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The Tradecraft of Warning: Overcoming Cognitive Barriers

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Warning analysts can reduce the chances of main-line analysts and policymakers being surprised by future events if they employ structured analytic techniques. This paper describes 12 tools—some recently developed—that warning analysts can employ to help them challenge assumptions, generate multiple hypotheses, discover unknown unknowns, and track alternative futures. Three techniques are particularly useful in helping analysts anticipate low probability events and avoid surprise: High Impact/Low Probability Analysis, What If? Analysis, and the Pre-Mortem Assessment. Use of these techniques will ensure greater rigor in the analysis and reduce the chances of surprise.

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Mindsets: An Unavoidable Problem

Postmortems of virtually every major intelligence failure over the past two decades have identified ingrained analytic mindsets as a key contributing cause. Mindsets, as bad as they may sound, are neither good nor bad, they are simply unavoidable.[i] Extensive research in the field of cognitive psychology has demonstrated that analytic mindsets are easy to form and extraordinarily difficult to overcome. If the analyst is lucky and has happened on the correct mental mindset—or, better yet, has tested his or her mindset and found it sound, the analysis will be accurate.

It is far more often the case that first impressions, partial information, and sometimes faulty assumptions underpin analytic mindsets. This weak foundation then gradually gains credence as analysts encounter more data that reinforces their mindset. In some cases, analysts will actively mold new data to make it consistent with their emerging conceptual framework—often a key reason that the warning klaxon is not sounded. When new data is consistently interpreted as "business as usual" and key assumptions are not challenged, the result, at best, is poor analysis; at worst, it becomes the explanation for why we have stumbled into another major intelligence failure.

Time pressures increase the likelihood that an analyst will fall back on an initial hypothesis and not realize that he or she is headed down the wrong path until it is too late. Usually the more important or politically significant an issue becomes, the greater the pressure to generate a finished product. In such an environment, it is the rare supervisor who argues that one must take the extra day, or even hour, to challenge key assumptions and review the quality of the data to ensure that "we got it right." Often it falls to the warning analyst to provide the necessary counterweight to the chronic pressures to fit new events into existing frameworks and to make analytic judgments quickly. It is his or her job to help analysts recognize their cognitive pitfalls and provide timely warning of unanticipated events.

Strategies and Techniques for Overcoming Mindsets

Past experience shows that it is exceedingly difficult to avoid premature closure and "groupthink" unless the analyst employs a specific tool or technique. Simply sensitizing analysts to the variety of analytic traps they are most likely to encounter rarely prevents them from falling into those traps.

Warning analysts can reduce the chances of main-line analysts and policymakers being surprised by future events if they employ structured analytic techniques.

The techniques they employ should help analysts:

- Challenge key assumptions.
- Generate multiple hypotheses.
- Discover "unknown unknowns."
- Track alternative future trajectories.
- Anticipate the unanticipated.

Challenging Key Assumptions

Two techniques have proven particularly effective in helping analysts identify and challenge the very foundations of their analysis: the Key Assumptions Check and Quadrant Crunching. **Key Assumptions Checks**[ii] have been incorporated into National Intelligence Estimates for decades, but only in recent years has the technique gained wider acceptance across the Intelligence Community. All that the technique requires is that the analyst—or the analytic team—write down the key assumptions that underlie the analysis. The process of literally writing down one's Key Assumptions (or listing them on a whiteboard) forces analysts to think critically about what they assume to be true. Most assumptions will stand up to challenge but, invariably, a few start to fall apart. Those assumptions often become Key Uncertainties rather than Key Assumptions. The author's experience in conducting Key Assumptions Check exercises over the past decade suggests that usually one in four key assumptions, initially presumed to be true, turns out on closer examination to be unfounded.

A sound understanding of the assumptions underlying an analytic judgment sets the limits for the confidence the analyst ought to have in that judgment. The probability that the judgment is accurate cannot be greater than the probability of the accuracy of the weakest assumption. Another advantage of this technique is that the process forces the analyst to consider under what circumstances an assumption might not hold up, thereby sensitizing him or her to data that might otherwise have been ignored.

