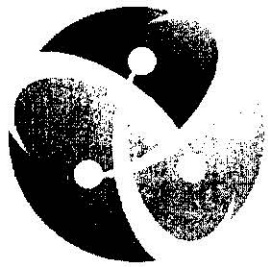


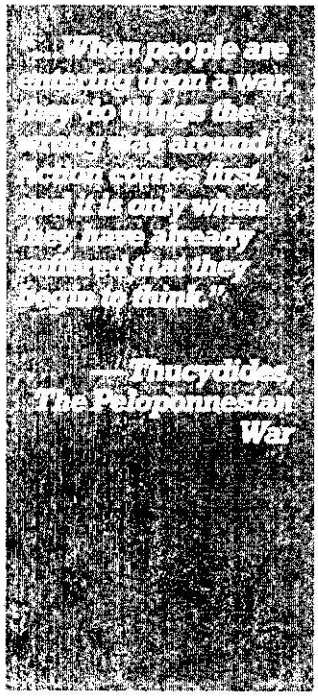
DIRECTORATE FOR ANALYSIS

ANALYTIC METHODOLOGIES

A Tradecraft Primer: Basic Structured Analytic Techniques

FIRST EDITION
MARCH 2008

FOREWORD



This primer is intended to be a companion to the Sherman Kent School's *A Tradecraft Primer: Structured Analytic Techniques for Improving Intelligence Analysis*. The only duplication occurs where DIA's Directorate for Analysis differs slightly in the use or interpretation of a given technique. The primer was developed to give analysts in the Directorate for Analysis a reference document for the basic structured analytic techniques that form the content base of DI's analytic foundation courses — composed of the *Fundamentals of Intelligence Analysis* and all variations of the *Critical Thinking and Structured Analysis* courses. Therefore, while the potential use of the techniques is limited only by the individual's imagination, this primer focuses on their use for intelligence analysis.

This primer includes common basic structured analytic techniques that help mitigate bias and mindset that may influence analysis. The techniques are presented in a clear and concise manner using intelligence-based examples to demonstrate the value to the analyst. Analysts are expected to determine the relevance of each technique to their subject matter or problem set and then adopt those most appropriate to their analysis. Current and emerging mandates, including product evaluation based on developed standards and sourcing requirements from the Office of the Director for National Intelligence, can be met best through ongoing efforts to improve the analyst's understanding and use of a critical thinking process and structured analytic techniques. This primer is one of many actions intended to meet that goal.

Suggestions and comments on this primer should be submitted to the Defense Intelligence Agency, Directorate for Analysis Research Director Staff, using e-mail sent to:

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Functional Manager for Analysis
Defense Intelligence Agency

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INTRODUCTION

This primer is intended to support Defense Intelligence Agency analyst training courses and give the analyst an efficient reference to analytic methods to gain insight into intelligence challenges while helping to mitigate bias and mindset that may influence analysis. When integrated with a viable approach to critical thinking, these techniques are the best first line of defense against the most common cognitive biases facing intelligence analysts.

The techniques in this primer are intended not only for use each time the analyst gets a new task or completes a new assessment but also as part of the daily process of gathering and assessing evidence on the assigned subject matter. Many of the examples in this primer are hand drawn to reinforce the ease with which they can be integrated into the daily work flow. Analysts should determine which techniques provide the most insight for them based on their individual capabilities and preferences. The more techniques an analyst uses when analyzing problem sets, the more confidence the analyst will have in his or her assessments.

The level of possible success an analyst gains using these techniques will be largely based on the fidelity with which they are used. This includes reviewing all relevant evidence and data in the same systematic manner regardless of its initial perceived value.

The techniques in this primer are presented in an order in which most analysts would work through an intelligence problem:

- Issue Identification: Properly identifying the issue or problem.
- Evidence Diagnostics: Ensuring evidence is systematically reviewed.
- Hypothesis Generation: Creatively determining reasonable options or alternatives.
- Structured Analytic Techniques: Systematically reviewing hypotheses or options to gain insight for better understanding and presentation.

Analysts face new challenges as the diversity of groups working common issues expands. One of the important functions of this primer is the establishment of a common terminology within the analytic community that will provide a degree of efficiency and accuracy in communication not previously experienced.

Some techniques are believed to be new, or at least of unknown origin. Others have been adapted from other Intelligence Community training centers and some adapted from concepts included in Morgan D. Jones's book *The Thinker's Toolkit: 14 Powerful Techniques for Problem Solving.*

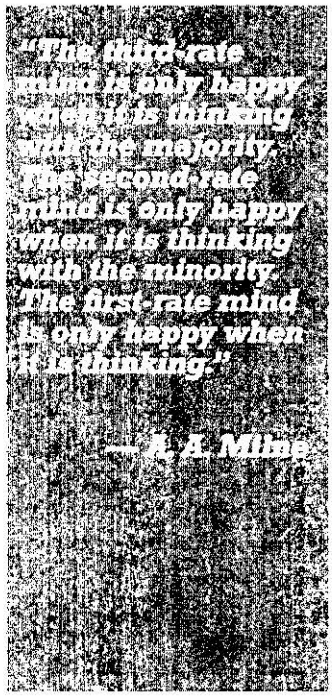
> *"Analytic tradecraft is the practiced skill of applying learned techniques and methodologies appropriate to an issue to mitigate bias, gain insight, and provide persuasive understanding of the issue to members of the U.S. Government and its allies."* — Directorate for Analysis definition.

ISSUE DEVELOPMENT

Most questions can be broken down into three categories. Questions of preference rarely intrude on the substantive world of intelligence analysis outside preferences of the subject of a biography. As such, they do not require methods or techniques for ensuring a quality response.

Questions of fact have only one correct answer. Some science and technology intelligence topics respond to questions of fact, although the specific answer frequently is based on very detailed and precise factors. As a result, the use of the response and level of variance acceptable are considerations and part of gaining the understanding necessary to provide the appropriate answer.

Most intelligence analysis is conducted in response to questions of judgment. These are questions where the quality of the answer can vary widely and the better the understanding of the issue or problem to analyzed, the better the chances of a high-quality answer. Therefore, issue development is an important ingredient for improving the quality of the finished intelligence developed in response to the question. Beyond having a healthy dialogue with the customer or the official customer liaison, there are methods for the analyst to review and develop the question or issue to be analyzed in the process for meeting customer needs. Those techniques follow.



NOTES

ISSUE DEVELOPMENT

A technique used to ensure the central issues and alternative explanations of an issue or problem are identified within the scope and focus of the problem statement to aid in gaining the best answer. This technique is also known as framing the question and problem restatement.

WHEN TO USE

Issue development should be used anytime the analyst begins to assess a new issue or problem or begins a new research endeavor to mitigate bias toward the issue. This technique may be used at any point throughout the analytic process, but it is especially useful when a new hypothesis or new evidence is introduced. This method is also well employed in reexamining a hypothesis or problem when an analyst is "stuck."

VALUE ADDED

Proper issue identification can save a great deal of time and effort that is easily misspent on research and analysis of a poorly stated issue that gives free rein to the analyst's bias. Poorly stated issues frequently fall into the following categories:

- Issue is solution driven. (Where is the WMD in Iraq?)
- Issue is assumption driven. (When China launches rockets into Taiwan, will the Taiwanese government collapse?)
- Issue definition is too broad or ambiguous. (What is the status of Russia's air defense system?)
- Issue definition is too narrow or misdirected. (Who is voting for President Chavez in the election?)

POTENTIAL PITFALLS

Although issue identification only takes 5 to 10 minutes with practice, analysts new to the technique tend to think it takes too long to accomplish. Poorly articulated issues, questions, or tasks are more difficult to redefine and may require reengaging with the source of the issue for clarification.

THE METHOD

Below are some of most efficient ways to ensure the issue is properly identified. The following processes may be used in any order and should be used together to identify the central issues and alternative explanations.

Paraphrase. Redefine the issue without losing the original meaning. Review the results to see if they provide a better foundation upon which to conduct the research and assessment to gain the best answer.

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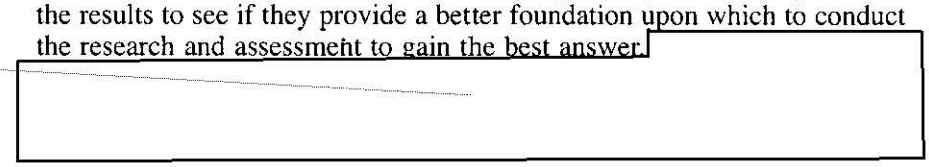

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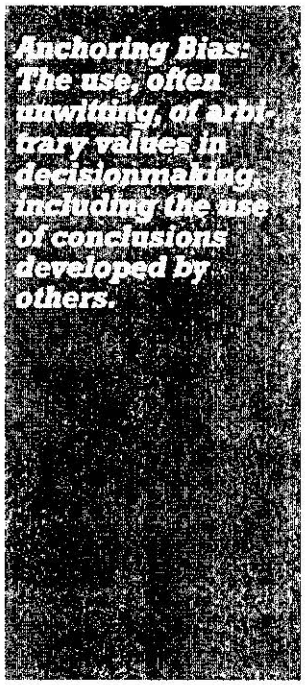

180 Degrees. Turn the issue on its head. Is the issue the one asked or the opposite of it?

[redacted]

Broaden the Focus. Instead of focusing on only one piece of the puzzle, step back and look at several pieces together. What is the issue before you connected to?

[redacted] (b)(5)

Narrow the Focus. Can the issue be broken down further? Take the question and ask about the components that make up the problem.

[redacted] (b)(5)

Redirect the Focus. What outside forces impinge on this issue? Is deception involved?

[redacted] (b)(5)

Ask "Why." Ask "why" of the initial issue or question. Develop a new question based on the answer. Then ask "why" of the second question and develop a new question based on that answer. Repeat this process until you believe the real problem emerges. This process is especially effective in generating possible alternative answers.

Example

(b)(5)

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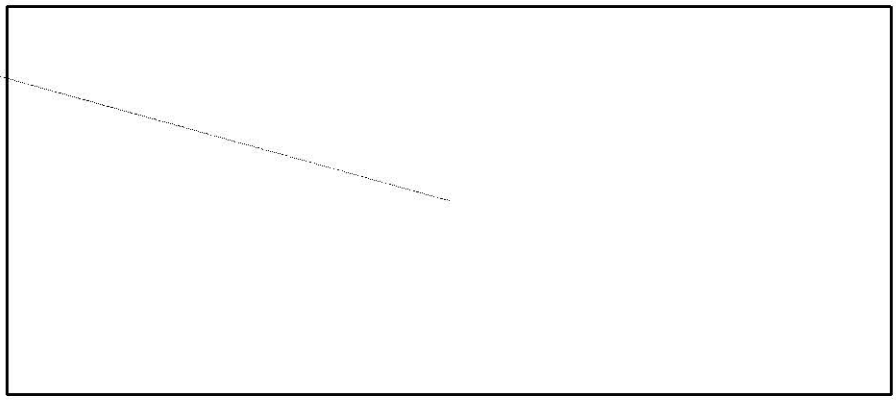


TIPS

- Always state the identified issue in a simple, positive question using active voice.
- When evidence indicates the issue may be improperly developed, return to the methods outlined above and review it again.

NOTES

DIAGNOSTIC TECHNIQUES

The Sherman Kent School's primer includes several elements of evidence review under the diagnostic title Quality of Information. This primer recommends reviewing the source, the information, the relevance of the information, and the possibility for denial and deception and considering them separate parts of the whole. The source is reviewed for reliability whereas the information is reviewed for viability. While related, they do not necessarily have a direct correlation. Relevance is frequently missed in the review of the source and information because of the perceived importance of the information even though it is not related to the issue being assessed. Denial and deception is too frequently relegated to a separate review or consideration, leading to less insight and understanding of the evidence or information than can be gained when source, information, and relevance are part of the consideration of denial and deception.

This primer also recommends that the diagnostic evaluation be recorded as part of the tracking of evidence so bias toward more recent reports or a failure to remember previous concerns is lessened. Efforts to automate the administration of tracking evidence, the diagnostics, and use of structured analytic techniques continue and are intended to support the techniques and recommendations in this primer.

NOTES

SOURCE CHECK

An evaluation of the source of information being marshaled for analysis to help determine source reliability and credibility based on the source's history and operational parameters.

