



Theoretical Framework and Method for Developing Analytic Rigor Profiles

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Developing Analytic Rigor Profiles

Introduction

Initial work on this project built on our team's findings in 2020 as part of the LAS Advancing Analytic Rigor team. We used the operational definition of analytic rigor that was the centerpiece of the 2020 Literature Review to explore ways to identify and categorize risks to analytic rigor and then determine interventions to help analysts mitigate these risks.

The LAS operational definition of analytic rigor (2020):

Analytic rigor is the effort by an analyst or researcher to be as complete as possible to arrive at the most accurate assessment/results in conducting an analysis with integrity. This is achieved by employing methods and techniques meant to support a variety of indicators of sufficiency (of rigor). Indicators of sufficiency include:

- Objectivity
- Thoroughness
- Replicability, reliability, validity
- Transparency (in analysis and analytic decision-making)
- Credibility
- Relevance

Findings of our 2020 work that resonated strongly with team members and others who are familiar with the work of intelligence analysts are that analytic rigor is quite difficult to identify (e.g., "I'll know it when I see it.") and analytic rigor seems to manifest itself differently depending on the type of analysis being done. In short, one size of analytic rigor doesn't seem to fit all types of intelligence analysis. These were the issues we examined in the 2021 work reported here. We worked on developing a theoretical framework for understanding risks to analytic rigor and a method for identifying those risks and developing interventions to mitigate them.

We used two concepts to reach these goals: the Indicators of Sufficiency of Rigor (IoS) and Common Characteristics of intelligence analysis. We examined these in the environment of a hypothetical case study which allowed us to focus on a specific type of analysis and provided a context to formatively test the framework as well as the method.

Our work is based on three assumptions.

1. Analytic rigor is present both in the *process* of analysis and the *product* of analysis.
2. Identifying analytic rigor in the process of analysis will yield a better product than identify issues related to analytic rigor upon completion of an analysis.
3. While the elements of analytic rigor (i.e., IoS) are true for all types of intelligence analysis, they manifest differently depending on the type of analysis. We refer to these different manifestation combinations as rigor profiles.

The information that follows describes the theoretical framework and method we developed, how it was developed, and insights we derived from this proof of concept.

Foundational Work

Early work on this project focused on how we can accurately define different types of analysis and how that, combined with IoS, can inform our understanding of risks to rigor and related interventions.

Our prior research has shown that rigor is represented differently as carried out by different types of analysts. Because of the great variety of definitions of intelligence analysts across the community and the inconsistency of information included in the definitions, the team studied descriptions of analytic positions from several different sources (i.e., agency websites, USAJobs.gov, and recruiting websites of government contractors) to determine types of analysts and analysis that could be employed consistently in our study. We used the Office of the Director of National Intelligence (ODNI) categorization of Types of Technical Expertise (ICD 610) to describe types of analysts. We felt this organization would be reasonable since it is put forth in an Intelligence Community Directive meant to provide guidance for the entire Intelligence Community (IC). We then determined that types of analysis are those employed by each of the types of analysts.

Type of Technical Expertise	Definition
Academic/Professional Disciplines	Applies the concepts, principles, theories, and methods of an academic/professional discipline
Counterintelligence	Gathers information and conducts activities to protect against espionage, other intelligence activities, sabotage, or assassinations conducted for or on behalf of foreign power, organizations, or persons, or international terrorist activities
Counterproliferation	Support USG efforts to discourage, prevent, eliminate, deter, and/or mitigate the development, proliferation, or use of WMD and their means of delivery. Provides policy makers with early warning of plans and intentions to develop WMD and identifies WMD-related people, programs, and networks of concern, eliminating priority gaps in knowledge. Identifies and helps the USG leverage opportunities to counter the development and spread of WMD (e.g., CBRNE)
Counterterrorism	Supports USG efforts to discourage, deter, and prevent acts of terrorism by providing policymakers, operators, and warfighters with an understand of terrorist motives, ideologies, intentions, and capabilities, weapons (including WMD) as well as early warning of plans for attacks. Identifies means of radicalization and recruitment and current and potential terrorism-related people, entities, programs, and networks of concern. Identifies and helps the USG leverage opportunities to counter current and developing terrorist threats and trends.
Cultural Expertise	Demonstrates knowledge of the cultural characteristics of a given group of people that permits deduction and inference as to real intent and probably causative factors of actions or communications of individuals and subgroups within that group.
Intelligence Disciplines	Applies knowledge of concepts and terminology, policies and directives, organization missions, and functions, with respect to intelligence capabilities.

