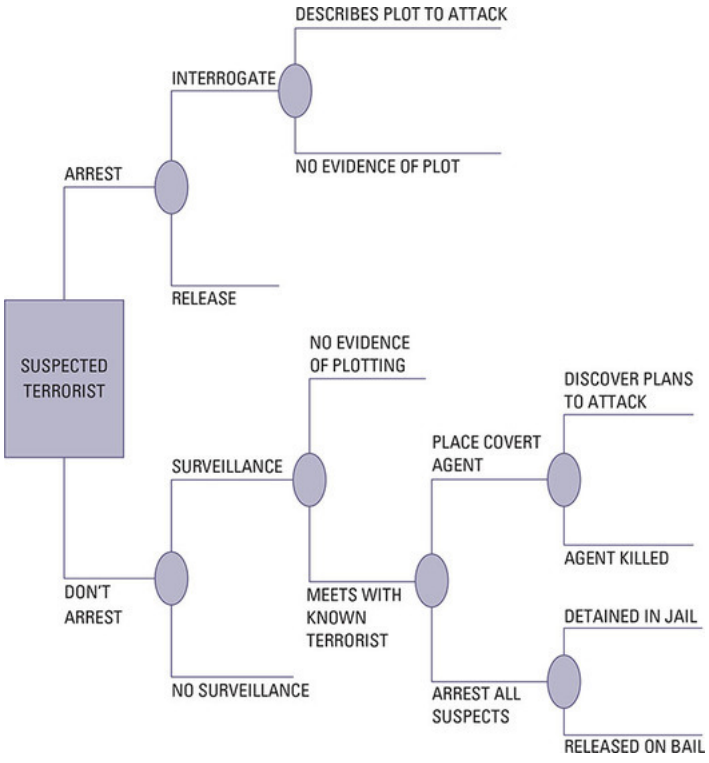
Decision Trees are simple to create and easy to use and interpret. A single analyst can create a Decision Tree but a group using brainstorming techniques as discussed in chapter 6 typically yields better results. Once the tree has been built, it can be posted on a wall or website and adjusted over time as new information becomes available. When significant new data are received that add new branches to the tree or substantially alter the probabilities of the options, these changes can be inserted into the tree and highlighted with color to show the decision maker what has changed and how it may have changed the previous line of analysis.

Both this technique and the Decision Matrix are useful for countering the impact of cognitive biases and heuristics such as the Anchoring Effect, Satisficing, and Premature Closure. They also help analysts avoid falling into the intuitive traps of Relying on First Impressions, Assuming a Single Solution, and Overrating Behavioral Factors.

The Method

Using a Decision Tree is a fairly simple process involving two steps: (1) building the tree and (2) calculating the value or probability of each outcome represented on the tree (see Figure 10.6). Follow these steps:

- Draw a square on a piece of paper or whiteboard to represent a decision point.
- Draw lines from the square representing a range of options that can be taken.
- At the end of the line for each option indicate whether further options are available (by drawing an oval followed by more lines) or by designating an outcome (by drawing a circle followed by one or more lines describing the range of possibilities).
- Continue this process along each branch of the tree until all options and outcomes are specified.
- Once the tree has been constructed, do the following:
    - Establish a set of percentages (adding to 100) for each set of lines emanating from each oval.
    - Multiply the percentages shown along each critical path or branch of the tree and record these percentages at the far right of the tree. Check to make sure all the percentages in this column add to 100.



Description

Figure 10.6 Counterterrorism Attack Decision Tree

The most valuable or most probable outcome will have the highest percentage assigned to it, and the least valuable or least probable outcome will have the lowest percentage assigned to it.

Potential Pitfalls

A Decision Tree is only as good as the reliability of the data, completeness of the range of options, and validity of the qualitative probabilities or values assigned to each option. A detailed Decision Tree can present the misleading impression that the authors have thought of all possible options or outcomes. For example, options may be available that the authors of the analysis did not imagine, just as there might be unintended consequences that the authors did not anticipate.

Relationship to Other Techniques

A Decision Tree is similar structurally to Critical Path Analysis and **P**rogram **E**valuation and **R**eview **T**echnique (PERT) charts. Both of these techniques, however, only show the activities and connections that need to be undertaken to complete a complex task. A timeline analysis (as is often done in support of a criminal investigation) is essentially a Decision Tree drawn after the fact, showing only the paths of actual events.

Origins of This Technique

This description of Decision Trees was taken from the Canadian government's Structured Analytic Techniques for Senior Analysts course. The Intelligence Analyst Learning Program developed the course, and the materials are used here with the permission of the Canadian government. More detailed discussions of how to build and use Decision Trees are readily available on the internet, for example, at the MindTools website and at https://medium.com/greyatom/decision-trees-a-simple-way-to-visualize-a-decision-dc506a403aeb.

10.7 DECISION MATRIX

A Decision Matrix helps analysts identify the course of action that best achieves specified goals or preferences.

When to Use It

The Decision Matrix technique should be used when a decision maker has multiple options from which to choose, has multiple criteria for judging the desirability of each option, and/or needs to find the decision that maximizes a specific set of goals or preferences. For example, a Decision Matrix can help choose among various plans or strategies for improving intelligence analysis, select one of several IT systems one is considering buying, determine which of several job applicants is the right choice, or consider any personal decision, such as what to do after retiring.

A Decision Matrix is not applicable to most intelligence analysis, which typically deals with evidence and judgments rather than goals and preferences. It can be used, however, for supporting a decision maker's consideration of alternative courses of action. Analysts can use the tool in a Red Hat Analysis to demonstrate the possible choices a leader might make when faced with a given situation or to help decision makers or clients see the potential effect of a policy choice or business decision. It can also be used at the conclusion of a Foresight workshop to identify optimal strategies for making good scenarios happen or mitigate the impact of bad scenarios.

Value Added

By deconstructing a decision into its component parts, the Decision Matrix technique makes it easier to identify areas of disagreement or hidden assumptions and determine their impact on the decision. Listing all the options or possible choices, the criteria for judging the options, the weights assigned to each of these criteria, and an evaluation of the extent to which each option satisfies each of these criteria makes the analytic process transparent. All the judgments are available for anyone to see—and challenge—by looking at the matrix.

Because it is so explicit, the matrix can play an important role in facilitating communication among those who are involved in, or affected by, the decision process. It can be easy to identify areas of disagreement and to determine whether such disagreements have any material impact on the decision. One can also see how sensitive a decision is to changes that might be made to the values assigned to the selection criteria or to the ability of an option to satisfy the criteria. If circumstances or preferences change, it is easy to go back to the matrix, make changes, and calculate the impact of the changes on the proposed decision.

The matrix helps decision makers and analysts avoid the cognitive traps of Premature Closure, Satisficing, and the Anchoring Effect. It also helps analysts avoid falling prey to intuitive traps such as Relying on First Impressions, Assuming a Single Solution, and Overrating Behavioral Factors.

The Method

Create a Decision Matrix table. To do this, break down the decision problem into two main components by making two lists—a list of options or alternatives for making a choice and a list of criteria to be used when judging the desirability of the options. Then follow these steps:

- Create a matrix with one column for each option. Write the name of each option at the head of one of the columns. Add two more blank columns on the left side of the table.
- Count the number of selection criteria, and then adjust the table so that it has that many rows plus two more: one at the top to list the options and one at the bottom to show the scores for each option. Try to avoid generating a large number of criteria: usually four to six will suffice. In the first column on the left side, starting with the second row, write in the selection criteria down the left side of the table, one per row. Listing them roughly in order of importance can sometimes add value but doing so is not critical. Leave the bottom row blank. (*Note*: Whether you enter the options across the top row and the criteria down the far-left column, or vice versa, depends on what fits best on the page. If one of the lists is significantly longer than the other, it usually works best to put the longer list in the left-side column.)
- Assign weights based on the importance of each of the selection criteria. This can be done in several ways, but the preferred way is to take 100 percent and divide these percentage points among the selection criteria. Be sure that the weights for all the selection criteria combined add to 100 percent. Also, be sure that all the criteria are phrased in such a way that a higher weight is more desirable. (Note: If this technique is being used by an intelligence analyst to support decision making, this step should not be done by the analyst. The assignment of relative weights is up to the decision maker.)
- Work across the matrix one row at a time to evaluate the relative ability of each of the options to satisfy each of the selection criteria. For example, assign ten points to each row and divide these points according to an assessment of the degree to which each of the options satisfies each of the selection criteria. Then multiply this number by the weight for that criterion. Figure 10.7 is an example of a Decision Matrix with three options and six criteria.
- Add the numbers calculated in the columns for each of the options. If you accept the judgments and preferences expressed in the matrix, the option with the highest number will be the best choice.

When using this technique, many analysts will discover relationships or opportunities not previously recognized. A sensitivity analysis may find that plausible changes in some values would lead to a different choice. For example, the analyst might think of a way to modify an option in a way that makes it more desirable or might rethink the selection criteria in a way that changes the preferred outcome. The numbers calculated in the matrix do not make the decision. The matrix is just an aid to help the analyst and the decision maker understand the trade-offs between multiple competing preferences.