WHEN TO USE

The source check should be conducted with the other information diagnostics as part of the first full review of the information. Any delay in the check will allow bias to form and potentially supersede good analytic tradecraft practices. If time allows, a second review after the initial draft assessment can pay dividends in determining the strengths and weaknesses of the information on which an analytic assessment rests. It also ensures that the appropriate confidence has been expressed.

VALUE ADDED

The primary value of this diagnostic technique is to mitigate bias for or against a given source. It also provides insight into the strength and weaknesses of the source being used that translates into a more cogent assessment of the source's reliability. In addition, the source check can:

- Provide an opportunity to catch errors of interpretation.
- Identify intelligence gaps.
- Give the analyst an opportunity to develop a confidence level for the source.
- Create a robust analyst-collector relationship based on source knowledge.

POTENTIAL PITFALLS

Over time an analyst's mindsets can promote bias for or against a given source of information that easily leads to shortcuts in checking sources. The categorization of all reports from a given source as poor or excellent can lead to an intelligence failure.

THE METHOD

At a minimum, analysts should systematically consider asking the following questions when evaluating their sources:

Human Intelligence *(HUMINT)*

- Are there multiple points of view in this report? What are they? (e.g., source and reporting officer)
- Who wrote the report, and what organization do they belong to?
- What is the evaluation of the source within the report?

- Has the reporting officer/handler interjected his or her opinions or assessments into the report (e.g., suggested coordinates of a village mentioned by the source)?
- Did the handler interpret correctly what the source actually meant (e.g., are there language barriers or expertise barriers that could be incorrectly reported)?
- What is the source's point of view?
- What is the source's placement/access in relation to the information reported?
- What is this source's history based on previous reporting?
- Can you discern the source's motivation and background?

Geospatial Intelligence *(GEOINT)*

- Are there features or activity that could be more effectively detected through nonliteral imagery analysis?
- Were there special collections initiated against the area of interest?
- Is the collection strategist well versed in special collection strategies?
- What is the currency of geospatial data sets?
- What is the experience of the Geographical Information Systems or imagery analyst?

Signals Intelligence *(SIGINT)*

Communications Intelligence (COMINT)

- Who translated the conversation, and what organization do they belong to?
- What is the language or transcription proficiency of the translator?
- Do they understand slang or technical terms associated with the topic?

Electronic Intelligence (ELINT)

- What type(s) of collection platform(s) was used and what gaps exist in the collection coverage?
- Are there any anomalies or artifacts associated with the collection?
- Does this collection have any equipment limitations, or is it subject to environmental factors?
- How accurate is the intercept location(s) and operating mode of the emitter(s)? Are they valid for the signal? Was the signal(s) properly identified?
- Is the signal new or known? Does the emitter correlate to a known site, platform, or system?
- What is the coverage and location accuracy (ellipse size based on how many hits)?

Measurement and Signature Intelligence *(MASINT)*

- What are the collection platform capabilities and limitations?
- Do I understand what the data is telling me? (Implications?)
- Who analyzed the data, and what organization do they belong to? What is their ability? Are they experienced with this type of problem?
- What was the duration of collection?
- What is the frequency of collection? When does it occur (time/day)?
- Is additional data being collected at different times?
- What is the coverage and location accuracy (ellipse size based on how many hits)?
- How often do you have access to it?

Open-Source Intelligence *(OSINT)*

- If based on a foreign language: Who translated the report and what organization do they belong to? What is their ability? Do they understand slang? Are they experienced with this type of problem?
- Who wrote/published the report, and what organization do they belong to?
- What is the author/publisher's history based on previous reports?
- Are there multiple points of view in this report? What are they, and whose are they?
- What is the author's point of view and purpose?
- What is the author's background and motivation? What are his or her identifiable biases?

TIPS

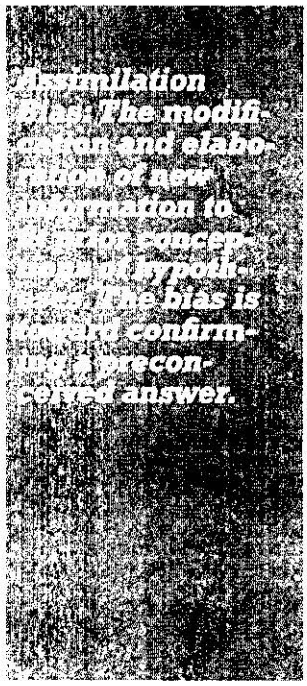
- Use the DI-developed spreadsheet available on the DI Tradecraft Sharepoint site to track your marshaled information and record your confidence in the source as a constant reminder of your findings.

NOTES

SOURCE CHECKS

QUALITY-OF-INFORMATION CHECK

A way to evaluate completeness and validity of available information separately from the source.



WHEN TO USE

The quality-of-information check should be initially conducted during the research and marshaling phases of the analytic process. The purpose is to gain insight into the validity strengths and weaknesses of the action information gathered independent of the source. Periodic reviews of the quality of the information should be conducted after the initial marshaling to prevent assumptions or weak judgments from becoming fact over time.

VALUE ADDED

Determining the quality of information independently of the source of the information is important to ensure that neither unduly compromises or supports the other. That is, an excellent source can knowingly and admittedly pass third- or fourth-hand information that may be of low quality. It is important to keep the two reviews separate. This check can:

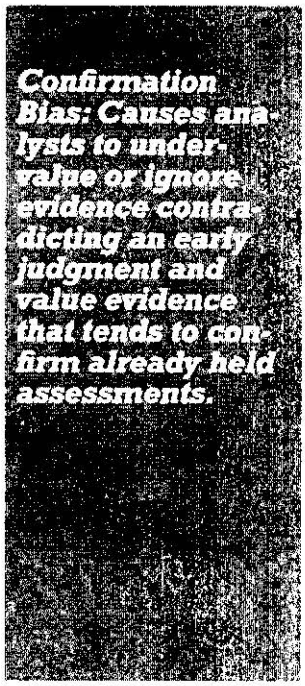
- Provide the most important basis of determining confidence of the assessment and judgments.
- Provide an opportunity to mitigate assimilation or confirmation bias based on the source.
- Provide an opportunity to catch errors of interpretation.
- Identify intelligence gaps.
- Help identify areas of concern of denial and deception.
- Give the analyst an opportunity to clearly convey to the customers a better understanding of the analyst's confidence in the aspects of the problem.

POTENTIAL PITFALLS

Analysts can become susceptible to circular reporting and source-based bias when reviewing the quality of information. Critical information can occasionally be found in reports from sources judged to have low access or a poor record. To not review the information on the basis of quality independent of the source could cause the information to be unduly dismissed. Where the same analyst works the same subject or area for extended periods of time, the analyst may miss the significance of incremental changes. Use the indicators or signposts of change to mitigate this possibility.

THE METHOD

At a minimum, analysts should systematically ask themselves the following questions when evaluating the quality of information:



Human Intelligence ***(HUMINT)***

- Who wrote the report, and to what organization do they belong?
- What changes have been made to the data since original collection?
- What is the collector's evaluation of the information in the report?
- Can the source's purpose be ascertained?
- Was the information first-, second-, or third-hand?
- Is there information from a separate INT that corroborates this report?
- Is this information consistent or inconsistent with previous information?
- Do you have any concerns that denial and deception may be in the information? Why?

Geospatial Intelligence ***(GEOINT)***

- What is the frequency of collection? When does it occur (time/day)? Have there been any recent changes to the frequency of collection or exploitation?
- Are additional images being taken at different times?
- Is the target aware of overhead imagery capabilities?
- Are there GEOINT-based indicators being used to assess the site or the activity?
- Is there a geospatial aspect to the information?

Signals Intelligence ***(SIGINT)***
Communications Intelligence (COMINT)

- Is this a complete transcript (verbatim) or a processed (analyzed) summary of the traffic?
- Was this report a snippet of a much longer conversation?
- Did a collection shortfall preclude capturing all of the traffic?

Electronic Intelligence (ELINT)

- Is the signal correlated to any events or activity?
- What was the duration of collection?
- What is the frequency of collection? When does it occur (time/day)?
- Are additional signals being collected at different times?
- Is there any additional intelligence that correlates with this emitter activity?
- Has the activity been corroborated by another form of intelligence?

TIPS

- Consciously avoid relating the source to the information until the quality-of-information check is complete. If relating the source to the quality of the information changes your opinion of the information, make sure you can articulate why.
- Use the DI-developed spreadsheet available on the DI Tradecraft Sharepoint site to track your marshaled information and record your confidence in the quality of information as a constant reminder of your findings.

RELEVANCE CHECK

A review determining the relevance of the marshaled information to the issue or question being addressed.

WHEN TO USE

Analysts should review the relevance of all information as it is obtained. If the issue changes, or information indicates the issue needs to be reviewed for possible change of scope, etc., it may be necessary to return to review information previously judged not to be relevant.

VALUE ADDED

This check will ensure the analyst saves time by not assessing information that is not relevant to the central issues being studied. The check also:

- Mitigates the analyst's biases reviewing each piece of information individually.
- Increases the analyst's level of confidence that the assessment is based on thoroughly analyzed data.
- Allows the analyst to easily identify intelligence that is important to his or her judgments.
- Helps identify intelligence gaps.

POTENTIAL PITFALLS

The review can become time consuming if there is a large amount of information.

THE METHOD

Approach each piece of data by determining if it relates to the central issues or alternative possibilities being analyzed. Questions to consider during the review are as follows:

- Does this relate to the main intelligence problem? (Is it related economically, socially, politically, or militarily?)
- Does this relate to subordinate issues associated with the main intelligence problem?
- Does this make sense with what we know?
- Does this make sense with what we think?
- Does this beg further questions or possibly highlight adversarial changes that need to be addressed analytically?
- Is this consistent with previous information? If not, what caused the change?

- What are the implications given this information? (For the U.S., allies and the adversary.)
- What additional information do you need to clarify the issue or lend new insights?
- Develop new collection requirements as necessary based on the review.

TIPS

- Look for alternatives. When reviewing information for relevance, an additional alternative may be raised that in turn requires the issue or problem to be reviewed and restated.
- Use the DI-developed spreadsheet available on the DI Tradecraft Sharepoint site to track your marshaled information and record your confidence in the relevance as a constant reminder of your findings.

HYPOTHESES GENERATION

Hypotheses are preliminary explanations or possible outcomes that are meant to be tested. The generation of hypotheses is the basis of the structured analytic techniques where the analysis of alternatives is paramount to gaining insight and the best answer to a question of judgment.

In a profession where abductive reasoning is commonly used, the Black Swan Rule continues to apply. That is, no matter how many white swans one finds to prove that all swans are white, it only takes one black swan to disprove this hypothesis. Disproving a hypothesis is far more emphatic and valid than attempting to prove it.

> **Abduction,** or **inference to the best explanation,** is a method of reasoning in which one chooses the hypothesis that would, if true, best explain the relevant evidence. Abductive reasoning starts from a set of accepted facts and infers to their most likely, or best, explanations. The term abduction is also sometimes used to mean just the generation of hypotheses to explain observations or conclusions, but the former definition is more common both in philosophy and computing. (Wiki last reviewed 3 December 2007.)

The principle of disproof is a hard doctrine. Even though it is fundamental to effective inquiry, its use is often resisted because of the effects of the very mindsets and biases the approach is attempting to remedy. For example, if two analysts propose two different hypotheses to explain a particular phenomenon, evidently at least one of these hypotheses must be at least partially or completely incorrect. Perhaps this is why so many analysts tend to resist the strong analytic approach.

This difficulty can be mitigated by the method of multiple hypotheses. A famous geologist, T.C. Chamberlin said the trouble is that when we make a single hypothesis, we become attached to it.

"The moment one has offered an original explanation for a phenomenon which seems satisfactory, that moment affection for his intellectual child springs into existence, and as the explanation grows into a definite theory his parental affections cluster about his offspring and it grows more and more dear to him.... There springs up also unwittingly a pressing of the theory to make it fit the facts and a pressing of the facts to make them fit the theory..."

"To avoid this grave danger, the method of multiple working hypotheses is urged. It differs from the simple working hypothesis in that it distributes the effort and divides the affections.... Each hypothesis suggests its own criteria, its own method of proof, its own method of developing the truth, and if a group of hypotheses encompass the subject on all sides, the total outcome of means and of methods is full and rich."