Intelligence Topics	Demonstrates current knowledge of, and prior experience in, one or more of the National Intelligence Priority Framework (NIPF) topics and other DNI-identified topics.
Languages	Demonstrates knowledge of and skill in one or more foreign languages and dialects
Targets	Applies current knowledge of one or more regions, countries, non-state entities, and/or technologies.

Table 1. ODNI Definitions of Types of Technical Expertise

We analyzed the information gathered to identify common characteristics. Originally, we identified 11 Common Characteristics. We sought to achieve a reasonable level of face validity from our team of analyst and social science experts regarding the description and relevance of these characteristics, and regarding the cognitive processes related to these characteristics. We attempted to do this quantitatively via a survey and found numerous challenges. We learned that attempting to come to consensus across disciplines (i.e., intelligence analysis and social science) is not easily achieved through the written word alone. We regrouped and tackled the problem from a qualitative perspective that involved constructing definitions together.

The team – made up of LAS government, academic, and industry members – conducted a deep dive examination of the Common Characteristics, their definitions, and the kind of information could be derived from knowing the described characteristics. The team work here provided a rigorous approach to determining face validity of both the definitions and the affiliated information. They represent meaning and language that is meaningful to potential users (analysts) and represents the researchers’ intent. These revised and improved definitions are significant because they form a validated foundation of the rigor profile model. This activity resulted in the description of 7 Common Characteristics and 2 IC Influencers. Identification of these Common Characteristics allows us to make comparisons across different types of analysis (by characteristic), to examine cognitive processes, and to determine rigor.

Definitions of Common Characteristics, Related Cognitive Processes, and Indicators of Sufficiency¹

What follows is the result of our work on identifying and defining Common Characteristics of intelligence analysis, results of face validity efforts of our social science team members regarding cognitive processes that are present in each of the common characteristics, and results of our examination of the IoS and their relative importance to each of the common characteristics.

Cognitive Processes

A panel of academic social scientists who have experience working with intelligence analysts were asked to determine what cognitive processes were employed by an individual intelligence

¹ Definitions of cognitive processes and Indicators of Sufficiency are provided in Appendix A.

analyst when working at each stage identified in the common characteristics. Determinations were made using the cognitive processes identified in Bloom's Taxonomy². We used the updated version created by Vanderbilt University³. The processes and definitions are as follows.

Cognitive Process	Description	Descriptors
Create	Produce new or original work; synthesize	Design, assemble, construct, conjecture, develop, formulate, investigate
Evaluate	Justify a stand or decision	Appraise, argue, defend, judge, select, support, value, critique, weigh
Analyze	Draw connections among ideas	Differentiate, organize, related, compare, contrast, distinguish, examine, experiment, question, test
Apply	Use information in new situations	Execute, implement, solve, use, demonstrate, interpret, operate, schedule, sketch
Understand	Explain ideas or concepts	Classify, describe, discuss, explain, identify, locate, report, select, translate
Remember	Recall facts and basic concepts.	Define, duplicate, list, memorize, repeat, state

Table 2. Cognitive Processes as Described in Bloom's Taxonomy

Indicators of Sufficiency

The same panel of social science experts who determined cognitive processes also determined which Indicators of Sufficiency were present in activity involved in each of the common characteristics. Definitions of the Indicators of Sufficiency are provided in Appendix A.