	% Weight	Option 1	Option 2	Option 3
		(Weights in each row add up to 10)		
Criterion 1	30%	3.5 × 30 = 105	3 × 30 = 90	3.5 × 30 = 105
Criterion 2	10%	3.5 × 10 = 35	2 × 10 =20	4.5 × 10 = 45
Criterion 3	20%	2.5 × 20 = 50	4.5 × 20 = 90	3 × 20 = 60
Criterion 4	20%	4 ×20 = 80	2.5 × 20 = 50	3.5 × 20 = 70
Criterion 5	15%	3 × 15 = 45	4 × 15 =60	3 × 15 = 45
Criterion 6	5%	3.5 × 5 = 175	2.5 × 5 =12.5	4 × 5 = 20
Totals	100%	332.5	322.5	345

Figure 10.7 Decision Matrix

Origins of This Technique

This is one of the most commonly used techniques for decision analysis. Many variations of this basic technique have been called by many different names, including decision grid, Multiple Attribute Utility Analysis (MAUA), Multiple Criteria Decision Analysis (MCDA), Multiple Criteria Decision Making (MCDM), Pugh Matrix, and Utility Matrix. For a comparison of various approaches to this type of analysis, see Panos M. Parlos and Evangelos Triantaphyllou, eds., *Multi-Criteria Decision Making Methods: A Comparative Study* (Dordrecht, Netherlands: Kluwer Academic Publishers, 2000).

10.8 FORCE FIELD ANALYSIS

Force Field Analysis is a simple technique for listing and assessing all the forces for and against a change, problem, or goal.

Kurt Lewin, one of the fathers of modern social psychology, believed that all organizations are systems in which the present situation is a dynamic balance between forces driving for change and forces restraining change. For any change to occur, the driving forces must exceed the restraining forces, and the relative strength of these forces is what this technique measures. This technique is based on Lewin's theory.[3]

When to Use It

Force Field Analysis is useful in the early stages of a project or research effort when the analyst is defining the issue, gathering data, or developing recommendations for action. It requires that the analyst clearly define the problem in all its aspects. The technique aids in structuring the data and assessing the relative importance of each of the forces affecting the issue. It can also help the analyst overcome the natural human tendency to dwell on the aspects of the data that are most comfortable. An individual analyst or a small team can use this technique.

In the world of business and politics, the technique can help develop and refine strategies to promote a particular policy or ensure that a desired outcome actually occurs. In such instances, it is often useful to define the various forces in terms of key individuals who need to be persuaded. For example, instead of listing budgetary restrictions as a key factor, one would write down the name of the person who controls the budget. Similarly, Force Field Analysis can help diagnose what forces and individuals need to be constrained or marginalized to prevent a policy from being adopted or an outcome from happening.

Value Added

The primary benefit of Force Field Analysis is that it requires an analyst to consider the forces and factors (and, in some cases, individuals) that influence a situation. It helps analysts think through the ways various forces affect the issue and fosters recognition that such forces can be divided into two categories: driving forces and restraining forces. By sorting the evidence into two categories, the analyst can delve deeply into the issue and consider less obvious factors.

By weighing all the forces for and against an issue, analysts can better recommend strategies that would be most effective in reducing the impact of the restraining forces and strengthening the effect of the driving forces.

Force Field Analysis offers a powerful way to visualize the key elements of the problem by providing a simple tally sheet for displaying the different levels of intensity of the forces individually and together. With the data sorted into two lists, decision makers can more easily identify which forces deserve the most attention and develop strategies to overcome the negative elements while promoting the positive elements. Figure 10.8 is an example of a Force Field diagram.

> *An issue is held in balance by the interaction of two opposing sets of forces—those seeking to promote change (driving forces) and those attempting to maintain the status quo (restraining forces).*
>
> —Kurt Lewin, *Resolving Social Conflicts* (1948)



Description

Figure 10.8 Force Field Analysis: Removing Abandoned Cars from City Streets

Source: Pherson Associates, LLC, 2019.

Force Field Analysis is a powerful tool for reducing the impact of several of the most common cognitive biases and heuristics: Premature Closure, Groupthink, and the Availability Heuristic. It also is a useful weapon against the intuitive traps of Relying on First Impressions, Expecting Marginal Change, and Assuming a Single Solution.

The Method

- Define the problem, goal, trend, or change clearly and concisely.
- Brainstorm to identify the forces that will most influence the issue. Consider such topics as needs, resources, costs, benefits, organizations, relationships, attitudes, traditions, and interests. Other forces and factors to consider are social and cultural trends, rules and regulations, policies, values, popular desires, and leadership to develop the full range of forces promoting and restraining the factors involved.
- Make one list showing the forces or personalities “driving” change and a second list showing the forces or personalities “restraining” change.
- Assign a value (the intensity score) to each driving or restraining force to indicate its strength. Give the weakest intensity scores a value of 1 (weak) and the strongest a value of 5 (strong). The same intensity score can be assigned to more than one force if the analyst considers the factors equal in strength. List the intensity scores in parentheses beside each item.
- Examine the two lists to determine if any of the driving forces balance out or neutralize the restraining forces.
- Devise a manageable course of action to strengthen the forces that lead to the preferred outcome and weaken the forces that would hinder the desired outcome.

Analysts should keep in mind that the preferred outcome may be either promoting a change or restraining a change. For example, if the problem is increased drug use or criminal activity, the analysis would focus on the factors that would have the most impact on

restraining criminal activity or drug use. On the other hand, if the preferred outcome is improved border security, the analyst would highlight the drivers that would be most likely to promote border security if strengthened.

Potential Pitfalls

When assessing the balance between driving and restraining forces, the authors recommend caution not to add up the scores on each side and concluding that the side with the most points will win. Any numerical calculation can be easily manipulated by simply adding more forces or factors to either list to increase its overall score.

Origins of This Technique

Force Field Analysis is widely used in social science and business research. (A Google search on the term brings up more than seventy-one million hits.) This version of the technique is found in Randolph H. Pherson, *Handbook of Analytic Tools and Techniques,* 5th ed. (Tysons, VA: Pherson Associates, LLC, 2019). To learn more about the Decision Matrix techniques, visit https://asq.org/quality-resources/decision-matrix.

10.9 PROS-CONS-FAULTS-AND-FIXES

Pros-Cons-Faults-and-Fixes is a strategy for critiquing new policy ideas. It is intended to offset the human tendency of a group of analysts and decision makers to jump to a conclusion before completing a full analysis of the problem.

When to Use It

Making lists of pros and cons for any action is a common approach to decision making. Finding “Faults” and “Fixes” distinguishes this technique from a simple “Pros and Cons” approach. Use this technique to make a quick appraisal of a new idea or a more systematic analysis of a choice between two options.

One advantage of Pros-Cons-Faults-and-Fixes is its applicability to virtually all types of decisions. Of the various structured techniques for decision making, it is one of the easiest and quickest to use. It requires only a certain procedure for making the lists and discussing them with others to solicit divergent input.

In the business world, the technique can help discover potential vulnerabilities in a proposed strategy to introduce a new product or acquire a new company. By assessing how Pros can be “Faulted,” one can anticipate how competitors might react to a new corporate initiative; by assessing how Cons can be “Fixed,” potential vulnerabilities can be addressed, and major mistakes avoided early in the planning process.

Value Added

It is unusual for a new idea to meet with instant approval. What often happens in meetings is that a new idea is brought up, one or two people immediately explain why they don't like it or believe it won't work, and the idea is then dropped. On the other hand, there are occasions when just the opposite happens. A new idea is immediately welcomed, and a commitment to support it is made before the idea is critically evaluated. The Pros-Cons-Faults-and-Fixes technique helps to offset this human tendency to jump to conclusions.

The technique first requires a list of Pros and Cons about the new idea or the choice between two alternatives. If there seems to be excessive enthusiasm for an idea and a risk of acceptance without critical evaluation, the next step is to look for "Faults." A Fault is any argument that a Pro is unrealistic, won't work, or will have unacceptable side effects. On the other hand, if there seems to be a bias toward negativity or a risk of the idea being dropped too quickly without careful consideration, the next step is to look for "Fixes." A Fix is any argument or plan that would neutralize or minimize a Con, or even change it into a Pro. In some cases, it may be appropriate to look for both Faults and Fixes before comparing the two lists and finalizing a decision.

The Pros-Cons-Faults-and-Fixes technique does not tell an analyst whether the decision or strategy is "good" or not, nor does it help decide whether the Pros or the Cons have the strongest argument. That answer is still based on an analyst's professional judgment. The purpose of the technique is to offset any tendency to rush to judgment. It organizes the elements of the problem logically and helps ensure that the analyst considers both sides of a problem or issue systematically. Documenting the elements of a problem and taking the time to reflect whether all parties would view each element the same way helps the analyst and decision maker see things more

clearly and become more objective and emotionally detached from the decision (see Figure 10.9).