T.C. Chamberlin proposed the method of multiple hypotheses in 1897.

NOTES

DIVERGENT/CONVERGENT THINKING[1]

A form of brainstorming that generates new analytic ideas, hypotheses, or concepts through an unconstrained individual or group process.

WHEN TO USE

This technique works best when an individual is willing to work as part of a group to develop multiple ideas, hypotheses, or concepts. It can be used either at the beginning of an analytic project to help generate the initial hypotheses or at a later stage if the initial result proves inadequate. New information may be found that could cause the analyst to return to this technique to integrate it into the existing hypotheses.

VALUE ADDED

When properly done, this technique can maximize an analyst or group effort to overcome individual biases. It also exposes external factors potentially affecting their analysis or new and larger issues that must be addressed. Creative thinking and the reevaluation of analytic mindsets occur as new ideas are considered, unknown issues come to the fore, and existing ideas, hypotheses, and concepts are reexamined.

POTENTIAL PITFALLS

When the technique is used allowing the members to voice their ideas, there are two relevant obstacles to overcome. First, group members are very susceptible to anchoring bias. One negative comment or gesture can shut down the creativity of the members of the group. Secondly, analysts think much faster than they voice their thoughts, causing nonspeaking members to either forget an idea or to become frustrated. Both obstacles can be overcome to some degree by the use of Post-it notes and not allowing verbal or physical reaction to anyone else's idea.

THE METHOD

Creative thinking works best when a trained facilitator is available to ensure the session is fruitful. The creative thinking process actually consists of two phases: a divergent phase, where group members create new ideas via brainstorming, and a convergent phase, where group members cluster ideas for review, consolidation, and follow-up action.

There are many approaches to creative thinking. This is an example of a typical session:

Divergent Phase

Step One: Organize the group. Group members should come from a vari-

[1] This technique is adapted from the concept of the same named technique in *The Thinker's Toolkit 14 Powerful Techniques for Problem Solving* by Morgan D. Jones.

ety of backgrounds (cross fertilization is important). Cognitive diversity, different points of view, and a wide range of experience are important. Small groups tend to function better than large ones; five to seven participants is a good target.

Step Two: Focus on a specific topic or question. It should not be so broad that no solution is possible or so narrow that creativity won't help. Make clear to all members in advance that discussion will not be constrained by current positions or available evidence.

Step Three: Have everyone write down at least one idea before discussion starts. Use paper, white boards, or Post-it notes to record ideas. That will allow easy clustering of ideas during the convergent phase.

Step Four: Have the group verbally generate as many ideas as possible. When a group has one or more strong personalities, the facilitator can have the members stop all verbalization and write their ideas down and post them where others can read them and build on any idea. Listen closely as others talk; this will help generate ideas. Suspend judgment; do not eliminate ideas; what looks crazy at first may become valuable later, after more thought or when new data is received.

Step Five: Let the first session last for 45-60 minutes or until a noticeable decline in activity takes place. Then take a break. Keep going for two more sessions, ending each when the activity falls off. After the third such period, it is time to stop the divergent phase.

Convergent Phase

Step One: Group the ideas by theme, then set aside any that do not easily fit with any group. Then through voting or other means, select the themes or outliers that deserve further attention.

Step Two: After the session is over, have the individuals spend time alone to silently review the submission and consider:

- Which of the alternatives are reasonable and would meet the goals of the decisionmaker?
- What are the alternative's shortcomings?
- What are the alternative's benefits?

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Example

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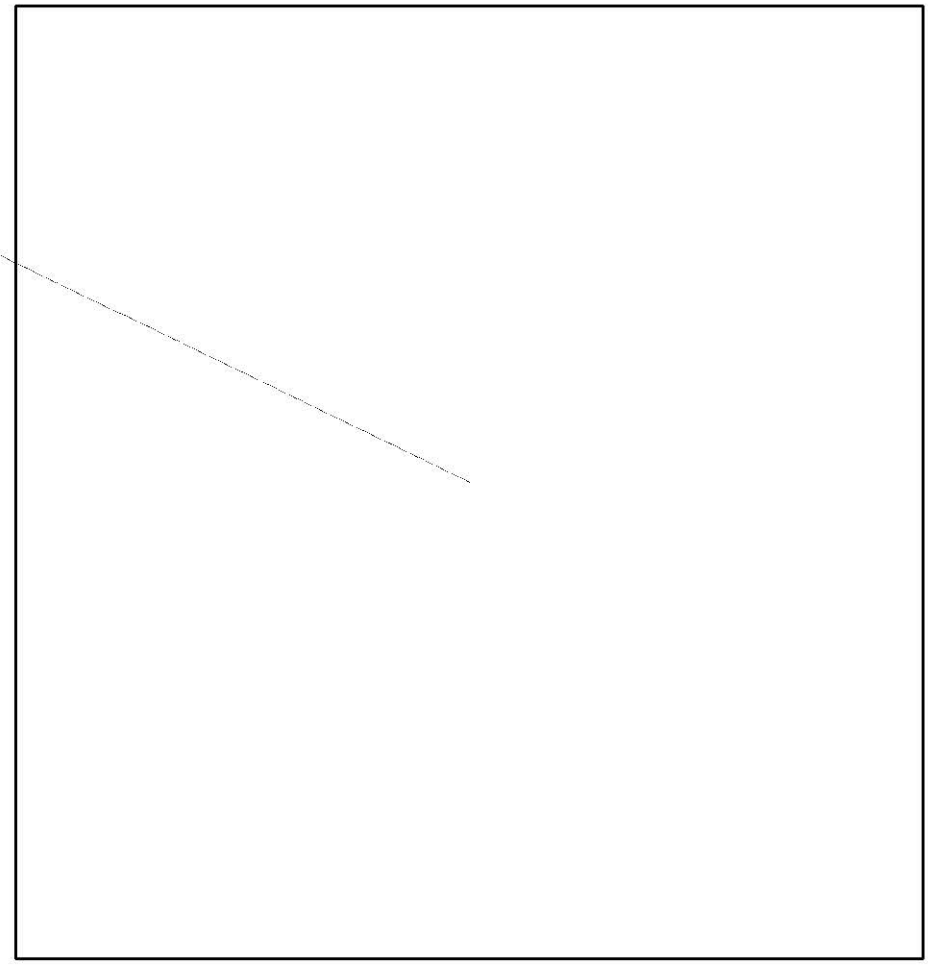

DIVERGENT THINKING

TIPS

- When brainstorming alone, write as many thoughts about the topic as possible. Do not be afraid to stretch your idea of reality.
- Get your coworkers to review your ideas and discuss the feasibility, likelihood, and capabilities needed for these ideas to be true.

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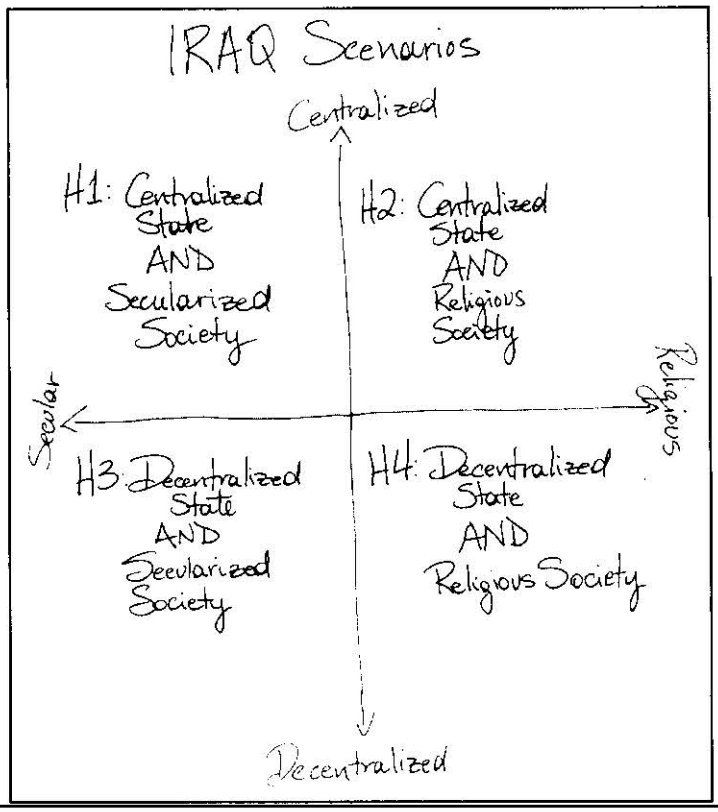

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HYPOTHESIS REVIEW

An effective technique to mitigate mirror-imaging bias and to understand individual hypothesis.

> *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, foreign behavior 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 [sic] the logic of the situation as it appears to them.*
> — Richards J. Heuer, Jr., Psychology of Intelligence Analysis

WHEN TO USE

After generating hypotheses to answer a given question, use this technique to gain a better understanding of alternatives from the adversarial or decisionmaker's point of view to counter mirror-imaging. Ethnocentrism-sometimes referred to as mirror-imaging-is best described as an inability to see the world through the eyes of a different national or ethnic group or the inability to put aside one's own cultural attitudes and imagine the world from the perspective of those belonging to a different group. An ethnocentric perspective is especially dangerous in the intelligence context because it can distort important aspects of strategic thinking, especially where problems of perception and prediction are involved.

VALUE ADDED

It can mitigate mirror-imaging bias and the natural negative bias. It can be applied to any problem at any point in the analytic process as a simple, fast, and effective technique to gain insight into the cultural-based adversary's or decisionmaker's point of view of the potential implications of an option.

POTENTIAL PITFALLS

This method can generate false impressions of a given alternative or the benefit-versus-risk calculus if the analyst does not have an adequate understanding of the adversary or decisionmaker's culture-based point of view.

THE METHOD

For each alternative or hypothesis to be reviewed, perform the following steps from the point of view of the adversary or decisionmaker. Ensure you perform all the steps for one alternative before going on to the next. Knowledge and understanding of the culture(s) involved as well as the goals and motivation are critical to the success not only of this technique but of the assessment to follow.

Step One: List all the benefits or pluses for the alternative being reviewed from the adversary or decisionmaker's point of view. Why would it be a good choice?

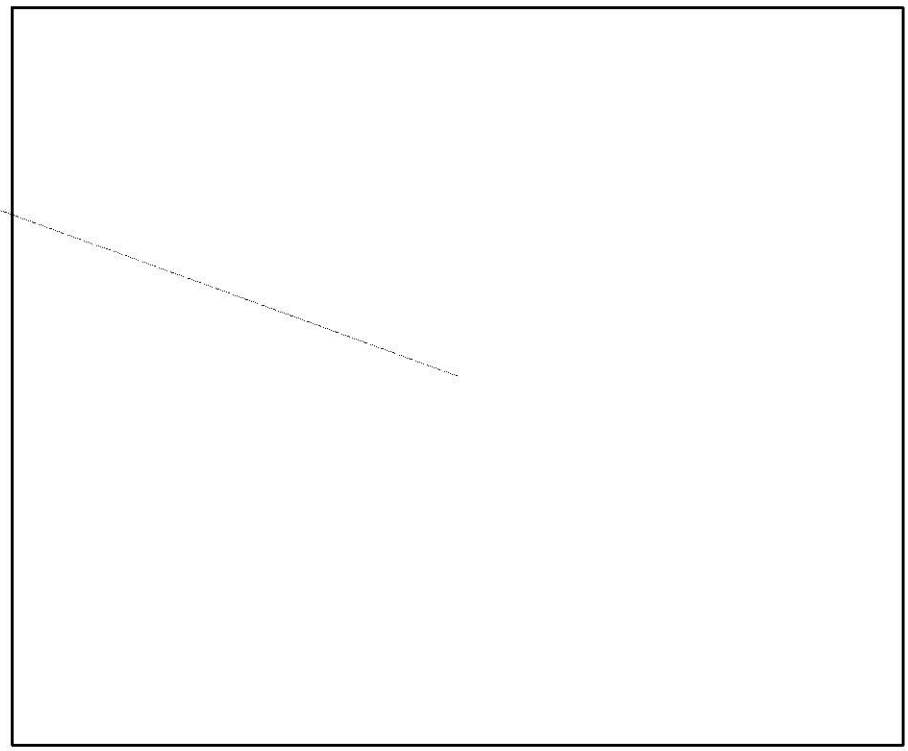
Step Two: List all the risks or minuses for the alternative being reviewed from the adversary or decisionmaker's point of view. What detracts from it being a good choice?