Warning analysts have found **Quadrant Crunching,** described by some as a Key Assumptions Check "on steroids," an efficient and effective way to generate a broad set of alternatives when faced with little data and high degrees of uncertainty. This group process for identifying and examining all possible combinations of selected key variables helps analysts systematically challenge assumptions, explore the implications of contrary assumptions, and discover "unknown unknowns." By generating multiple potential outcomes for any situation, it greatly reduces the chance that events could play out in previously unimagined ways.

The Quadrant Crunching technique is particularly beneficial to military analysts because it helps analysts think through how an attack would be launched, what the most likely targets would be, and what signposts or indicators would suggest that a specific attack is in the

early stages of implementation. As a result, analysts, policymakers, and military decisionmakers can set priorities and generate specific sets of field requirements in response to highly ambiguous threats.

Generating Multiple Hypotheses

A hypothesis is a potential explanation or conclusion that is to be tested by collecting and presenting 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. Gaining confidence in a hypothesis is not a function solely of accumulating evidence in its favor, but also in showing that situations that could establish its falsity do not, in fact, happen.

"Satisficing" and "confirmation bias," two common causes of analytic failure, stand in the way of a rigorous examination of the evidence. "Satisficing" is the technical term for the tendency to accept the first answer that comes to mind that is "good enough." "Confirmation bias" refers to viewing the evidence only from the perspective of whether or not it supports our preconceived answer. Analysts who look for evidence that proves they are right often do not see—or try to discredit—the evidence that suggests they may be wrong. Starting analysis by generating multiple hypotheses, or potential explanations, rather than a single hypothesis can help the warning analyst avoid both cognitive pitfalls. The leading techniques for overcoming "satisficing" and "confirmation bias" are Multiple Hypotheses Generation, Analysis of Competing Hypotheses (ACH), and a recent web-based variant called Collaborative-Analysis of Competing Hypotheses (C-ACH).

Multiple Hypothesis Generation is a technique for developing multiple alternatives for explaining a particular issue, activity, or behavior. Analysts should develop multiple hypotheses at the start of a project when there is a high level of uncertainty about the outcome; many factors are involved in the analysis; or there are strongly held, competing views amongst analysts or decisionmakers.

Pherson Associates has developed a new technique called the **Hypotheses Generator** to help analysts create multiple explanations for the data at hand. While analysts can often brainstorm a useful set of hypotheses without such a tool, the Hypotheses Generator gives warning analysts a greater degree of confidence that a critical alternative or an outlier possibility is not overlooked.

Analysis of Competing Hypotheses is a tool to aid judgment on issues requiring careful weighing of alternative explanations or estimates. ACH involves the identification of a complete set of alternative explanations or outcomes (presented as hypotheses), the systematic evaluation of each, and the selection of the one that best fits the evidence. The analysis proceeds by trying to refute rather than to confirm each of the hypotheses.[iii]

ACH is appropriate for almost any analysis in which there are alternative explanations for what has happened, is happening, or is likely to happen. ACH is especially effective when there is a robust flow of data to absorb and evaluate. For example, it is well-suited for dealing with technical issues in the chemical, biological, radiological, and nuclear (CBRN) arena. It can be used to address questions such as: "What weapons system is this part most likely being imported for?" or "Which type of missile system is Country X importing or developing?" ACH also is particularly helpful when an analyst must deal with the potential for denial and deception, as it was initially developed by Richards J. Heuer, Jr. for that purpose.

ACH helps analysts overcome two common cognitive traps that often lead to intelligence failures:

- Being overly influenced by a first impression based on incomplete data, an existing analytic line, or a single explanation.
- Relying on evidence that supports one's favored hypothesis but that also happens to be consistent with alternative hypotheses and, therefore, has no diagnostic value in assessing the relative likelihood of the hypotheses.

Collaborative-ACH allows analytic teams to conduct ACH exercises from multiple locations in a web-based environment. It is being introduced to A-Space in mid-2009, and several Intelligence Community and DoD organizations will be involved in refining the software. It provides a common, web-based platform for analysts to collaborate either synchronously or asynchronously as inter-agency teams working from multiple geographic locations. It is particularly useful when analysts want to compare how they have loaded their data and identify key areas of disagreement.