The technique militates against classic biases and misapplied heuristics including Groupthink, Satisficing, and the Anchoring Effect. It also protects against Projecting Past Experiences, Overrating Behavioral Factors, and Overinterpreting Small Samples.

The Method

Start by clearly defining the proposed action or choice. Then follow these steps:

- List the Pros in favor of the decision or choice. Think broadly and creatively, and list as many benefits, advantages, or other positives as possible.
- List the Cons, or arguments against what is proposed. The Cons usually will outnumber the Pros, as most humans are naturally critical. It is often difficult to get a careful consideration of a new idea because it is easier to think of arguments against something new than to imagine how the new idea might work.

Faults	Pros	Cons	Fixes
Fault Pro A	Pro A	Con A	Fix Con A
	Pro B	Con B	Fix Con B
Fault Pro C	Pro C	Con C	
Fault Pro D	Pro D	Con D	Fix Con D
A **Fault** is any argument that the option is unrealistic, won't work, or will have unacceptable side effects. Identifying Faults allows you to troubleshoot your Pros.			
A **Fix** is any argument or plan of action that would neutralize or minimize a Con, or even change it into a Pro. Identifying fixes allows you to improve the chances of success for an option by removing possible obstacles.			

Figure 10.9 Pros-Cons-Faults-and-Fixes Analysis

- Review each list and consolidate similar ideas. If two Pros are similar or overlapping, consider merging them to eliminate any redundancy. Do the same for any overlapping Cons.

If the choice is between two clearly defined options, go through the previous steps for the second option. If there are more than two options, a technique such as the Decision Matrix may be more appropriate than Pros-Cons-Faults-and-Fixes.

- Decide whether the goal is to demonstrate that an idea will not work or show how best to make it succeed.
- If the goal is to challenge an initial judgment that an idea will not work, take the Cons and see if they can be "Fixed." How can their influence be neutralized? Can you even convert them to Pros? Four possible strategies are to
    - Propose a modification of the Con that would significantly lower the risk of the Con being a problem.
    - Identify a preventive measure that would significantly reduce the chances of the Con being a problem.
    - Create a contingency plan that includes a change of course if certain indicators are observed.
    - Identify a need for further research to confirm the assumption that the Con is a problem.

- If the goal is to challenge an initial optimistic assumption that the idea will work and should be pursued, take the Pros, one at a time, and see if they can be “Faulted.” That means to try to figure out how the Pro might fail to materialize or have undesirable consequences. This exercise is intended to counter any wishful thinking or unjustified optimism about the idea. A Pro might be Faulted in at least three ways:
    - Identify a reason why the Pro would not work or why the benefit would not be received.
    - Identify an undesirable side effect that might accompany the benefit.
    - Identify a need for further research or information gathering to confirm or refute the assumption that the Pro will work or be beneficial.
- A third option is to combine both approaches: to Fault the Pros and Fix the Cons.
- Compare the Pros, including any Faults, against the Cons, including the Fixes. Weigh one against the other and make the choice. The choice is based on your professional judgment, not on any numerical calculation of the number or value of Pros versus Cons.

Potential Pitfalls

Often when listing the Pros and Cons, analysts will assign weights to each Pro and Con on the list and then re-sort the lists, with the Pros or Cons receiving the most points at the top of the list and those receiving the fewest points at the bottom. This can be a useful exercise, helping the analyst weigh the balance of one against the other, but the authors strongly recommend against mechanically adding up the scores on each side and deciding that the list with the most points is the right choice. Any numerical calculation can be easily manipulated by simply adding more Pros or more Cons to either list to increase its overall score. The best protection against this practice is simply not to add up the points in either column.

Origins of This Technique

Pros-Cons-Faults-and-Fixes is Richards J. Heuer Jr.'s adaptation of the Pros-Cons-and-Fixes technique described by Morgan D. Jones in *The Thinker's Toolkit: Fourteen Powerful Techniques for Problem Solving* (New York: Three Rivers Press, 1998), 72–79. Jones assumed that humans are "compulsively negative" and that "negative thoughts defeat creative objective thinking." Thus, his technique focused only on Fixes for the Cons. The technique described here recognizes that analysts and decision makers can also be biased by overconfidence, in which case Faulting the Pros may be more important than Fixing the Cons.

10.10 COMPLEXITY MANAGER

Complexity Manager helps analysts and decision makers understand and anticipate changes in complex systems. As used here, the word “complexity” encompasses any distinctive set of interactions that are more complicated than even experienced analysts can think through solely in their heads.[4]

When to Use It

As a policy support tool, Complexity Manager can help assess the chances for success or failure of a new or proposed program or policy and identify opportunities for influencing the outcome of any situation. It is also useful in identifying what would have to change to achieve a specified goal as well as the unintended consequences from the pursuit of a policy goal.

When trying to foresee future events, both the intelligence and business communities have typically dealt with complexity by doing the following:

- Assuming that the future is unpredictable and generating alternative future scenarios and indicators that can be tracked to obtain early warning of which future is emerging.
- Developing or contracting for complex computer models and simulations of how the future might play out. This practice is costly in time and money and often of limited practical value to the working analysts.
- Making multiple assumptions and relying on the analyst's intuition or expert judgment to generate a best guess of how things will work out.

The use of Complexity Manager is a fourth approach that may be preferable in some circumstances, especially in cases of what one might call "manageable complexity." It can help decision makers ask better questions and anticipate problems.

Complexity Manager is different from other methods for dealing with complexity, because we believe the average analyst who lacks advanced quantitative skills can use it. There is no need for

programs such as Causal Loop Diagramming or Block-Flow Diagramming commonly used in System Dynamics Analysis.

Value Added

We all know that we live in a complex world of interdependent political, economic, social, and technological systems in which each event or change has multiple effects. These effects then affect other elements of the system. Although we understand this, we usually do not analyze the world in this way, because the multitude of potential interactions is too difficult for the human brain to track simultaneously. As a result, analysts often fail to foresee future problems or opportunities that may be generated by current trends and developments. Or they fail to foresee the undesirable side effects of well-intentioned policies.[5]

Complexity Manager can often improve an analyst's understanding of a complex situation without the time delay and cost required to build a computer model and simulation. The steps in the Complexity Manager technique are the same as the initial steps required to build a computer model and simulation. These are identification of the relevant variables or actors, analysis of all the interactions between them, and assignment of rough weights or other values to each variable or interaction.

Scientists who specialize in the modeling and simulation of complex social systems report that "the earliest—and sometimes most significant—insights occur while reducing a problem to its most fundamental players, interactions, and basic rules of behavior," and that "the frequency and importance of additional insights diminishes exponentially as a model is made increasingly complex."[6] In many cases the Complexity Manager is likely to provide much, although not all, of the benefit one could gain from computer modeling and simulation, but without the time lag and contract costs. However, if key variables are quantifiable with changes that are trackable over time, it would be more appropriate to use a quantitative modeling technique such as System Dynamics.

Complexity Manager, like most Structured Analytic Techniques, does not itself provide analysts with answers. It enables analysts to find a best possible answer by organizing in a systematic manner the jumble of information about many relevant variables. It helps analysts comprehend the whole problem, not just one part of the problem at a time. Analysts can then apply their expertise to make an informed judgment about the problem. This structuring of the analyst's thought process also provides the foundation for a well-organized report that clearly presents the rationale for each conclusion. This may also lead to some form of visual presentation, such as a Concept Map or Mind Map, or a causal or influence diagram.

It takes time to work through the Complexity Manager process, but it may save time in the long run. This structured approach helps analysts work efficiently without getting mired down in the complexity of the problem. Because it produces a better and more carefully reasoned product, it also saves time during the editing and coordination processes.

The Complexity Manager is helpful in reducing the influence of many cognitive biases and misapplied heuristics, among them, Premature Closure, Mental Shotgun, and the Availability Heuristic. It also helps mitigate the impact of several intuitive traps including Relying on First Impressions, Overinterpreting Small Samples, and Overestimating Probability.

The Method

Complexity Manager requires the analyst to proceed through eight specific steps:

1. **Define the problem.** State the problem (plan, goal, outcome) to be analyzed, including the time period covered by the analysis.
2. **Identify and list relevant variables.** Use one of the brainstorming techniques described in chapter 6 to identify the significant variables (factors, conditions, people, etc.) that may affect the situation of interest during the designated time period. Think broadly to include organizational or environmental constraints that are beyond anyone's ability to control. If the goal is to estimate the status of one or more variables several years in the future, those variables should be at the top of the list. Group the other variables in some logical manner with the most important variables at the top of the list.
3. **Create a Cross-Impact Matrix.** Create a matrix in which the number of rows and columns are each equal to the number of variables plus one header row (see chapter 7). Leaving the cell at the top-left corner of the matrix blank, enter all the variables in the cells in the row across the top of the matrix and the same variables in the column down the left side. The matrix then has a cell for recording the nature of the relationship between all pairs of variables. This is called a Cross-Impact Matrix—a tool for assessing the two-way interaction between each pair of variables. Depending on the number of variables and the length of their names, it may be convenient to use the variables' letter designations across the top of the matrix rather than the full names.