Step Three: Attempt to mitigate each risk or minus with actions the adversary or decisionmaker could take that would be consistent with their culture or, if not, be sure you understand the logic of such an unexpected reaction.

Step Four: Compare the results of the review for each hypothesis.

Remember that the technique is used to gain insight into the alternatives from other than the analyst's point of view. It will not provide the correct alternative that will be selected by the decisionmaker, but it will provide insight and understanding of the context in which the decision will be made.

(b)(3):10 USC 424



HYPOTHESIS REVIEW

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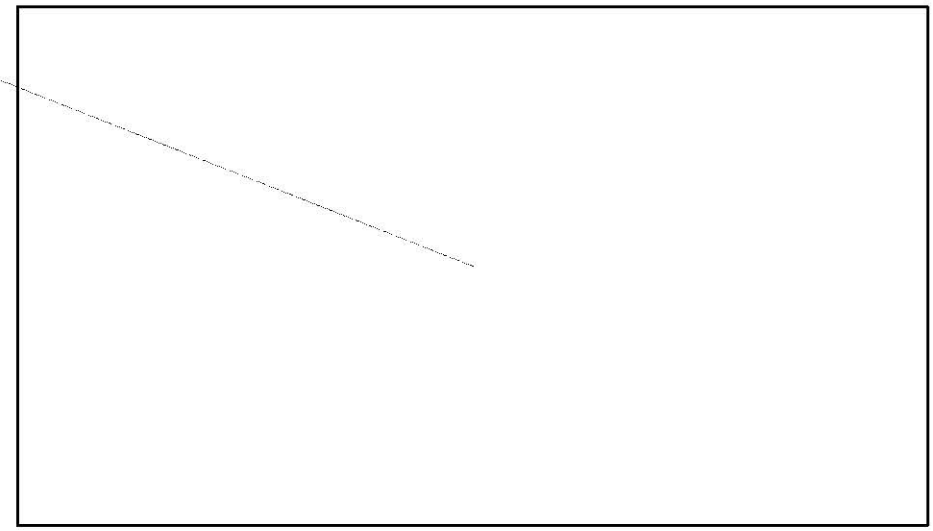

TIPS

- Consider education. Education greatly affects the culture-based mental process used to determine what decision can be made. Advanced degrees in a science or engineering field indicate a more structured process is likely to be used to research and assess the factors upon which the decision will be based.

NOTES

BASIC STRUCTURED ANALYTIC TECHNIQUES

Structured analytic techniques are an aid to the analytic method-the breaking down of information into subsets until the hypothesis is found to be either sensible or untrue. Structuring one's analysis is the separating of elements of a problem in an organized manner and reviewing the information in a systematic and sufficient way. The structure is the plan, and the analysis is the execution of the plan. This primer covers only some of the basic structured techniques. DI plans to create an advanced structured analytic techniques primer in the next year.

The more important the problem or issue, the more important structured analytic techniques become in the development of the best judgment of the response. Structured analytic techniques force the mind to remain open and thereby mitigate the mindsets and biases that inhibit the analyst's need to consider alternatives and judge them fairly.

Structured analytic techniques:

- Help analysts make sense of complex problems.
- Let analysts compare and weigh pieces of information against each other.
- Ensure analysts focus on the issue under study.
- Force analysts to consider one element at a time in a systematic manner.
- Aid analysts in overcoming their mindsets and biases developed on the topic.
- Ensure analysts see the elements of information that in turn enhance the identification of correlations and patterns that would not appear if not depicted outside the mind.
- Enhance the analysts' data gathering and review, which in turn provide the creative powers of the mind with a better base to intuitively derive alternatives and solutions.

The following techniques are basic and will not provide an answer to intelligence challenges. But they will provide insight that will support problem solving. The techniques will improve assessments by making them more rigorous, improve the presentation of the finished intelligence in persuasive manner, and provide ways to measure progress as well as identify what might be missing.

NOTES

SORTING

A basic structuring technique for grouping information to develop insight to facilitate analysis.

WHEN TO USE

Sorting is effective when information elements can be broken out into categories or subcategories for comparison using an automated computer program, such as a spreadsheet. This technique is most useful for reviewing massive data stores that pertain to an intelligence challenge. Sorting also aids in the review of multiple categories of information that when broken down into components can present possible trends, similarities, differences, or other insights not readily identifiable. Sorting can be used at any stage and is particularly effective during initial data gathering and hypothesis generation.

VALUE ADDED

Sorting massive amounts of data can provide insights into trends or abnormalities that warrant further analysis and that otherwise would go unnoticed. This technique can highlight new or additional analytic insights within an old intelligence problem or a new one. Sorting data before you begin analyzing transactions (e.g., COMINT or transfers of goods), is very helpful.

POTENTIAL PITFALLS

Improper sorting can hide valuable insights as easily as illuminating them. Standardizing the data being sorted is imperative. Working with an analyst with experience in sorting can avoid this pitfall in most cases.

THE METHOD

Step One: Review the categories the information is broken down into to determine which category or combination of categories might show the trends or an abnormality that would provide insight into the problem being studied. Place data into a spreadsheet or data base, using as many fields (columns) as necessary to differentiate among the data types (e.g., dates, times, locations, people, activities, amounts, etc.). List each of the facts, pieces of information, or hypotheses involved in the problem that you may want to use in your sorting schema (can use paper, white board, movable Post-it papers, or other means).

Step Two: Review the listed facts/information/hypotheses in the data base or spreadsheet to identify key fields that may allow you to uncover possible patterns or groupings. Those patterns or groupings then illustrate your schema categories and can be listed as header categories. For example, if you are examining terrorist activity and notice that most attacks occur in hotels and restaurants but the times of the attacks vary, "Location" is the main category; while date and time are secondary categories.

Step Three: Group those items according to your schema in the categories you previously defined in Step 1.

Step Four: 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.

Step Five: Review (and rereview) your 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 of this technique is to sort according to multiple schemas and examine results for correlations between data and categories. For example, you notice that most terrorist attacks that happen in hotels also happen in June.

Examples

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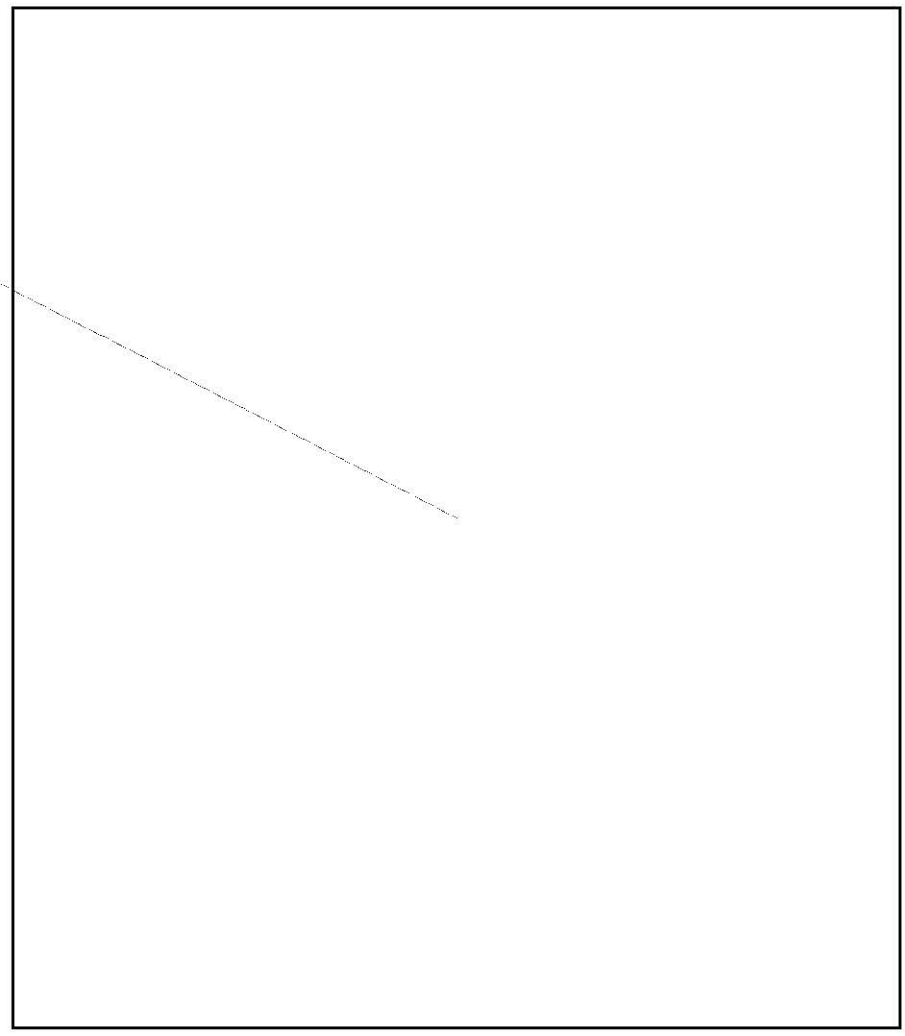

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TIPS

- Get others to review the sorted information to increase the brainstorming opportunities and for new ways of sorting the data to gain insight.
- Remember that correlation is not the same as causation.
- Return to sorting anytime during the analysis when new insights are gained and sorting can either support or negate the insight.

NOTES

CHRONOLOGIES AND TIMELINES

A chronology is a list placing events or actions into the order in which they occurred; 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 between the events or actions and, in the case of a timeline, between the events and actions as well as other events or actions in the context of the overarching intelligence problem.

WHEN TO USE

Chronologies and timelines aid in organizing events or actions. Whenever it is important to understand the timing and sequence of relevant events as well as to identify key events and gaps, these techniques can be used. These events may have a cause-and-effect relationship, or they may not.

VALUE ADDED

Chronologies and timelines aid in the identification of patterns and correlations between events. The techniques allow the analyst to relate seemingly random events to the big picture to highlight or identify significant changes or assist in the discovery of trends, developing issues, or anomalies. Multiple-level timelines allow the analyst to track concurrent events that may have an impact on each other. While timelines may be developed at the onset of an analytic task to ascertain the context of the activity to be analyzed, timelines and chronologies also may be used to assist analysts in postmortem intelligence studies to break down intelligence and find the causes for intelligence failures and highlight significant events after an intelligence surprise. The activities on a timeline also can lead the analyst to hypothesize that particular events occurred between known events in order for them to flow correctly. The analyst can then be aware of indicators to look for so the missing events are found and charted. Timelines and chronologies organize information in a format that can be easily understood in a briefing. This technique also can support the use of other structured analytic methods, such as event trees.

POTENTIAL PITFALLS

One pitfall is the analyst may assume that events following earlier events are caused by earlier events when there may be no causal relationship involved. Also, the value of this technique can be reduced if the analyst using it lacks creativity in finding contextual events that relate to the information in the chronology or timeline.

THE METHOD

Step One: As you research the problem, ensure the relevant information is listed with the date or order in which it occurred. Make sure the data are properly referenced.

Step Two: 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?
- Did the analyst overlook piece(s) of intelligence information that may have had an impact on the events?
- Conversely, if events seem to happen more rapidly than expected, is it possible that the analyst has information related to multiple event timelines?
- Are all critical events necessary for the outcome to occur shown?
- What are the intelligence gaps?
- What are the vulnerabilities in the timeline for collection activities?
- What events outside this timeline could have influenced the activities?

Step Three: If preparing a timeline, synopsize the data along a line, usually horizontal or vertical. The sides of the line can be used to distinguish between types of data. If multiple actors are involved, multiple lines can be used, showing how and where they converge.