Discovering Unknown Unknowns

In the complex, evolving, and uncertain situations that intelligence analysts and policymakers must deal with, the future is not predictable. Usually, the best the analyst can do is to identify the driving forces that will determine that future and monitor those forces as they interact to become the future. Scenarios, plausible and provocative stories about how the future might unfold, are a principal vehicle for doing this. When alternative futures have been clearly outlined, policymakers can mentally rehearse these futures and ask themselves, "What should I be doing now to prepare for these futures?"

Scenarios analysis provides a framework for considering multiple plausible futures. As Peter Schwartz, author of *The Art of the Long View,* has argued, "The future is plural."[iv] Trying to divine or predict a single outcome is often a disservice to senior intelligence officials,

policymakers, and other valued clients. Generating several scenarios helps focus attention on the key underlying forces and factors most likely to influence how the situation develops. Scenarios can also be used to examine key assumptions and deliver useful warning messages when high impact/low probability scenarios are included in the exercise.

The two most common techniques used in the Intelligence Community for generating scenarios are Alternative Futures Analysis and Multiple Scenarios Generation. Pherson Associates has recently developed another technique, **Simple Scenarios**, that analysts can do at their desk or with a small group of colleagues. Simple Scenarios requires the analyst to define the focal issue; identify the forces, factors, and events most likely to influence the future; alter the "weights" or impact of each of these drivers to generate a best case scenario, worst case scenario, and a most likely scenario. Additional scenarios can be generated by flipping a key assumption or driver. Once a set of scenarios is defined, the analyst then describes the implications of each scenario, generates a set of indicators that would suggest that a particular scenario is beginning to play out, and monitors the list of indicators on a periodic basis.

Alternative Futures Analysis and Multiple Scenarios Generation differ from Simple Scenarios in that both usually use a group of experts, often including academics and policy makers, and employ a knowledgeable facilitator who uses a systematic process. Both techniques have proven highly effective in helping analysts, decisionmakers, and policymakers contemplate multiple futures, challenge their assumptions, and anticipate surprise developments by identifying "unknown unknowns." Unknown unknowns are best identified as those factors, forces, or players that one did not realize were important or influential before commencing the scenarios analysis exercise.

- **Alternative Futures Analysis** usually focuses 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** helps warning analysts and decisionmakers expand their imagination and avoid surprise by generating a much larger number of potential scenarios. For example, if analysts have identified five key drivers, the process can be used to generate as many as 40 different "stories" or scenarios.

Tracking Alternative Future Trajectories

The human mind tends to see what it expects to see and to overlook the unexpected. Identifying indicators or signposts creates an awareness that prepares the mind to recognize early signs of significant change. Monitoring indicators and signposts is fundamental to much intelligence analysis, as it is the principal means of avoiding surprise.

By specifying in advance the threshold for what actions or events would be significant and might change their minds, analysts can avoid rationalizing new developments or events as "nothing new" or fitting them into an existing intellectual framework. Indicators can also be used to direct collection efforts and to help route relevant information to all interested parties.

The classic application of indicators is to seek early warning of some undesirable event such as a military attack or a possible nuclear test by a foreign country. Today, indicators or signposts are often paired with scenarios to identify which of several possible scenarios is developing. They are also used to measure change toward an undesirable condition, such as political instability or a humanitarian crisis, or toward a desirable condition, such as economic reform or democratization.

The **Indicators Validator** is a simple tool that was developed by Pherson Associates in 2008 to assess the diagnostic power of indicators. It is particularly useful when developing indicators for competing hypotheses or alternative scenarios. Once an analyst has developed a set of alternative scenarios or future worlds, the next step is to generate indicators for each scenario (or world) that would appear if that particular world were beginning to emerge. A critical question that is not often asked is whether a given indicator would appear only in the scenario to which it is assigned or in one or more alternative scenarios as well. Indicators that could appear in several scenarios are not considered diagnostic, suggesting that they are not particularly useful in determining whether a specific scenario is emerging. The ideal indicator is highly consistent for the world it is assigned and highly inconsistent for all other worlds.

Anticipating the Unanticipated

In the warning arena, three techniques are particularly useful in helping the analyst anticipate low probability events and avoid surprise: High Impact/Low Probability Analysis, What If? Analysis, and the Pre-Mortem Assessment.