   When deciding whether to include a variable, or to combine two variables into one, keep in mind that the number of variables has a significant impact on the complexity and the time required for an analysis. If an analytic problem has five variables, there are 20 possible two-way interactions between those variables. That number increases rapidly as the number of variables increases. With 10 variables, as in Figure 10.10, there are 90 possible interactions. With 15 variables, there are 210. Complexity Manager may be impractical with more than 15 variables.

4. **Assess the interaction between each pair of variables.** Use a diverse team of experts on the relevant topic to analyze the strength and direction of the interaction between each pair of variables. Enter the results in the relevant cells of the matrix. For each pair of variables, ask the question: Does this variable affect the paired variable in a manner that will increase or decrease the impact or influence of that variable?

   When entering ratings in the matrix, it is best to take one variable at a time, first going down the column and then working across the row. Note that the matrix requires each pair of variables to be evaluated twice—for example, the impact of variable A on variable B and the impact of variable B on variable A. To record what variables impact variable A, work down *column* A and ask yourself whether each variable listed on the left side of the matrix has a positive or negative influence, or no influence at all, on variable A. To record the reverse impact of variable A on the other variables, work across *row* A to analyze how variable A impacts the variables listed across the top of the matrix.

   Analysts can record the nature and strength of impact that one variable has on another in two different ways. Figure 10.10 uses plus and minus signs to show whether the variable being analyzed has a positive or negative impact on the paired variable. The size of the plus or minus sign signifies the strength of the impact on a three-point scale. The small plus or minus sign shows a weak impact; the medium size a medium impact; and the large size a strong impact. If the variable being analyzed has no impact on the paired variable, the cell is left empty. If a variable might change in a way that could reverse the direction of its impact, from positive to negative or vice versa, this is shown by using both a plus and a minus sign.

   The completed matrix shown in Figure 10.10 is the same matrix you will see in chapter 11, when the Complexity Manager technique is used to forecast the future of Structured Analytic Techniques. The plus and minus signs work well for the finished matrix. When first populating the matrix,

however, it may be easier to use letters (*P* and *M* for plus and minus) to show whether each variable has a positive or negative impact on the other variable with which it is paired. Each *P* or *M* is then followed by a number to show the strength of that impact. A three-point scale is used, with 3 indicating a Strong Impact, 2 Medium, and 1 Weak.

After rating each pair of variables, and before doing further analysis, consider pruning the matrix to eliminate variables that are unlikely to have a significant effect on the outcome. It is possible to measure the relative significance of each variable by adding up the weighted values in each row and column. The sum of the weights in each row is a measure of each variable's impact on the entire system. The sum of the weights in each column is a measure of how much each variable is affected by all the other variables. Those variables most impacted by the other variables should be monitored as potential indicators of the direction in which events are moving or as potential sources of unintended consequences.

5. **Analyze direct impacts.** Document the impact of each variable, starting with variable A. For each variable, provide further clarification of the description, if necessary. Identify all the variables that have an impact on that variable with a rating of 2 or 3, and briefly explain the nature, direction, and, if appropriate, the timing of this impact. How strong is it and how certain is it? When might these effects be observed? Will the effects be felt only in certain conditions? Next, identify and discuss all variables on which this variable has an effect with a rating of 2 or 3 (Medium or Strong Impact), including the strength of the impact and how certain it is to occur. Identify and discuss the potentially good or bad side effects of these impacts.

6. **Analyze loops and indirect impacts.** The matrix shows only the direct effect of one variable on another. When you are analyzing the direct impacts variable by variable, there are several things to look for and make note of. One is feedback loops. For example, if variable A has a positive impact on variable B, and variable B also has a positive impact on variable A, this is a positive feedback loop. Or there may be a three-variable loop, from A to B to C and back to A. The variables in a loop gain strength from one another, and this boost may enhance their ability to influence other variables. Another thing to look for is circumstances where the causal relationship between variables A and B is necessary but not sufficient for something to happen. For example, variable A has the potential to influence variable B, and may even be trying to influence variable B, but it can do so effectively only if variable C is also present. In that case, variable C is an enabling variable and takes on greater significance than it ordinarily would have.

	A	B	C	D	E	F	G	H	I	J
A Increased use of Structured Analytic Techniques		+	+		+–	+–	✣	+–	✣–	–
B Executive support for collaboration and Structured Analytic Techniques	+		+	✣	✣	✣–	✣	+–	+–	–
C Availability of virtual technologies	+	✣		✣	✣		+		+–	
D Generational change	+	✣	✣		+			+–	–	+
E Availability of analytic tradecraft support	+–	+–	✣–				+–	+–	✣–	+
F Change in budget for analysis	–	–	–	–	–			+–		
G Change in client preferences for collaborative, digital products	✣	+	✣		✣–	✣–		+	–	
H Research on effectiveness of Structured Analytic Techniques	+–	✣–			✣–	+–	+–		✣–	+–
I Analysts' perception of time pressure	✣–	✣–			+					✣
J Lack of openness to change among senior analysts/managers	–	–			–				✣–	

Reading the matrix: The cells in each ***row*** show the impact of the variable represented by that row on each of the variables listed across the top of the matrix. The cells in each ***column*** show the impact of each variable listed down the left side of the matrix on the variable represented by the column.

Direction and magnitude of the impact:
+ strong positive impact
✣ medium positive impact
\+ weak positive impact
– strong negative impact
– medium negative impact
– weak negative impact

Combination of + and - means impact could go either direction.
Empty cell = no impact.

Description

Figure 10.10 Variables Affecting the Future Use of Structured Analysis

All variables are either static or dynamic. Static variables are expected to remain unchanged during the period covered by the analysis. Dynamic variables are changing or have the potential to change. The analysis should focus on the dynamic variables, as these are the sources of surprise in any complex system. Determining how these dynamic variables interact with other variables and

with each other is critical to any forecast of future developments. Dynamic variables can be either predictable or unpredictable. Predictable change includes established trends or established policies that are in the process of being implemented. Unpredictable change may be a change in leadership or an unexpected change in policy or available resources.

7. **Draw conclusions.** Using data about the individual variables assembled in steps 5 and 6, draw conclusions about the entire system. What is the most likely outcome, or what changes might be anticipated during the specified time period? What are the driving forces behind that outcome? What things could happen to cause a different outcome? What desirable or undesirable side effects should be anticipated? If you need help to sort out all the relationships, it may be useful to sketch out by hand a diagram showing all the causal relationships. A Concept Map (chapter 6) may be useful for this purpose. If a diagram is helpful during the analysis, it may also be helpful to the reader or customer to include such a diagram in the report.
8. **Conduct an opportunity analysis.** When appropriate, analyze what actions could be taken to influence this system in a manner favorable to the primary customer of the analysis.

Relationship to Other Techniques

The same procedures for creating a matrix and coding data can be applied in using a Cross-Impact Matrix (chapter 7). The difference is that the Cross-Impact Matrix technique is used only to identify and share information about the cross-impacts in a group or team exercise. The goal of Complexity Manager is to build on the Cross-Impact Matrix to analyze the working of a complex system.

If the goal is to identify alternative scenarios and early warning of future directions of change, especially in a highly uncertain environment, a form of Foresight analysis rather than Complexity Manager would be more appropriate. Use a computerized modeling system such as System Dynamics rather than Complexity Manager when changes over time in key variables can be quantified or when there are more than fifteen variables to be considered.[7]

Origins of This Technique

Richards J. Heuer Jr. developed Complexity Manager to fill an important gap in structured techniques available to the average analyst. It is a simplified version of older quantitative modeling techniques, such as System Dynamics.

NOTES

1. See Graham T. Allison and Philip Zelikow, *Essence of Decision: Explaining the Cuban Missile Crisis,* 2nd ed. (New York: Addison-Wesley, 1999).

2. Heinz Weihrich, “The TOWS Matrix—A Tool for Situational Analysis,” *Long Range Planning* 15, no. 2 (April 1982): 54–66.

3. Kurt Lewin, *Resolving Social Conflicts: Selected Papers on Group Dynamics* (New York: Harper & Row, 1948).

4. Seth Lloyd, a specialist in complex systems, has listed thirty-two definitions of *complexity*. See Seth Lloyd, *Programming the Universe* (New York: Knopf, 2006).

5. Dietrich Dorner, *The Logic of Failure* (New York: Basic Books, 1996).

6. David S. Dixon and William N. Reynolds, “The BASP Agent-Based Modeling Framework: Applications, Scenarios, and Lessons Learned,” *Proceedings of the 36th Annual Hawaii International Conference on System Sciences* (February 2003), https://www.academia.edu/797988/The_BASP_Agent-Based_Modeling_Framework_Applications_Scenarios_and_Lessons_Learned_with_William_N._Reynolds. Also see Donnella H. Meadows and J. M. Robinson, *The Electronic Oracle: Computer Models and Social Decisions* (New York: Wiley, 1985).