Example

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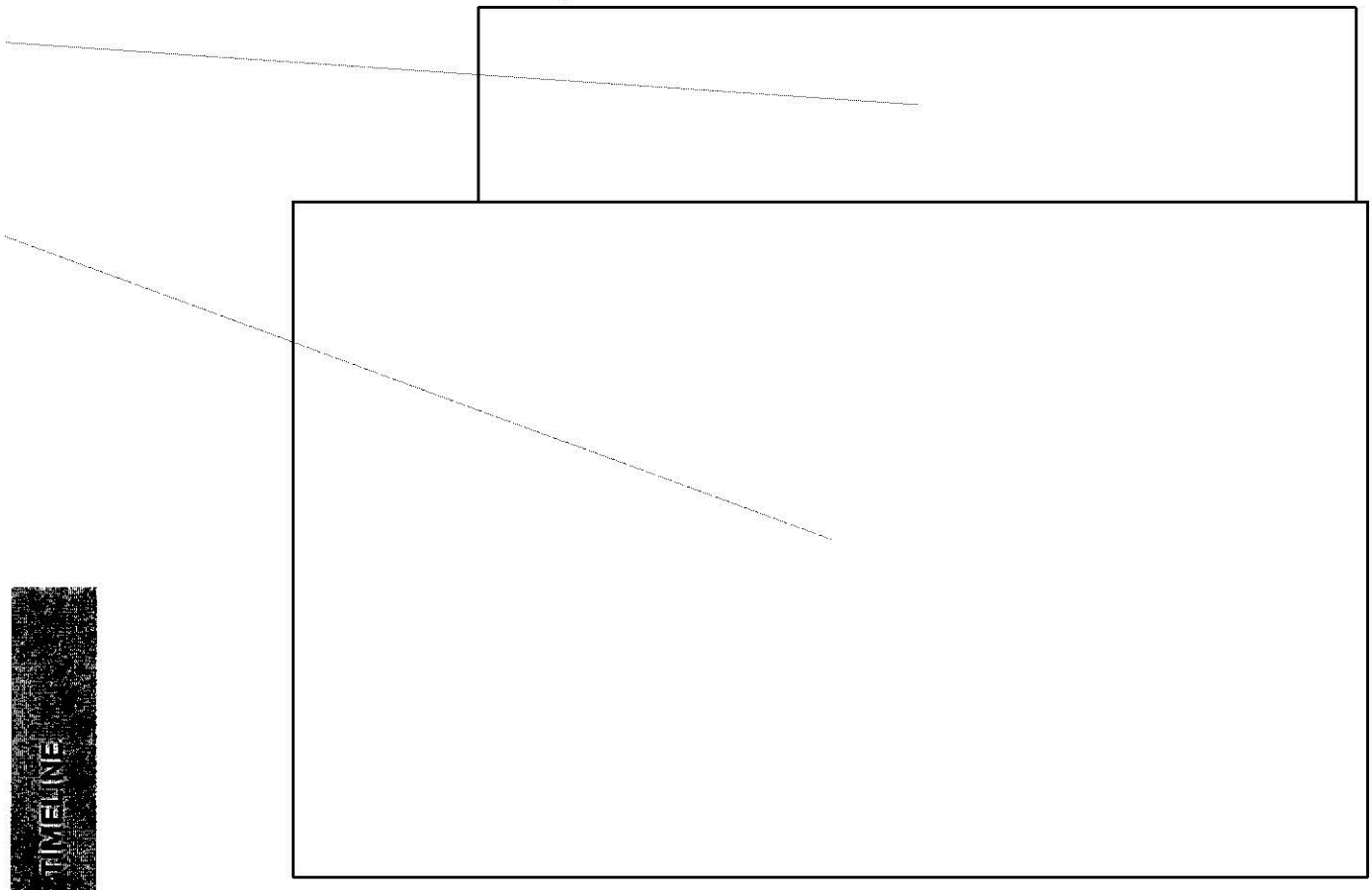

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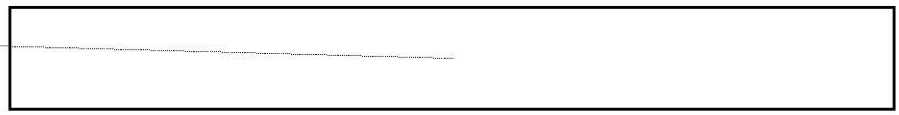

TIPS

- Use an excel spreadsheet, such as the DI developed version available on the DI Tradecraft Sharepoint site, to log the results of research and marshal evidence.
- Consider chronologies and timelines; they are effective, yet simple, ways for analysts to order incoming information on a daily basis as they go through their daily message traffic.
- Use tools such as Excel (drawing function) or the Analysts' Notebook to draw the timeline.

NOTES

MATRICES

A grid with as many cells as required to sort data and gain insight.

WHEN TO USE

Matrices are useful whenever there are more options or more intricate data than can be conceptualized at one time without a visual representation. Whenever information can be reduced to a matrix, it provides analytic insights.

VALUE ADDED

Matrices are exceptionally useful in isolating critical data when there is an abundant amount of overall information relevant to an issue. When used to review data related to options, such as the analysis of competing hypotheses, it enables analytic focus on each option, improving comparison. Matrices allow elements of a problem to be separated and categorized by type, for comparison of different types of information or of pieces of the same type of information. Matrices also allow analysts to identify patterns or correlations within the information-such as through phone calls between members of a group, which is an intermediate step in link analysis.

POTENTIAL PITFALLS

The two-dimensional design of matrices limits their use for collating data on complex issues. Leaving out pertinent data easily oversimplifies an issue.

THE METHOD

Matrices can be rectangular, square, or triangular depending on the purpose and number of rows and columns required to enter the data.

Step One: Draw a matrix with sufficient columns and rows to enter the two sets of data to be compared.

Step Two: Enter the range of data or decision criteria along the horizontal axis (first column) and along the vertical axis (first row).

Step Three: In the grid squares in between, note the relationships or lack thereof in the cell at the intersection between the two associated data points.

Step Four: Review the hypotheses developed for the issue in light of the relationships shown in the matrix and, if appropriate, develop a new hypothesis(es) based on the insight gained from the matrix.

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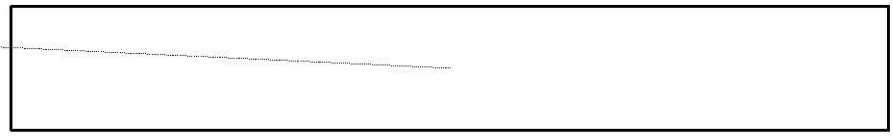

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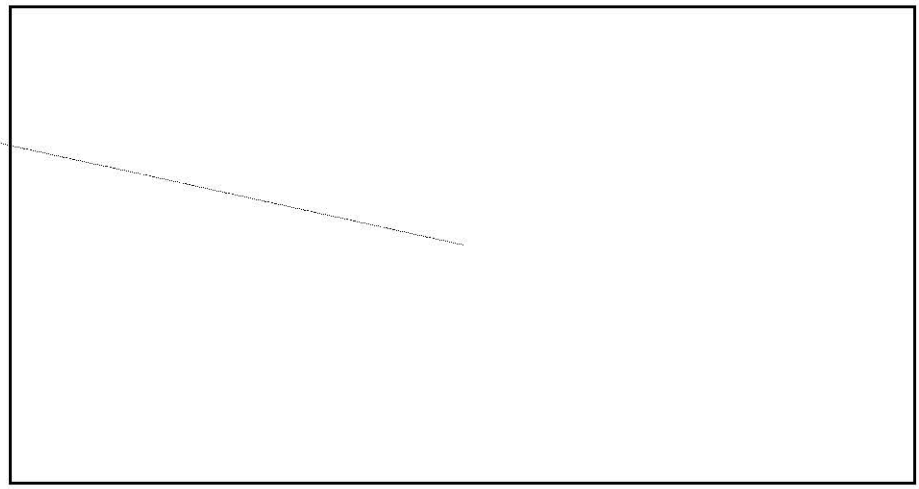

TIPS

- Develop a template for recurring topics where the data points remain consistent.
- Color-code results (like the example above) to aid in understanding the results.

ADVERSARY INTENTIONS MATRIX

A technique to efficiently provide insight from an adversary's point of view on the most important criteria used to determine the impact and implications of likely options under consideration.

WHEN TO USE

The adversary intent matrix should be used when the most likely and reasonable alternatives under consideration by the adversary are known. It is necessary for the analyst using the technique to have knowledge of the motivation, goals, and objectives of the adversary making the decision and to assess the criteria in the matrix from the adversary's point of view. This technique also provides a quick method to determine indicators of change to use to generate collection requirements.

VALUE ADDED

If the matrix is completed as instructed, it will help mitigate bias and mindset while providing insight into the criteria's effect on the options under study. The matrix gives the analyst the ability to develop clear indicators for each decision option under study, permitting specific collection planning.

With the criteria already established in the column headings, the analyst only has to enter the alternatives or options being considered. Normally the matrix can be completed in less than an hour. During the input of information into the matrix, new and potentially better options become apparent, increasing the value of the technique.

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POTENTIAL PITFALLS

The criteria used in the matrix are not as extensive as and quite possibly less relevant than criteria derived during use of the weighted ranking technique. As a result, the insight gained may be less than that gained using other techniques.

THE METHOD

Use the column headings entered on the adversary intent matrix. It is very important to enter the information for every option in a column before moving to the next column. That is the manner by which this technique mitigates bias. The steps for this technique are:

Step One: Enter the decision options believed to be reasonable from the adversary's viewpoint.

Step Two: Fill in the objectives for each option from the adversary's viewpoint, in the Objective column.

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Step Three: Fill in the Benefits column from the adversary's viewpoint with the benefits of the adversary's decision option.

Step Four: Fill in the Risk column from the adversary's viewpoint with the risks of the adversary's decision option.

Step Five: Fill in the Implications column, which transitions the analyst from the adversary's point of view to the analyst's point of view. Enter the implications from the adversary's point of view and then add a slash (/) and enter the implications *from the analyst's point of view.*

Step Six: Enter the indicators from the analyst's viewpoint into the Indications column. This provides a basis for generating collection to determine which option was selected by the adversary as early as possible.

TIPS

- Use the weighted ranking technique for more detailed insight if time allows.
- Color-code your entries using red for those from the adversarial point of view and blue for those from the analyst's point of view.

NOTES

LINK CHARTS

A method to gain analytic insight by visualizing social, business, and activities-related connections among people and groups as well as infrastructure, logistics, and production chains.

WHEN TO USE

Analysts should use a link chart whenever individuals, groups, group activities, or process networks are being reviewed for insight. The need for link charts for analysis increases with the increase in data and network complexity.

VALUE ADDED

Link charts can clarify what is known and what may be missing about the network being charted. Key nodes and hubs can be identified for social, organizational, and infrastructure networks, giving insight into relationships and potential vulnerabilities. The charts greatly aid collection planning. Link analysis charts are easily understood in briefings and make great graphics in products.

POTENTIAL PITFALLS

Analysts could assume (incorrectly) a central figure in a network is the leader because of the number of connections to that individual. Analysts also might ignore the temporal aspect of the relationships and assume they are concurrent. Link analysis provides a freeze-frame look at activity and seldom conveys change over time unless paired with a timeline or other multidimensional approach.

THE METHOD

The steps for a simple link chart include:

Step One: Extract entities and the information about their relationships from imagery, SIGINT intercepts, message traffic, etc.

Step Two: Place entity associations into a link chart by using a software link analysis tool or spreadsheet or drawing it by hand.

Step Three: Analyze the entities and links in the link chart.

Step Four: Translate the links into a graphic format. Use separate shapes for different types of entities — circles for people, rectangles for activities, triangles for buildings/facilities, etc. Use colored and varying types of lines to show different activities — green solid lines for money transfer, blue dotted lines for communications, solid black lines for activity, etc.