Analysts employ **High Impact/Low Probability Analysis** to provide policymakers and military decisionmakers with early warning that a seemingly unlikely event with major policy and resource repercussions might actually occur. It should be used when one wants to alert policymakers and decisionmakers to the potential that a seemingly long-shot development that would have a major policy or resource impact may be more likely than previously anticipated. A High Impact/Low Probability study usually is initiated when some new and often fragmentary information is received suggesting that a previously unanticipated event might actually occur; for example, a tip-off suggesting the susceptibility of the United States to a major information warfare attack or a dramatic terrorist attack on a national holiday or

on Election Day. The technique can also be used to sensitize analysts and decisionmakers to the possible effects of low probability events, to spur them to think in advance about what measures they could take to deal with the danger, or to exploit a previously unforeseen opportunity.

The technique allows analysts to explore the consequences of an event—particularly one not deemed likely by conventional wisdom—without having to challenge the main-line judgment or to argue with others about how likely an event is to happen. It 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 as a given that an event *could* happen that would have a major and unanticipated impact.

What If? Analysis takes as a given that an event has occurred with potential major impact and then explains how it could come about. Warning analysts can use it to great effect when they are having difficulty getting others to focus on the possibility that an event might actually happen and to consider the consequences if it really does occur. It has also proved effective when dealing with deeply-engrained views within the analytic or policymaking community or when the "conventional wisdom" asserts that a certain event could not happen.

The What If? technique forces the analyst to shift his or her focus away from whether an event *will* occur to imagining that it *has* occurred and then explaining how it might have happened. What If? Analysis shifts the discussion from "How likely is it?" to questions such as "How could it possibly come about?" "What would be the impact?" and "Has the possibility of the event happening increased?" The technique also gives decisionmakers a better sense of what they might be able to do today to either prevent an untoward development from occurring or to leverage a previously unrecognized opportunity for advancing their interests.

The goal of the **Pre-Mortem Assessment** 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 to challenge the accuracy of their own conclusions. The method is for the team leader to pose a question along the lines of the following: "It looks like we have the right answer, but we haven't done as much as we should to ensure there are no major flaws in our analytic process. Let's imagine that we have sent our analysis forward, and now, several months later, we learn that our analytic judgment was flat wrong and we have failed spectacularly. Working from that assumption, let's figure out how we could have failed."

The Pre-Mortem Assessment is similar to the previous two techniques in that it asks an analyst or decisionmaker to imagine the occurrence of some future condition and then to reflect on what might cause it. The technique empowers team members who might have had unspoken reservations about a line of analysis or the team consensus to speak out in a context that is not threatening.

Conclusion

None of these structured analytic techniques guarantee that all analysts will foresee unanticipated events in enough time to provide adequate warning. Intelligence surprises are inevitable, but use of these techniques will ensure greater rigor in the analysis and reduce the chances of surprise. If analysts continually test, probe, and indeed attack their assumptions and mindsets, they will be more capable of knowing what they know and discovering what they actually did **not** know. Use of these techniques helps warning analysts anticipate what might occur in the future and better prepare themselves to track developments that presage dramatic change. In the end, decisionmakers will benefit from the more thoughtful, comprehensive analysis that results from employing these techniques.

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[i] Richards J. Heuer, Jr., Psychology of Intelligence Analysis. (Washington: Pherson Associates, 2007), p. 10.

[ii] Detailed descriptions of this and all other tools described in this paper can be found in the "Handbook of Analytic Tools and Techniques" (Reston, VA: Pherson Associates, LLC, 2008) which can be ordered from www.pherson.org. A more extensive list of 52 structured analytic techniques and instructions on how to use them will be available later in 2009 with the publication of Structured Analytic Techniques for Intelligence Analysis by Richards J. Heuer, Jr., and Randolph H. Pherson.

[iii] ACH software is available on several Intelligence Community computer systems and to the public at no cost. The software can be downloaded from Pherson Associates at www.pherson.org. A web-based, collaborative version of ACH has also been developed by Pherson Associates and is being provided to several IC test bed platforms. A web-based version of basic ACH can also be obtained for free by emailing ach@pherson.org.

[iv] Peter Schwartz, The Art of the Long View: Planning for the Future in an Uncertain World (New York: Doubleday, 1996).