7. John Sterman, *Business Dynamics: Systems Thinking and Modeling for a Complex World* (New York: McGraw-Hill, 2000).

Descriptions of Images and Figures

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Hazard or opportunity, cause or trend consisting of preventive barrier or accelerator, escalation factor consisting of EF barrier or accelerator for their recovery, and consequences with recovery barrier or amplifier leads to risk event or opportunity event. Causes are anticipatory and consequences are reactive.

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Stimulus leads to response, which leads to different forms of instability. The sources of grievances and conflict are domestic or international, intellectual, social, political, economic, and military. This is the stimulus. Opposition's ability to articulate grievance or mobilize discontent leads to government or society's capacity to respond. This is the response. Responses include legitimacy or leadership, resource availability or responsiveness, institutional strength, and monopoly of coersive force. The response leads to grievance and conflict, and different forms of instability. All and legitimate instability is peaceful political change. Elite and illegitimate instability are conspiracy or coups d'etat, internal war or insurgencies, and group-on-group violence. Mass and illegitimate stability are turmoil, internal war or insurgencies, and group-on-group violence.

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A suspected terrorist is either arrested or not arrested. If arrested, they are either interrogated or released. If interrogated, the plot to attack is described, or there is no evidence of plot. If the terrorist is not arrested, they are either under no surveillance or under surveillance. If they are under surveillance, there is no evidence of plotting or they meet with known terrorist. If there is meeting, then place covert agent, who either discovers plans to attack or gets killed, or arrest all suspects to be detained in jail or released on bail.

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Note: The number value and size of the type indicate the significance of each argument. With increase in the number value, the size of the type increases. The arguments corresponding to each number value are as follows. 1: The definition of "abandoned cars" is unclear to the public. 2: The public climate favors cleaning up the city. It is difficult to locate abandoned cars. Health Department has cited old and abandoned vehicles as potential health hazards. 3: A procedure is needed to verify a car's status and notify owners. Advocacy groups have expressed interest. The owners of old cars feel threatened. Locating and disposing of cars will be expensive. 4: The City Council supports the plan. A location is needed to put the abandoned cars once identified. 5: Local auto salvage yards will remove cars for free. The public service director supports the plan.

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Reading the matrix: The cells in each row show the impact of the variable represented by that row on each of the variables listed across the top of the matrix. The cells in each column show the impact of each variable listed down the left side of the matrix on the variable represented by the column. Combination of positive and negative means impact could go either direction. Empty cell equals no impact.

	A	B	C	D	E	F	G	H	I

	A	B	C	D	E	F	G	H	I
A Increased use of Structured Analytic Techniques	Nil	Strong positive	Positive	Nil	Strong positive and strong negative	Weak positive and weak negative	Medium positive	Strong positive and strong negative	Mediur positive and mediur negativ
B Executive support for collaboration and Structured Analytic Techniques	Strong positive	Nil	Strong positive	Medium positive	Medium positive	Medium positive and medium negative	Medium positive	Strong positive and strong negative	Weak positive and weak negativ
Availability of virtual technologies	Strong positive	Medium positive	Nil	Medium positive	Medium positive	Nil	Strong positive	Nil	Weak positive and weak negativ
D Generational change	Strong positive	Medium positive	Medium positive	Nil	Weak positive	Nil	Nil	Weak positive and weak negative	Weak negativ
E Availability of analytic tradecraft support	Strong positive and strong negative	Strong positive and strong negative	Medium positive and medium negative	Nil	Nil	Nil	Weak positive and weak negative	Weak positive and weak negative	Mediur positive and mediur negativ
F Change in budget for analysis	Strong negative	Medium negative	Medium negative	Medium negative	Strong negative	Nil	Nil	Strong positive and strong negative	Nil

	A	B	C	D	E	F	G	H	I
G Charge in client preferences for collaborative, digital products	Medium positive	Weak positive	Medium positive	Nil	Medium positive and medium negative	Medium positive and medium negative	Nil	Weak positive	Mediur negativ
H Research on effectiveness of Structured Analytic Techniques	Strong positive and strong negative	Medium positive and medium negative	Nil	Nil	Medium positive and medium negative	Weak positive and weak negative	Weak positive and weak negative	Nil	Mediur positive and mediur negativ
I Analysts' perception of time pressure	Medium positive and medium negative	Medium positive and medium negative	Nil	Nil	Weak positive	Nil	Nil	Nil	Nil
J Lack of openness to change among senior analysts or managers	Medium negative	Medium negative	Nil	Nil	Medium negative	Nil	Nil	Nil	Mediur positive and mediur negativ

CHAPTER 11 THE FUTURE OF STRUCTURED ANALYTIC TECHNIQUES

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Since the term Structured Analytic Techniques was first introduced in 2005, a persistent and unresolved debate has centered on the question of their effectiveness in generating higher-quality analysis. Testing the value of these techniques in the U.S. Intelligence Community has been done largely through the process of using them. That experience has certainly been successful, but it has not been enough to convince skeptics reluctant to change their long-ingrained habits. Nor has it persuaded academics accustomed to looking for hard, empirical evidence. Similar questions have arisen regarding the use of Structured Analytic Techniques in business, medicine, and other fields that consistently deal with probabilities and uncertainties rather than hard data.

11.1 LIMITS OF EMPIRICAL ANALYSIS

A few notable studies have evaluated the efficacy of structured techniques. A RAND study in 2016, for example, found that intelligence publications using the techniques generally addressed a broader range of potential outcomes and implications than did other analyses, but that more controlled experiments were needed to provide a complete picture of their contribution to intelligence analysis.[1]

Coulthart in his 2015 doctoral dissertation, “Improving the Analysis of Foreign Affairs: Evaluating Structured Analytic Techniques,” evaluates the use of twelve core techniques in the U.S. Intelligence Community.[2] His study found moderate to strong evidence affirming the efficacy of using Analysis of Competing Hypotheses, Brainstorming, and Devil’s Advocacy. Other findings were that face-to-face collaboration decreases creativity, weighting evidence appears to be more valuable than seeking disconfirming evidence, and conflict improves the quality of analysis.

Chang et al., in a 2018 article, “Restructuring Structured Analytic Techniques in Intelligence,” identify two potential problems that could undercut the effectiveness of structured techniques.[3] First, Structured Analytic Techniques treat all biases as unipolar when, in fact, many are bipolar. For example, analysts using structured techniques to mitigate the impact of Confirmation Bias, which would make them too confident in the soundness of their key judgments, could trigger the opposing problem of under-confidence. Second, many structured techniques involve the process of decomposing a problem into its constituent parts. No one has tested, however, whether the process of decomposition is adding or subtracting noise from the analytic process. They suspect that, on balance, decomposition is most likely to degrade the reliability of analytic judgments. As they conclude—and the authors agree—more sustained scientific research is needed to determine whether these

and other shortcomings pose problems when evaluating the utility of structured techniques in improving analytic reasoning.

Efforts to conduct such qualitative studies, however, confront several obstacles not usually encountered in other fields of study. Findings from empirical experiments can be generalized to apply to intelligence analysis or any other specific field only if the test conditions match the conditions in which the analysis is conducted. Because so many variables can affect the research results, it is extremely difficult to control for all, or even most, of them. These variables include the purpose for which a technique is used, implementation procedures, context of the experiment, nature of the analytic task, differences in analytic experience and skill, and whether the analysis is done by a single analyst or as a group process. All of these variables affect the outcome of any experiment that ostensibly tests the utility of a Structured Analytic Technique. Many of these same challenges are present, and should be factored into, efforts by intelligence organizations to formalize processes for evaluating the quality of papers produced by their analysts.

Two specific factors raise questions about the practical feasibility of valid empirical testing of Structured Analytic Techniques as used in intelligence analysis. First, these techniques are commonly used as a group process. That would require testing with groups of analysts rather than individual analysts. Second, intelligence deals with issues of high uncertainty. Former Central Intelligence Agency director Michael Hayden wrote that because of the inherent uncertainties in intelligence analysis, a record of 70 percent accuracy is a good performance.[4] If this is true, a single experiment testing the use of a structured technique that leads to a wrong answer does not prove the lack of effectiveness of the technique. Multiple repetitions of the same experiment would be needed to evaluate how often the analytic judgments were accurate.

Many problems could largely be resolved if experiments were conducted with intelligence analysts using techniques as they are used every day to analyze typical intelligence issues.[5] But even if

such conditions were met, major obstacles to meaningful conclusions would remain. Since many Structured Analytic Techniques can be used for several purposes, research findings on the effectiveness of these techniques can be generalized and applied to the intelligence community only if the techniques are used in the same way and for the same purpose as actually used by intelligence analysts.