Step Five: Review the chart for gaps, significant relationships, and meaning of the relationships based on the activity occurring. Ask critical questions of the data, such as:

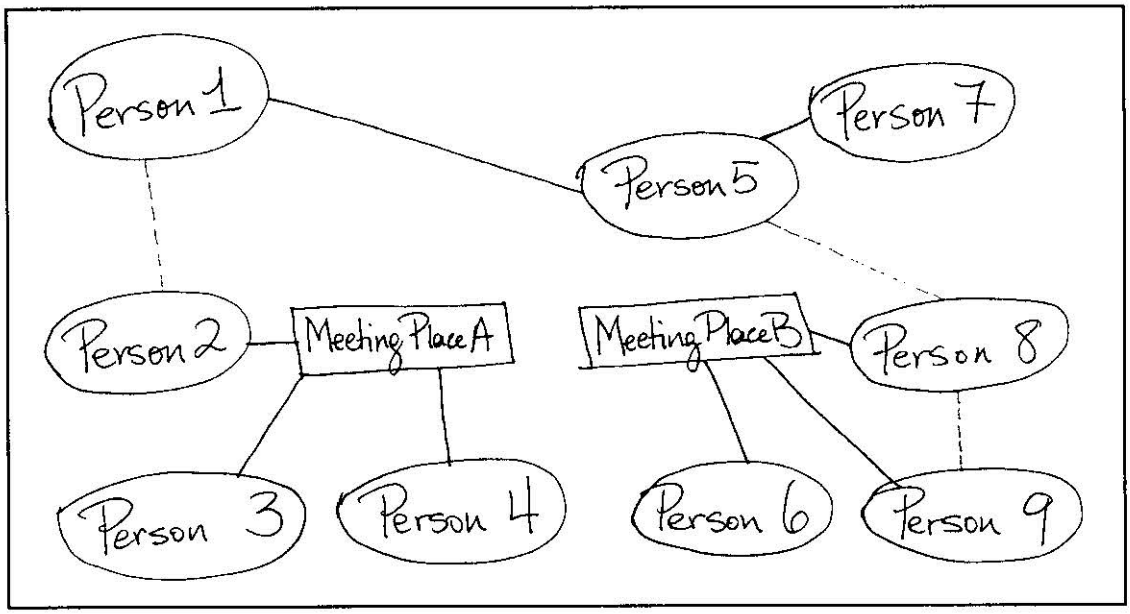
- Which entity is central or key to the network?
- Who or what is the initiator of interactions?
- What role is each entity playing in the network?
- Who or what forms a bridge or liaison between groups or subgroups?
- How have the interactions changed over time?
- Which nodes should be targeted for collection or defeat?

Step Six: Summarize what is seen in the chart and draw interim hypotheses regarding the relationships.

Example

An analyst has been monitoring the activity of two suspected groups of terrorists; the relationship of these groups has not been defined. From the activity on the link chart, we can infer that Person 5 is the key node in this network because of his connections with the outside financier (Person 7) and both groups of suspected terrorists, as demonstrated by his phone conversation with Person 8 and money transfer with Person 1. Persons 8 and 9 conversed on the phone, so we can infer they knew each other before the meeting; the same with persons 1 and 2. No evidence suggests the rest of the group knew each other before the meeting.

What other inferences can you make by the data represented in the chart?



Simple Link Chart Showing Possible Terrorist Relations.

TIPS

- Watch for clutter. Charts may become cluttered by too much data; peripheral data may be set aside.
- Use simple charts. Large, complex charts can be broken into smaller charts.
- Eliminate crossing lines to increase clarity.
- Use computerized software. The charting portion of link analysis may be greatly aided by the use of computerized software such as Analysts' Notebook because it allows one to instantly redraw the chart as new information becomes available.

NOTES

EVENT TREES

Graphical depiction of a potential temporal sequence of events, including potential junctures within the event sequence.

WHEN TO USE

Use an event tree to clarify alternative event sequences with potential future or at least unknown outcomes related to an intelligence problem. Event trees work best when there are multiple, mutually exclusive options that cover the spectrum of reasonable alternatives available.

VALUE ADDED

An event tree is a visual tool by which analysts can depict an adversary's options with decision points that gives insight into potential vulnerabilities. It clarifies the presumed sequence of causal or temporal events or decisions between an initiating event and a final outcome. Event trees also provide an excellent method of determining collection requirements for the indications that a decision has been made or events have unfolded in one of the alternative limbs of the tree.

POTENTIAL PITFALLS

An intelligence failure can occur when the adversary selects an unforeseen option arising from ignorance or when an unidentified event occurs.

THE METHOD

Step One: Identify the mutually exclusive (not overlapping) and collectively exhaustive (complete) set of hypotheses that pertain to a given intelligence issue.

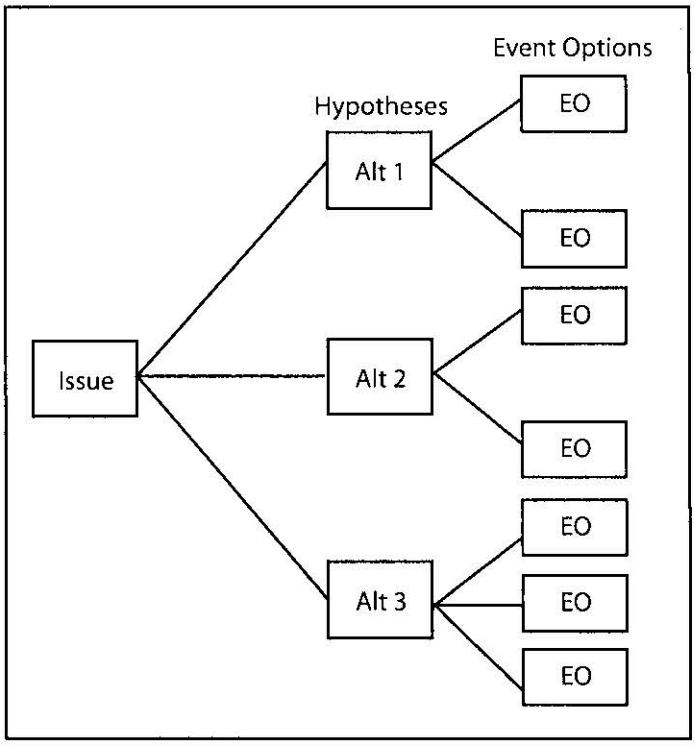
Step Two: Decide which events, factors, or decisions (i.e., variables) will have the greatest influence on the alternatives or hypotheses identified in Step One.

Step Three: Decide on the temporal or causal order (sequence) in which these factors are expected to occur or impact one another.

Step Four: Determine the event options within each alternative (hypothesis) and establish clear definitions for each event option to ensure collection strategies to monitor events are effective.

Step Five: Construct the event tree from left to right. Each alternative or hypothesis is a separate main branch. Start with the first alternative and have one branch from this node for each realistic path the first event can take. For instance, the purchased equipment could be used for its intended purpose, or it could be reverse-engineered for duplication, or it could be disassembled and sold for scrap (see the example below).

Proceed down each event option node until the end state for that subbranch is reached. Then move to the next alternative or hypothesis and repeat the process.



Event Tree Development Example.

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Step Six: Determine what would indicate a decision has been made at each decision point for each option to use in generating an integrated collection plan.

Step Seven: Assess the implications or aftereffects of each alternative on the intelligence problem.

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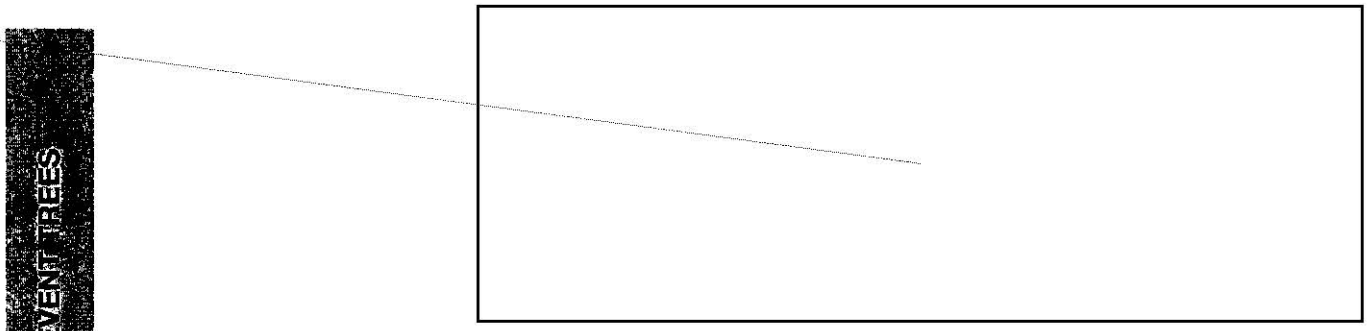

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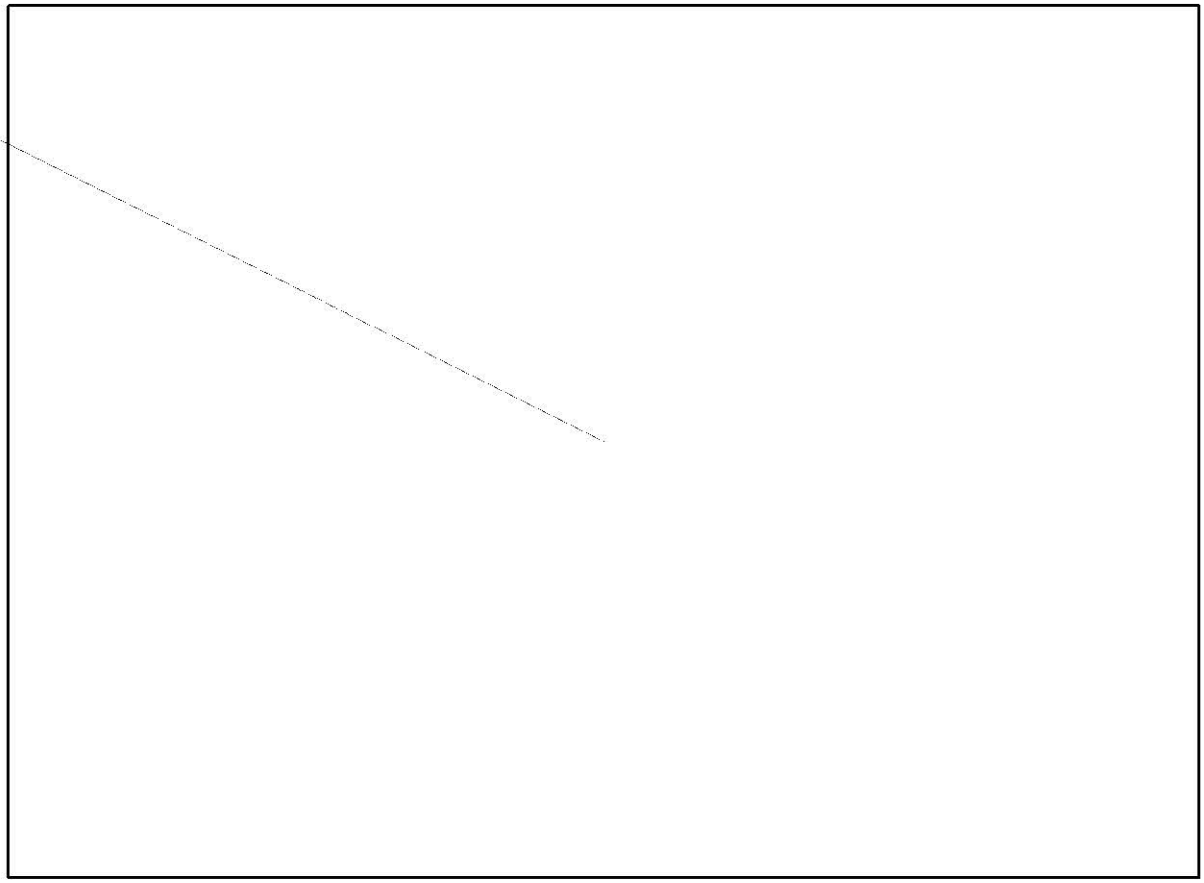

TIPS

- Use this technique in conjunction with weighted ranking, hypothesis review techniques, and subjective probability to gain added insights.
- Leverage the expertise of a group of analysts during the construction of an event tree to ensure all important events, factors, and decision options (variables) are considered.

EVENT MAPPING

A mind-mapping diagram representing the scenarios in hypotheses linked around a central word or short phrase representing the issue or problem to be analyzed.

WHEN TO USE

Use this technique when a nonlinear method is desired to generate, visualize, structure, and delineate the events in a scenario or hypotheses related to the intelligence issue or problem. The addition of colors can represent key players in each scenario, such as economics, military, opposition group, science, culture, as well as internal and external political pressures. It is also easy to annotate indicators of change to use in the formation of collection plans.

VALUE

The image-centered diagram with connections between events in a scenario on a radial encourages a brainstorming approach to the event mapping. The large amount of association in event maps promotes creativity in generating new ideas and associations not previously considered. The elements are arranged intuitively according to the importance of the concepts and are organized into groupings, branches, or areas. The uniform graphic formulation of the semantic structure of information on the method of gathering knowledge may aid recall of existing memories. As scenario event hypotheses are mapped radially around the issue or problem without the implied prioritization that comes from hierarchy or sequential arrangements, anchoring and other cognitive bias can be mitigated to some degree.