² In 1956, Benjamin Bloom with collaborators Max Englehart, Edward Furst, Walter Hill, and David Krathwohl published a framework for categorizing educational goals: *Taxonomy of Educational Objectives*. The framework elaborated by Bloom and his collaborators consisted of six major categories: Knowledge, Comprehension, Application, Analysis, Synthesis, and Evaluation. The categories after Knowledge were presented as "skills and abilities," with the understanding that knowledge was the necessary precondition for putting these skills and abilities into practice. While each category contained subcategories, all lying along a continuum from simple to complex and concrete to abstract, the taxonomy is popularly remembered according to the six main categories. Bloom, B. S. (ed.). *Taxonomy of Educational Objectives. Vol. 1: Cognitive Domain*. New York: McKay, 1956.

³ Anderson, L.W., Krathwohl, D., Airasian, P., Cruikshank, K.A., Mayer, R.E., Pintrich, P., Rath, J., Wittrock, M.C. (2001) *A Taxonomy for Learning, Teaching, and Assessing: A Revision of Bloom's Taxonomy of Educational Objectives Complete Edition*. New York: Addison Wesley Longman

Influencers:

As part of the deep dive into defining Common Characteristics of intelligence analysis, we concluded that two of the original common characteristics: IC Agency and Agency Organization would more appropriately be designated as *influencers* of a particular type of analysis as opposed to its basic *characteristics*. Influencers have a nuanced impact on the type of analysis, whereas basic characteristics can be thought of as basic building blocks of the type of analysis.

IC (Intelligence Community) Agency and Agency Organization

<i>Definition</i>	Intelligence community agency or affiliated organization where the analysis is being performed. Includes grouping of offices and subordinate entities in the named agency where analysis is being performed.
<i>Potential Derived Information</i>	Organizational culture (i.e., underlying beliefs, assumptions, values, and ways of interacting that contribute to the unique social and psychological environment of an organization); analytic perspective; alignment of analysis with Title Authorities, which regulate mission boundaries and can therefore shed light on how intelligence questions are approached, as well as recommended findings and courses of action. Agency organization can inform mission objective; analytic perspectives; alignment of analysis with Title Authorities as discussed above.
<i>Related Cognitive Processes (Bloom)</i>	Analyze, Evaluate
<i>Related Indicators of Sufficiency</i>	Objectivity, Transparency, Credibility

Common Characteristics

As stated earlier, the Common Characteristics represent those features that appear in most or all types of intelligence analysis.

Foundational Mission Objectives

<i>Definition</i>	Types of intelligence needs and corresponding analytic approaches that span enduring, current, and anticipatory intelligence operations.
<i>Potential Derived Information</i>	May provide insights into: Scope of analysis - broad focused v. narrow focused; Duration - long-term v. short-term; Anticipatory/emerging focus - ill-defined boundaries
<i>Related Cognitive Processes (Bloom)</i>	Evaluate, Create
<i>Related Indicators of Sufficiency</i>	Transparency, Thoroughness, Repeatability/Reliability/Validity, Relevance, Credibility

Customer

<i>Definition</i>	An internal or external organizational entity that requests and seeks to utilize specific information or analysis.
<i>Potential Derived Information</i>	May provide information about types of products (e.g., intelligence estimate, targeting package)
<i>Related Cognitive Processes (Bloom)</i>	Analyze, Evaluate, Create

<i>Related Indicators of Sufficiency</i>	Objectivity, Thoroughness, Repeatability/Reliability/Validity, Credibility
------------------------------------------	----------------------------------------------------------------------------

Analysis Topic

<i>Definition</i>	Topics that are typically studied using each type of analysis
<i>Potential Derived Information</i>	Insights into the degree of complexity of analysis; qualitative v. quantitative approach
<i>Related Cognitive Processes (Bloom)</i>	Apply, Analyze, Evaluate, Create, Understand
<i>Related Indicators of Sufficiency</i>	Objectivity, Repeatability/Reliability/Validity, Relevance