Philip Tetlock, for example, in his pathbreaking book, *Expert Political Judgment*, describes two experiments that show scenario development may not be an effective analytic technique. The experiments compared judgments on a political issue before and after the test subjects prepared scenarios to try to gain a better understanding of the issues.[6] The experiments showed that the predictions by both experts and nonexperts were more accurate *before* generating the scenarios; in other words, the generation of scenarios actually *reduced* the accuracy of their predictions. Several experienced analysts have separately cited this finding as evidence that scenario development may not be a useful method for intelligence analysis.[7]

However, Tetlock's conclusions should not be generalized to apply to intelligence analysis, as his experiments tested scenarios as a predictive tool. The intelligence community does not use scenarios for prediction. Scenario development is best used to describe several outcomes or futures that a decision maker should consider because intelligence is unable to predict a single outcome with reasonable certainty. For most decision makers, the most important product generated by Foresight analysis is the identification of a set of key drivers that will likely determine how the future will evolve. These drivers then can be leveraged by the decision maker to mitigate harmful scenarios and facilitate the emergence of beneficial scenarios. Two other often-cited benefits are the discovery of emerging trends and the identification of indicators and milestones for each scenario. The indicators and milestones can then be monitored to gain early warning of the direction in which events

seem to be heading. Tetlock's experiments did not use scenarios in this way.

11.2 PURPOSE OF STRUCTURED TECHNIQUES

We believe the easiest way to assess the value of Structured Analytic Techniques is to look at the purpose for which a technique is used. Once that is established, the next step is to determine whether it achieves that purpose, or some better way exists to achieve that same purpose.

A key distinction in this debate is that Structured Analytic Techniques are designed primarily to help analysts think, not to predict what will occur in the future. The authors often describe structured techniques as “thinking tools” analysts can use to instill more rigor, structure, and imagination in the analysis. Most analysts report that the techniques help them avoid—or at least mitigate—the impact of cognitive bias, misapplied heuristics, and intuitive traps, thereby reducing error rates. Structured Analytic Techniques also spur analysts to reframe issues and discover “unknown unknowns” that they otherwise would have missed.

For these reasons, basing an analysis of the value of structured techniques on how accurately they can be used to predict the future would be applying an incomplete and misleading standard for the evaluation. The better questions to test would be, Did the analysts correctly frame the issue? Was the analysis done with rigor and transparency? Were incorrect mental mindsets identified and corrected? Did the analysis explore both challenges and opportunities for the decision maker? and Did use of the techniques save the analysts time over time? Moreover, applying a standard of predictive accuracy could be highly misleading if the analyst accurately identified an emerging problem and policymakers took action to prevent it from occurring. The function of a good warning analyst is to alert decision makers to a developing problem in time for them to prevent a prediction from becoming true.

This book has six chapters of techniques. Each Structured Analytic Technique has what is called face validity, which means there is reason to expect that it will help to mitigate or avoid a type of problem that sometimes occurs when one is engaged in doing analysis. The following paragraphs provide examples of face validity or how structured techniques help analysts do a better job.

A great deal of research in human cognition during the past sixty years shows the limits of working memory and suggests that one can manage a complex problem most effectively by breaking it down into smaller pieces. That is, in fact, the dictionary definition of "analysis,"[8] and that is what techniques that make lists, trees, matrices, diagrams, maps, and models do. It is reasonable to expect, therefore, that an analyst who uses such tools for organization or visualization of information will do a more thorough job than an analyst who does not.

Similarly, much empirical evidence suggests that the human mind tends to see what it is looking for and often misses what it is not looking for (i.e., Confirmation Bias and Ignoring Inconsistent Evidence). Given this cognitive limitation, it seems useful to develop scenarios and indicators of possible future events for which intelligence needs to provide early warning. These techniques can help collectors target needed information. For analysts, they prepare the mind to recognize the early signs of significant change.

"Satisficing" is the term Herbert Simon invented to describe the act of selecting the first identified alternative that appears "good enough" rather than evaluating all the likely alternatives and identifying the best one (see the introduction to chapter 6). Satisficing is a common analytic shortcut that people use in making everyday decisions when there are multiple possible answers. It saves a lot of time when making judgments or decisions of little consequence, but it is ill-advised when making judgments or decisions with significant consequence for national security. It seems self-evident that an analyst who deliberately identifies and analyzes alternative

hypotheses before reaching a conclusion is more likely to find a better answer than an analyst who does not.

Given the necessary role that assumptions play when making intelligence judgments based on incomplete and ambiguous information, an analyst who uses the Key Assumptions Check is likely to do a better job than an analyst who makes no effort to identify and validate assumptions. Extensive empirical evidence suggests that reframing a question helps to unblock the mind. It helps one to see other perspectives.

The empirical research on small-group performance is virtually unanimous in emphasizing that groups make better decisions when their members bring to the table a diverse set of ideas, experiences, opinions, and perspectives.[9] Looking at these research findings, one may conclude that the use of any structured technique in a group process is likely to improve the quality of analysis, as compared with analysis by a single individual using that technique or by a group that does not use a structured process for eliciting divergent ideas or opinions.

The experience of U.S. Intelligence Community analysts using the Analysis of Competing Hypotheses (ACH) software and similar computer-aided analytic tools provides anecdotal evidence to support this conclusion. One of the goals in using ACH is to gain a better understanding of the differences of opinion with other analysts or between analytic offices.[10] The creation of an ACH matrix requires step-by-step discussion of evidence and arguments being used and deliberation about how these are interpreted as either consistent or inconsistent with each of the hypotheses. This process takes time, but many analysts believe it is time well spent; they say it saves them time in the long run once they have learned the technique.

Our experience teaching ACH to intelligence analysts illustrates how structured techniques can elicit significantly more divergent information when used as a group process. Intelligence and law enforcement analysts consider this group discussion the most

valuable part of the ACH process. Use of structured techniques does not guarantee a correct judgment, but this anecdotal evidence suggests that these techniques make a significant contribution to higher-quality analysis.

11.3 PROJECTING THE TRAJECTORY OF STRUCTURED TECHNIQUES

Intelligence analysts and managers are continuously looking for ways to improve the quality of their analysis. One of these paths is the increased use of Structured Analytic Techniques. This book is intended to encourage and support that effort.

This final chapter employs a new technique called Complexity Manager (chapter 10) to instill rigor in addressing a complex problem—the future of Structured Analytic Techniques. Richards J. Heuer Jr. developed the Complexity Manager as a simplified combination of two long-established futures analysis methods, Cross-Impact Matrix and System Dynamics. It is designed for analysts who have not been trained in the use of advanced, quantitative techniques.

We apply the Complexity Manager technique specifically to address the following questions:

- What is the prognosis for the use of Structured Analytic Techniques in 2030? Will the use of Structured Analytic Techniques gain traction and be used with greater frequency by intelligence agencies, law enforcement, the business sector, and other professions? Or will its use remain at current levels? Or will it atrophy?
- What forces are spurring the increased use of structured analysis, and what opportunities are available to support these forces?
- What obstacles are hindering the increased use of structured analysis, and how might these obstacles be overcome?

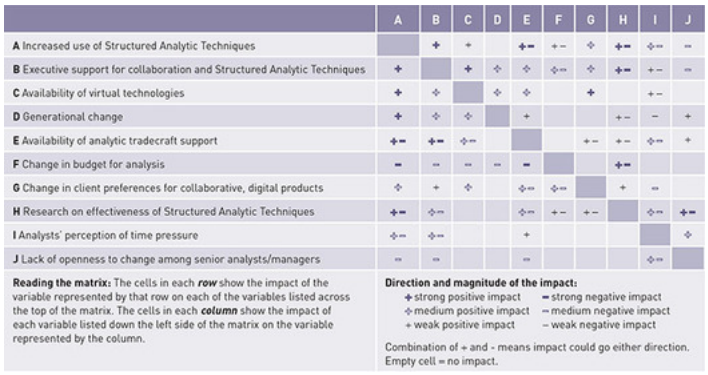
In this chapter, we suppose that it is now the year 2030 and the use of Structured Analytic Techniques is widespread. We present our vision of what has happened to make this a reality and how the use of structured techniques has transformed the way analysis is done—not only in intelligence but across a broad range of professional disciplines.

11.3.1 Structuring the Data

The analysis for this future of Structured Analytic Techniques case study starts with a brainstormed list of variables that will influence—or be impacted by—the use of Structured Analytic Techniques in the coming years. The first variable listed is the target variable, followed by nine other variables related to it.

A. Increased use of Structured Analytic Techniques
B. Executive support for collaboration and Structured Analytic Techniques
C. Availability of virtual collaborative technology platforms
D. Generational change of analysts
E. Availability of analytic tradecraft support and mentoring
F. Change in budget for analysis
G. Change in client preferences for collaborative, digital products
H. Research on effectiveness of Structured Analytic Techniques
I. Analysts' perception of time pressure
J. Lack of openness to change among senior analysts and mid-level managers

The next step in Complexity Manager is to put these ten variables into a Cross-Impact Matrix. This is a tool for the systematic description of the two-way interaction between each pair of variables. Each pair is assessed using the following question: Does this variable affect the paired variable in a manner that will contribute to increased or decreased use of Structured Analytic Techniques in 2030? The completed matrix is shown in Figure 11.3.1. This is the same matrix that appears in chapter 10.