POTENTIAL PITFALLS

Unconstrained event mapping can become overly detailed, lose focus, and include events and scenarios that lack relevance to the issue or problem being studied.

METHOD

The general rules of event mapping are:

- Start with a blank paper or use Post-it notes on a white board.
- Thinks in terms of key words, phrases, or symbols that represent ideas and words.
- Put down ideas as they occur, wherever they fit.
- Don't judge or hold back.
- Develop in directions the topic takes you — not limited by how you are doing the map.
- As you expand the map, try to become more detailed.
- Use arrows or other visual aids to show the links between events in the scenario.

Step One: Put the word or symbol representing the issue or problem to be analyzed in the center of the paper or white board. Take a minute to think about it before continuing.

Step Two: Add symbols or words to represent hypotheses around the central issue or problem.

Step Three: Link the hypotheses to the central issue or problem. Use color to indicate the major influence the link represents. For example, use green for economic links, red for opposition groups, purple for military forces, blue for recognized legal political movements, black for external pressures, brown for cultural based links, etc.

Step Four: Continue working outward building the scenario of events into branches and subbranches for each hypothesis in greater detail.

Step Five: Use emphasis such as underlining and stars to show importance or level of influence.

Step Six: Do not allow yourself or the group to get stuck in one scenario. If you dry up, move to another area or another hypothesis.

Step Seven: When the creativity dies down, stop and take a break. After a period of an hour or so, return and review the map, making additions and changes as desired.

Step Eight: As an option, you can add a number on links or decision points in each hypothesis and, on a separate piece of paper, write down the evidence for each number to be collected that would disprove that link or decision being made. Use the lists for each number to develop an integrated collection strategy for the issue or problem.

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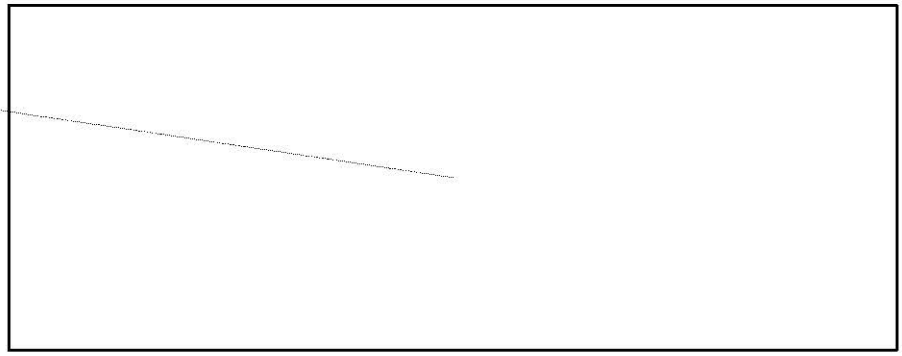

Porphyry of Tyros, a noted thinker of the 3rd century, was responsible for some of the earliest examples of mind maps when he graphically visualized the concept categories of Aristotle.

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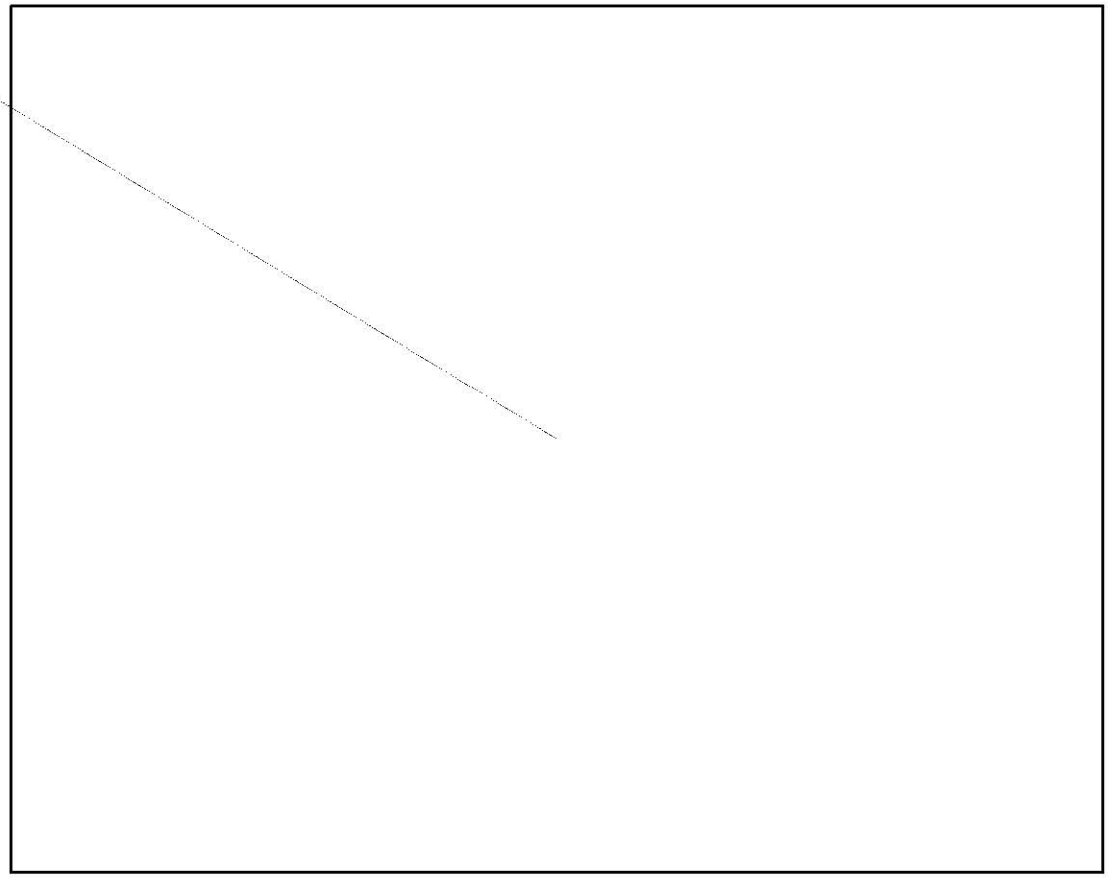

TIPS

- Think fast. Your brain works best in 5- to 7-minute bursts, so capture that explosion of ideas as rapidly as possible.
- Keep moving. If ideas slow down, draw empty lines, and watch your brain automatically find ideas to put on them. Stand up and use an easel pad or white board to generate even more energy.
- Include distractions. If you are mapping and you suddenly remember you need to pick up your cleaning, put down "cleaning" on the side of the map. Otherwise your mind will get stuck like a record in that "cleaning" groove.
- Write on links. Put key words on lines to give context to the link.
- Print words. Print rather than write in script. It is easier to read and remember. Lowercase is more visually distinctive (and easier to remember) than uppercase.

NOTES

SUBJECTIVE PROBABILITY

A quantitative expression of an analyst's degree of belief in the truth of a statement relative to others from among a complete set of alternative possibilities.

WHEN TO USE

Subjective probabilities are used to quantitatively express an analyst's overall degree of belief in the truth of a statement or hypothesis where the total belief held by an analyst is allocated among the possibilities (nonoverlapping hypotheses) in proportion to how likely each answer or event is correct. Subjective probability analysis is useful in comparing the perceived likelihood of hypotheses, supporting event tree or matrix analysis by providing quantitative estimates for each event, and quantitatively evaluating the value of additional information in shaping the conclusions of an analysis.

VALUE ADDED

The expression of numerical probabilities can mitigate the imprecision of probability phrases (e.g., "very likely" or "improbable"). Moreover, numerical probabilities mitigate the potential for analysts to exploit imprecision in favor of their position. Using numerical probabilities ensures mathematical rules are followed and forces consideration a complete set of alternatives. This in turn gives the analyst a rational basis to judge whether the probability distribution is an accurate reflection of his/her beliefs.

POTENTIAL PITFALLS

Assignments of probability require a complete (exhaustive) set of nonoverlapping (mutually exclusive) answers, events, scenarios, or courses of action. In addition, misuse can feed availability and anchoring biases.

THE METHOD

Subjective probability rules must be followed:

- The probability assigned to a given hypothesis must be within the range of 0.0 (or 0 percent) to 1.0 (100 percent). A probability of 0.0 means the hypothesis is certainly wrong, whereas a probability of 1.0 means that the hypothesis is certainly correct.
- The probability assigned to a hypothesis not being correct is equal to one minus the probability that the hypothesis is correct
- The total probability distributed among all hypotheses in a complete, nonoverlapping set must add to 1.0 (100 percent).
- The probability assigned to "hypothesis A or hypothesis B is correct" is equal to the sum of their individual probabilities if they are mutually exclusive.

Step One: Identify a complete set of high-level, nonoverlapping hypotheses that seek to answer a clearly defined question. Use the technique of defining the issue to ensure that the question is clear.

Step Two: Generate simple chains of events or facts for each hypothesis. Event trees and event mapping are two techniques that aid in this step. The number of scenarios that can be constructed for a given hypothesis depends on the detail desired. Each scenario describes one instance of how the associated hypothesis may come to pass.

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Step Three: The probability of a given hypothesis is a function of the probabilities of all the scenarios that would support a hypothesis as being true. The probability of a given scenario is a function of all the events within that scenario occurring. That is, the probabilities (percentages) for each option are multiplied throughout the scenario to determine the probability for that scenario. There are two types of probability events that need to be analyzed:

- Mutually Exclusive. The occurrence of one event precludes the occurrence of the others. Either one or another will occur, but not both. For example, an elections result: if one individual wins, another necessarily cannot. The total probability for the total events must equal 100 percent.
- Conditionally Dependent. Events are those for which the probability of occurrence of one event depends on whether or not another has occurred. These are the events within a scenario where the probability for each event in the scenario is multiplied to determine the probability of the end result.

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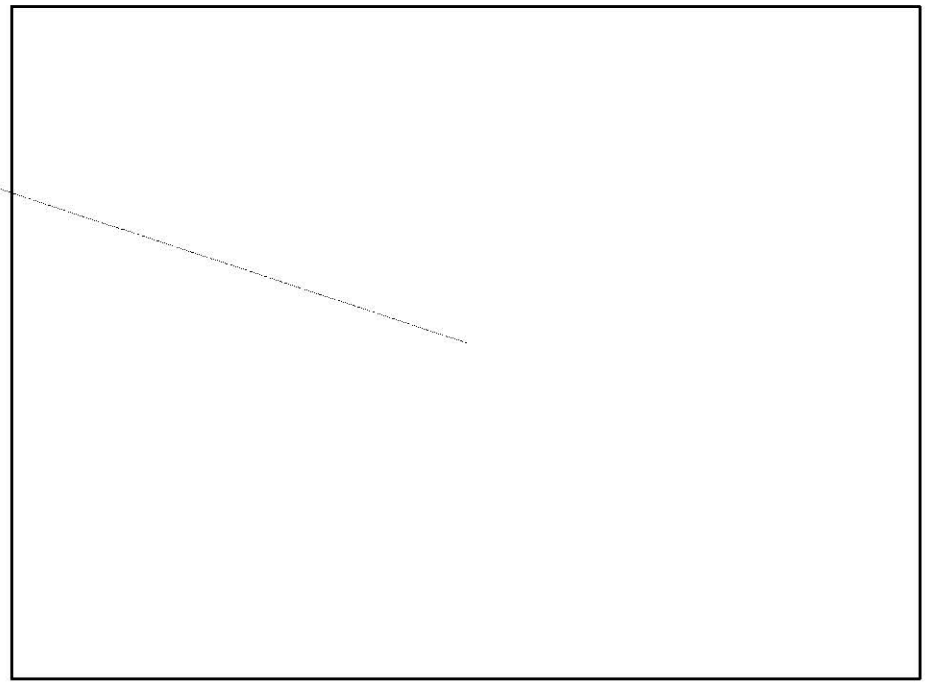