	A	B	C	D	E	F	G	H	I	J
A Increased use of Structured Analytic Techniques		+	+		+–	+–	⁘	+–	⁘–	–
B Executive support for collaboration and Structured Analytic Techniques	+		+	⁘	⁘	⁘–	⁘	+–	+–	–
C Availability of virtual technologies	+	⁘		⁘	⁘		+		+–	
D Generational change	+	⁘	⁘		+			+–	–	+
E Availability of analytic tradecraft support	+–	+–	⁘–				+–	+–	⁘–	+
F Change in budget for analysis	–	–	–	–	–			+–		
G Change in client preferences for collaborative, digital products	⁘	+	⁘		⁘–	⁘–		+	–	
H Research on effectiveness of Structured Analytic Techniques	+–	⁘–			⁘–	+–	+–		⁘–	+–
I Analysts' perception of time pressure	⁘–	⁘–			+					⁘
J Lack of openness to change among senior analysts/managers	–	–			–				⁘–	

Reading the matrix: The cells in each ***row*** show the impact of the variable represented by that row on each of the variables listed across the top of the matrix. The cells in each ***column*** show the impact of each variable listed down the left side of the matrix on the variable represented by the column.

Direction and magnitude of the impact:
+ strong positive impact
⁘ medium positive impact
\+ weak positive impact
– strong negative impact
⁘– medium negative impact
– weak negative impact

Combination of + and - means impact could go either direction.
Empty cell = no impact.

Description

Figure 11.3.1 Variables Affecting the Future Use of Structured Analysis

The goal of this analysis is to assess the likelihood of a substantial increase in the use of Structured Analytic Techniques by 2030, while identifying any side effects that might be associated with such an increase. That is why increased use of structured techniques is the lead variable, variable A, which forms the first column and top row of the matrix. The letters across the top of the matrix are abbreviations of the same variables listed down the left side.

To fill in the matrix, the authors started with *column A* to assess the impact of each of the variables listed down the left side of the matrix on the frequency of use of structured analysis. This exercise provides an overview of what likely are the most important variables that will impact positively or negatively on the use of structured analysis. Next, the authors completed *row A* across the top of the matrix. This shows the reverse impact—the impact of increased use of structured analysis on the other variables listed across the top of the matrix. Here one identifies the second-tier effects. Does the growing use of structured techniques affect any of these other variables in ways that one needs to be aware of?[11]

The remainder of the matrix was then completed one variable at a time, while identifying and making notes on potentially significant secondary effects. A secondary effect occurs when one variable strengthens or weakens another variable, which in turn has an effect on or is affected by Structured Analytic Techniques.

11.3.2 Identifying Key Drivers

A rigorous analysis of the interaction of all the variables suggests several conclusions about the future of structured analysis. The analysis focuses on those variables that (1) are changing or that have the potential to change and (2) have the greatest impact on other significant variables.

The principal potential positive drivers of the system are the extent to which (1) senior executives support a culture of collaboration and (2) the work environment supports the development of virtual collaborative communities and technologies. These two variables provide strong support to structured analysis through their endorsement of and support for collaboration. Structured analysis reinforces them in turn by providing an optimal process through which collaboration occurs.

A third variable, the new generation of analysts accustomed to social networking, is strongly supportive of information sharing and collaboration and therefore indirectly supportive of growth in the use of Structured Analytic Techniques. The impact of the new generation of analysts is important because it means time is not neutral. In other words, with the new generation, time is now on the side of change. The interaction of these three variables, all reinforcing one another and moving in the same direction, signals that the future of structured techniques is most likely to be positive.

Two other variables are likely to play a major role because they have the most cross-impact on other variables as shown in the matrix. These two variables represent opportunities either to facilitate the change or obstacles that need to be managed. The two variables are (1) the level of support for analytic tradecraft cells, on-the-job mentoring, and facilitators to assist analysts and analytic teams in using structured techniques[12] and (2) the results of ongoing research on the effectiveness of structured techniques.

- The speed and ease of the change in integrating structured techniques into the analytic process will be significantly influenced by the availability of senior mentors and facilitators who can identify which techniques to use and explain how to use them correctly.

- Ongoing research into the viability of structured techniques and best ways to harness their potential could provide strong validation for their use or undercut the prima facia case for their use. Research that discusses some of the obstacles identified earlier in this chapter could be helpful in optimizing their use and counter the opposition from those who are hesitant using the techniques.

The odds seem to favor continuing, fundamental change in how analysis is done. However, any change is far from guaranteed, because the outcome depends on two assumptions, either of which, if wrong, could preclude the desired outcome.

- One assumption is that funding for analysis during the next decade will be adequate to provide an environment conducive to the expanded use of Structured Analytic Techniques. Increased training of managers as well as analysts in the proper use of structured techniques is important, but the provision of online programs and informal “brown bag” sessions to reinforce what was taught as well as the availability of knowledgeable mentors and facilitators is even more important. In addition, funding is needed to establish and sustain analytic tradecraft and collaboration support cells, facilitation support, mentoring programs, and research on the effectiveness of Structured Analytic Techniques.

- A second assumption is that senior executives will have the wisdom to allocate the necessary personnel and resources to create robust collaboration communities within and external to their organizational units. A critical requirement is the

introduction and institutionalization of inventive and effective incentives to foster the broader use of structured techniques in support of their analysis.

11.4 ROLE OF STRUCTURED TECHNIQUES IN 2030

Imagine it is now 2030. Our assumptions have turned out to be accurate, and collaboration in the use of Structured Analytic Techniques is widespread. What has happened to make this outcome possible? How has it transformed the way analysis is done in 2030? This is our vision of what could be happening by that date.

The use of analytic teams and virtual collaborative platforms has been growing rapidly over the past decade. Analysts working in small groups, often from different locations, have increasingly embraced digital collaborative systems as user-friendly vehicles to produce joint papers with colleagues working on related topics in other offices. Analysts in different geographic locations arrange to meet from time to time, but most of the ongoing interaction is accomplished using asynchronous and synchronous computer applications and systems.

Analysts, with a click of the mouse or a simple voice command, can find themselves participating in a virtual meeting conferring with experts from multiple geographic locations. They can post their papers—or more likely a digital product—for others to review and edit in their virtual world, call up an internet site that merits examination, or project what they see on their own computer screens so that others can view their presentation or how they are using a specific software tool. Analysts or small teams can use virtual, collaborative platforms to be mentored “on demand” by a senior analyst on the use of a particular technique or by an instructor who can teach a structured techniques workshop without requiring anyone to leave his or her cubicle.

Structured Analytic Techniques have become a primary vehicle by which information is shared as analysts work together to deliver a high-quality product. Analysts readily employ a basic set of

techniques and critical thinking skills at the beginning of most projects to establish a shared foundation for their communication and work together. They routinely use structured brainstorming techniques to identify key drivers and relevant variables to be tracked and considered, a Cross-Impact Matrix as a basis for discussion and learning from one another about the relationships between key variables, and a Key Assumptions Check to review and critically assess the assumptions that will provide the foundation for the analysis. They usually incorporate the results of these exercises as dropdowns in their tablet presentations.

The techniques provide a common base of knowledge and understanding about a topic of interest. They also help reveal, at an early stage of the production process, potential differences of opinion, gaps in the available information, what graphics to use, and where best to find the data and tap the expertise of people most knowledgeable about various aspects of the project.

By 2030, most social media service providers have established large analytic units to vet what is posted on their sites and combat the proliferation of Digital Disinformation or “Fake News.” Many of these units have started to employ structured techniques to instill more rigor into their analytic processes and anticipate new ways perpetrators of Digital Disinformation could thwart their curation processes.

By 2030, all the principal elements of the U.S. Intelligence Community, many foreign intelligence services, and a growing number of business analysis units have created analytic tradecraft or collaboration support cells—or support mechanisms—in their analytic components. Academic institutions now routinely teach courses on critical thinking, cognitive bias, Structured Analytic Techniques, combating Digital Disinformation, and using structured techniques to better exploit Big Data. Analysts with experience in using structured techniques routinely help other analysts overcome their uncertainty when using a technique for the first time. They help others decide which techniques are most appropriate for their

particular needs, provide oversight when needed to ensure that a technique is being used appropriately, and teach other analysts through example and on-the-job training how to effectively facilitate team or group meetings.