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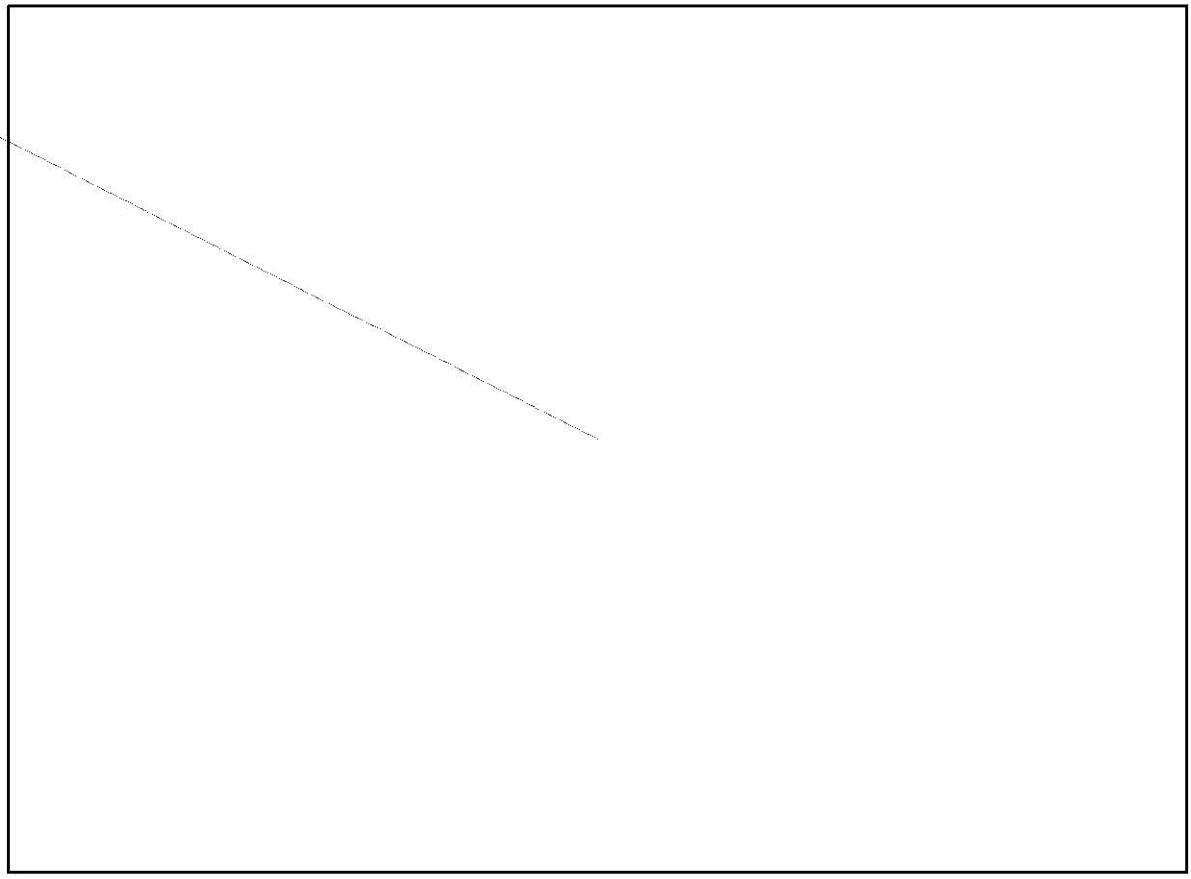

TIPS

If you have trouble determining the subjective probability for the hypotheses, try one or more of the following tips:

- Draw a circle and allocate slices of the circle or "pie" where the relative size of the slice of pie for a hypothesis represents how likely the analyst believes it is true.
- Assign numbers to each hypothesis according how strongly it is believed. Determine the subjective probability by dividing the points for each hypothesis by the total of the numbers assigned to all hypotheses.
- Determine the amount of money you would be willing to bet on a hypothesis being true given that you were to win $1,000,000 if true-the subjective probability in this case would be the ratio of your wager to the total pot (e.g., $1,000/$1,000,000 = 0.001, or 0.1 percent).

WEIGHTED RANKING

A technique used by an individual or group to gain confidence in the assessment of available alternatives by weighting criteria in importance from the decisionmaker's point of view.

WHEN TO USE

Weighted ranking should be used anytime the topic is important enough to warrant the investment of time and there is a need for transparency in the reasoning used to derive the assessment. In intelligence analysis, each criterion used in the technique must be selected and given a weighted importance from the adversary decisionmaker's point of view. The insight gained on how each criterion will affect the final outcome allows for a clear, persuasive presentation and argumentation of the assessment.

Weighted ranking helps mitigate bias and mindset when the analyst using it faithfully follows the method and treats each step as equally important to the outcome. The technique can be used by a group working together as long as a group facilitator keeps the process on track. The validity of the weighting of the criteria can be enhanced by the group through discussions sharing insight into the adversary decisionmaker's purpose and point of view.

VALUE ADDED

Weighted ranking adds validity to an assessment of alternatives, options, and hypothesizes by mitigating bias and mindset in comparison to an analyst's intuition that results in the unsystematic and therefore inconsistent use of criteria. The results of the systematic approach provide transparency of the derivation and logic of the assessment to customers who may otherwise question the assessment or key judgments.

POTENTIAL PITFALLS

Weighted ranking takes more time than many other basic analytic techniques and relies on a fair number of mathematical computations, which causes many analysts to avoid the technique.

THE METHOD

There are eight steps to accomplish a weighted ranking review of alternative options being assessed.

Step One: Take the alternatives, options, or hypothesis generated or another process to fill in the first column of a matrix under the column heading of Options.

Step Two: On a separate sheet of paper or file, develop a comprehensive list of independent criteria the adversary would be likely to use to determine which option to select. List the criteria in a column with one

criterion per line. Notice that the context of the time, place, and objectives of the action being reviewed should be considered in the development of the criteria.

Step Three: Pair rank the criteria. Pair ranking requires each item being ranked to be compared with every other item and the selection of one over the other. Start with the first criterion in the list and compare it to the second criterion. Place a mark (1 or X) next to the criterion selected as the more important between the two. Next compare the first criterion with the third. Again mark the more important of the two. Once the first criterion has been ranked against all of the others, go to the second criterion and compare it with the third, placing a mark next the one judged most important. Then rank the second criterion with the fourth, and so on until it has been ranked against the remaining criteria in the list. Note that the second and succeeding criteria are not ranked against criteria on the list listed above them because that was accomplished when those criteria were going through the process. Continue to rank each criterion with those below it in the list until the list is completed.

Step Four: Count the marks or votes for each criterion in the list, and write the total to the right of the criterion and marks. Review the totals of each criterion and determine how many of the listed criteria to use in the weighted ranking matrix. Note that more than five or six criteria rarely provide sufficient difference to be worth the time and expertise. Count the total number of votes or marks received by the criteria selected to use to determine which option is the most likely. Divide the number of votes received by each selected criterion by the total number of votes for all selected criteria. For example, if the total number of votes for the selected criteria is 15 and the first criterion received 5 votes, divide 5 by 15 to get 33 percent, and the second criterion received 4 votes then divide 4 by 15 to get 27 percent (rounded up 26.7 percent to the next full number) and so on through the selected criteria. Make sure the total of the percent for the criteria adds up to exactly 100 percent by rounding off the figures as required.

Step Five: Enter the criteria in the options matrix as column headings starting with the second column. Note that the first column heading is Options. Include the percentage for each criterion with it in the column heading. The order that the criteria are entered is not important, but confusion can be avoided if the criterion with the largest percentage is entered in the first column and the remainder added in descending order.

Step Six: Pair rank the options based on the first criteria from the point of view of the adversary decisionmaker. The pair ranking is accomplished exactly like the procedure used in Step Four to rank the criteria. Compare the first option with the second option and determine which option most meets the criteria. Then place a mark (1 or X) in the box at the intersection for best option for the criteria. After pair ranking all of the options for the first criterion, move to the second criterion (column) and pair rank all of the

options against that criterion and so on until all criteria are used to pair rank the options.

Step Seven: Count the number of marks (votes) in each square in the matrix under the criteria and write the number in the square. Then multiple the number by the weight of the criteria (the percentage listed with the criterion at the top of the column). Write the product (result of the multiplication) in the square as well.

Step Eight: Once all squares with marks have been multiplied by the percentage for that criterion and placed in the appropriate square, add the product (result of the multiplication) in each square for each option (row). That is, add all of the final numbers in each square across the row and place the total in the final column for that option (row). This number can be larger than 1 (e.g. 2.58). The row with the largest total is the most likely option.

End by making a sanity check of the results and review the impact of the weighted criteria on the final result. This review should provide the insight needed to present the results in a clear and persuasive manner to customers. At a minimum, it will provide insight to the analyst on the interaction of the criteria from the point of view of the adversary decisionmaker.

Example

A major adversary is suspected of constructing a new chemical agent manufacturing facility to replace the aging and inefficient facilities currently in use. Reports of various sites being considered have surfaced from numerous sources. To select the most likely location, the weighted ranking technique is used to provide insight into the issue.

Step One: The reported sites and two suspected potential locations are placed in the matrix (Figure 1).

OPTIONS					Total
Lumbadca					
Buscanna					
Separata					
Raticana					
Lemitica					

Figure 1.

Step Two: On a separate piece of paper or file, develop a list of possible criteria (Figure 2).

Step Three: Pair rank the criteria and (Figure 3)

Step Four: Total the votes for each criterion and mark those with asterisk (*) selected for use in the option matrix (Figure 3). Calculate percentage for each criterion (Figure 4).

Figure 2.

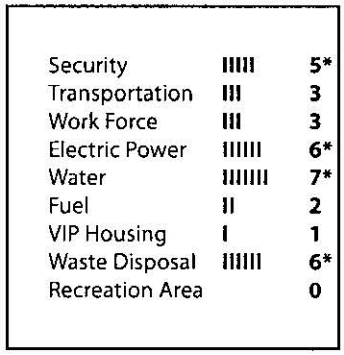

Figure 3.

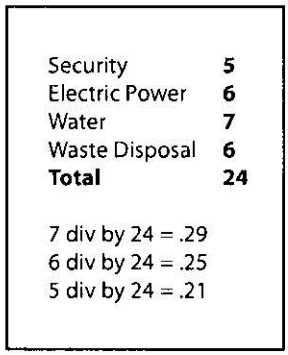

Figure 4.

Step Five: Enter the criteria in the matrix column headings (Figure 5).

OPTIONS	Water .29	Elec Power .25	Waste .25	Security .21	Total
Lumbadca					
Buscanna					
Separata					
Raticana					
Lemitica					

Figure 5.

Step Six: Pair rank each option by each criterion (Figure 6).

OPTIONS	Water .29	Elec Power .25	Waste .25	Security .21	Total
Lumbadca	I	III	II	II	
Buscanna	III	II	I	I	
Separata	II	I	IIII	III	
Raticana		IIII	III		
Lemitica	IIII			IIII	

Figure 6.

Step Seven: Count the number of votes for each option under the criteria and write the number in the square. Then multiple the number of votes by the weight of the criteria (the percentage listed with the criterion at the top of the column). Write the product (result of the multiplication) in the square.

OPTIONS	Water .29			Elec Power .25			Waste .25			Security .21			Total
Lumbadca	I	1	.29	III	3	.75	II	2	.50	II	2	.42	
Buscanna	III	3	.87	II	2	.50	I	1	.25	I	1	.21	
Separata	II	2	.58	I	1	.25	IIII	4	1.00	III	3	.63	
Raticana		0	0	IIII	4	1.00	III	3	.75		0	0	
Lemitica	IIII	4	1.16		0	0		0	0	IIII	4	.84	

Figure 7.

Step Eight: Add the product (result of the multiplication) in each square for each option (row) and place the total in the final column for that option (row). This number can be larger than one. The row with the largest total is the most likely option (Figure 8).

OPTIONS	Water .29			Elec Power .25			Waste .25			Security .21			Total
Lumbadca	I	1	.29	III	3	.75	II	2	.50	II	2	.42	1.96
Buscanna	III	3	.87	II	2	.50	I	1	.25	I	1	.21	1.83
Separata	II	2	.58	I	1	.25	IIII	4	1.00	III	3	.63	2.46
Raticana		0	0	IIII	4	1.00	III	3	.75		0	0	1.75
Lemitica	IIII	4	1.16		0	0		0	0	IIII	4	.84	2.00

Figure 8.

Note that Separata is not highly regarded against the most important criteria (Water), but when the remainder of the criteria are considered, it is by far the best location for the new facility. Although this technique will not ensure that the analyst has selected the site of the future plant, he or she will have a great deal of insight into the issue that probably would not be considered systematically without the use of the technique.

TIPS

Use a different color for each criteria and alternative during the pair. ranking to make the choices transparent (easy to review or recreate).