In 2030, the process for coordinating analytic papers and assessments is dramatically different. Formal coordination prior to publication is now a formality. Collaboration among interested parties takes place from the start as papers are initially conceptualized and relevant information is collected and shared. Basic critical thinking techniques such as the use of AIMS (**A**udience, **I**ssue, **M**essage, and **S**toryline) to describe the key components of an analyst's project and the Getting Started Checklist are used regularly. Differences of opinion are surfaced and explored early in the preparation of an analytic product. Analytic techniques, such as Premortem Analysis and Structured Self-Critique, have become a requirement to bulletproof analytic products. Several Adversarial Collaboration techniques have become ingrained into the culture as the most effective mechanisms to resolve disagreements before final coordination and delivery of an analytic product.

Exploitation of outside knowledge—especially cultural, environmental, and technical expertise—has increased significantly. Outside-In Thinking, Structured Analogies, and the Delphi Method are used extensively to obtain ideas, judgments, or forecasts electronically from geographically dispersed panels of experts. Almost all analytic units have a dedicated unit for conducting Foresight analysis that (1) identifies key drivers to help frame basic lines of analysis and (2) generates a set of alternative scenarios that can be tracked using validated indicators to anticipate new challenges and exploit new opportunities.

By 2030, the use of Structured Analytic Techniques has expanded across the globe. All U.S. intelligence agencies, all intelligence services in Europe, and many services in other parts of the world have incorporated structured techniques into their analytic process. Over one hundred Fortune 500 companies with competitive

intelligence units routinely employ structured techniques, including Foresight, Indicators, and Decision Support tools. A growing number of hospitals have incorporated selected structured techniques, including the Key Assumptions Check, Differential Diagnosis (their version of Analysis of Competing Hypotheses), Indicators, and Premortem Analysis into their analytic processes. Many businesses have concluded that they can no longer afford multimillion-dollar mistakes that would have been avoided by embracing competitive intelligence processes in their business practices.

One no longer hears the old claim that there is no proof that the use of Structured Analytic Techniques improves analysis. The widespread use of structured techniques in 2030 is partially attributable to the debunking of that claim. Several European Union and other foreign studies involving a sample of reports prepared with the assistance of several structured techniques and a comparable sample of reports where structured techniques had not been used showed that the use of structured techniques had distinct value. Researchers interviewed the authors of the reports, their managers, and the clients who received these reports. The studies confirmed that reports prepared with the assistance of the selected structured techniques were more thorough, provided better accounts of how the conclusions were reached, and generated greater confidence in the conclusions than did reports for which such techniques were not used. The findings were replicated by several government intelligence services that use the techniques, and the results were sufficiently convincing to quiet most of the doubters.

The collective result of all these developments is an analytic climate in 2030 that produces more rigorous, constructive, and informative analysis—a development that decision makers have noted and are making use of as they face increasingly complex and interrelated policy challenges. As a result, policymakers are increasingly demanding analytic products that identify key drivers, consider multiple scenarios, and challenge key assumptions and the conventional wisdom. The key conclusions generated by techniques such as Quadrant Crunching™ and What If? Analysis are commonly

discussed among analysts and decision makers alike. In some cases, decision makers or their aides observe or participate in Foresight workshops using structured techniques. These interactions help both clients and analysts understand the benefits and limitations of using collaborative processes to produce analysis that informs and augments policy deliberations.

This vision of a robust and policy-relevant analytic climate in 2030 is achievable. But it is predicated on the willingness and ability of senior managers in the intelligence, law enforcement, and business communities to foster a collaborative environment that encourages the use of Structured Analytic Techniques. Achieving this goal will require a relatively modest infusion of resources for analytic tradecraft centers, facilitators, mentors, and methodology development and testing. It will also require patience and a willingness to tolerate some mistakes as analysts become familiar with the techniques, collaborative software, and working in a virtual, digital landscape. We believe the outcome will be worth the risk involved in charting a new analytic frontier.

NOTES

1. Stephen Artner, Richard S. Girven, and James B. Bruce, *Assessing the Value of Structured Analytic Techniques in the U.S. Intelligence Community* (Santa Monica, CA: RAND Corporation, 2016), https://www.rand.org/pubs/research_reports/RR1408.html

2. Stephen Coulthart, "Improving the Analysis of Foreign Affairs: Evaluating Structured Analytic Techniques" (PhD diss., University of Pittsburgh, 2015), http://d-scholarship.pitt.edu/26055/

3. Welton Chang et al., "Restructuring Structured Analytic Techniques in Intelligence," *Intelligence and National Security* 33, no. 3 (2018): 337–56, https://doi.org/10.1080/02684527.2017.1400230

4. Paul Bedard, "CIA Chief Claims Progress with Intelligence Reforms," *U.S. News and World Report,* May 16, 2008, www.usnews.com/articles/news/2008/05/16/cia-chief-claims-progress-with-intelligence-reforms.html

5. One of the best examples of research that does meet this comparability standard is Robert D. Folker, Jr., *Intelligence Analysis in Theater Joint Intelligence Centers: An Experiment in Applying Structured Methods* (Washington, DC: Joint Military Intelligence College, 2000).

6. Philip Tetlock, *Expert Political Judgment* (Princeton, NJ: Princeton University Press, 2005), 190–202.

7. These judgments have been made in public statements and in personal communications to the authors.

8. *Merriam-Webster Online,* www.m-w.com/dictionary/analysis

9. Charlan J. Nemeth and Brendan Nemeth-Brown, "Better Than Individuals? The Potential Benefits of Dissent and Diversity for Group Creativity," in *Group Creativity: Innovation through*

Collaboration, eds. Paul B. Paulus and Bernard A. Nijstad (New York: Oxford University Press, 2003), 63–64.

10. This information was provided by a senior U.S. Intelligence Community educator in December 2006 and has been validated subsequently on many occasions in projects done by government analysts.

11. For a more detailed explanation of how each variable was rated in the Complexity Analysis matrix, send an email requesting the data to think@globalytica.com.

12. The concept of analytic tradecraft support cells is explored more fully in Randolph H. Pherson, "Transformation Cells: An Innovative Way to Institutionalize Collaboration," in *Collaboration in the National Security Arena: Myths and Reality—What Science and Experience Can Contribute to Its Success*, June 2009. It is part of a collection published by the Topical Strategic Multilayer Assessment (SMA), Multi-Agency/Multi-Disciplinary White Papers in Support of Counter-Terrorism and Counter-WMD, Office of Secretary of Defense/DDR&E/RTTO, http://www.hsdl.org/?view&did=712792.

Structured Analytic Techniques: Families and Linkages

The sixty-six Structured Analytic Techniques presented in this book can be used independently or in concert with other techniques. The art and science of analysis is dynamic, however, and we expect this list of techniques to continue to change over time.

For ease of presentation, we have sorted the techniques into six groups, or families, mirroring when they most often are used in the analytic production process. See chapter 3 for guidance on how to select the proper technique(s).

The graphic on the opposing page illustrates the relationships among the techniques. Mapping the techniques in this manner highlights the mutually reinforcing nature of many of the techniques.

Many of these techniques have value for more than one family. These “core” techniques relate to three or more families and are highlighted in a light color. These techniques are often cited by analysts in the intelligence and business communities as tools they are most likely to use in their analysis.

Structured Analytic Techniques that make use of indicators are designated by stars.

Descriptions of Images and Figures

Back to Figure

Reading the matrix: The cells in each row show the impact of the variable represented by that row on each of the variables listed across the top of the matrix. The cells in each column show the impact of each variable listed down the left side of the matrix on the variable represented by the column. Combination of positive and negative means impact could go either direction.

Empty cell equals no impact.

	A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**
A Increased use of Structured Analytic Techniques		Strong positive	Weak positive		Strong positive and strong negative	Weak positive and weak negative	Medium positive	Strong positive and strong negative	M p a m n
B Executive support for collaboration and Structured Analytic Techniques	Strong positive		Strong positive	Medium positive	Medium positive	Medium positive and medium negative	Medium positive	Strong positive and strong negative	W p a w n
Availability of virtual technologies	Strong positive	Medium positive		Medium positive	Medium positive		Strong positive		W p a w n
D Generational change	Strong positive	Medium positive	Medium positive		Weak positive			Weak positive and weak negative	W n
E Availability of analytic tradecraft support	Strong positive and strong negative	Strong positive and strong negative	Medium positive and medium negative				Weak positive and weak negative	Weak positive and weak negative	M p a m n

	A	B	C	D	E	F	G	H	I
F Change in budget for analysis	Strong negative	Medium negative	Medium negative	Medium negative	Strong negative			Strong positive and strong negative	
G Charge in client preferences for collaborative, digital products	Medium positive	Weak positive	Medium positive		Medium positive and medium negative	Medium positive and medium negative		Weak positive	M n
H Research on effectiveness of Structured Analytic Techniques	Strong positive and strong negative	Medium positive and medium negative			Medium positive and medium negative	Weak positive and weak negative	Weak positive and weak negative		M p a m n
I Analysts' perception of time pressure	Medium positive and medium negative	Medium positive and medium negative			Weak positive				
J Lack of openness to change among senior analysts/managers	Medium negative	Medium negative			Medium negative				M p a m n