Purpose of Analysis

<i>Definition</i>	Purpose and/or reason the analysis is being performed
<i>Potential Derived Information</i>	Analyst's approach to research, type of analysis output
<i>Related Cognitive Processes (Bloom)</i>	Analyze, Evaluate
<i>Related Indicators of Sufficiency</i>	Thoroughness, Credibility, Transparency

Types of Resources

<i>Definition</i>	Data and resources used to conduct analysis (e.g., types of INTs, classified, unclassified, coordination process used, outside experts, databases, tools to manipulate data)
<i>Potential Derived Information</i>	Insights into ways to assess completeness, identify data gaps (e.g., defining sources of data gaps can include limitations of databases, etc.), complexity and approach of analysis
<i>Related Cognitive Processes (Bloom)</i>	Evaluate, Understand
<i>Related Indicators of Sufficiency</i>	Objectivity (in terms of selection of data), Reliability, Thoroughness, Credibility, Relevance

Type of Product and Product Dissemination Method

<i>Definition</i>	The vehicle the analyst uses to address the intelligence question based on the approach or method being employed. Also, what form the analysis will be shared in (e.g., written report, oral briefing, finished intelligence, etc.). Selection of product dissemination method shapes the final product development in terms of depth of explanations, priority of findings and supporting reasoning. Type of product and dissemination method influence each other.
<i>Potential Derived Information</i>	Relationship of type of question and selected approaches to address it; how internal and external audiences affect type of product used; reliability and validity are determined. Knowledge of the form the analytic product will be disseminated in (shared with) can provide insights into how explanations will be presented, priority of findings, and provision of supporting reasoning.
<i>Related Cognitive Processes (Bloom)</i>	Analyze, Evaluate, Create, Apply, Understand, Remember
<i>Related Indicators of Sufficiency</i>	Relevance, Thoroughness, Transparency, Credibility, Objectivity

Expected Use of Analysis

<i>Definition</i>	How the analytic output is expected to be used in response to the intelligence question under study
<i>Potential Derived Information</i>	How the identified type of analysis (or area of technical expertise) addresses intelligence questions; insights into structure and focus of analysis
<i>Related Cognitive Processes (Bloom)</i>	Evaluate, Create
<i>Related Indicators of Sufficiency</i>	Relevance, Thoroughness, Transparency, Credibility, Objectivity

Weighing the Indicators of Sufficiency

When the operational definitions of the common characteristics were finalized, the next step was to determine the weights of Indicators of Sufficiency within each common characteristic (via the description of affiliated information). This was accomplished by using a paired comparison activity where all three of the case study developers reached a consensus on the relative importance of the indicators for each common characteristic activity. A detailed description of the procedure and results for the paired comparison activity appears in Appendix B. The results of the paired comparison activity to determine weights for each common characteristic are as follows.

COMMON CHARACTERISTICS	INDICATORS OF SUFFICIENCY					
	Objectivity	Transparency	Credibility	Thoroughness	Relevance	Repeatability, Reliability, Validity
Foundational Mission Objective	25%	0	18.75%	12.5%	31.25%	12.5%
Customer	33.3%	0	33.3%	22.2%	0	11.1%
Analysis Topic	0	0	0	0	50%	50%
Purpose of Analysis	0	40%	40%	20%	0	0
Type of Resources	0	0	37.5%	25%	37.5%	0
Expected use of Analysis	33.3%	16.7%	25%	16.7%	16.7%	0
Type of Product & Its Dissemination Method	40%	0	30%	20%	10%	0

Table 3. Weighted Importance of Indicators of Sufficiency by Common Characteristics

This information informs where we might be likely to find different types of risks to rigor that may occur in an analyst's cognitive workflow and their relative importance.

To test the theoretical framework, we developed rigor profiles as a method for identifying risks to rigor and determining interventions to mitigate them. The profile development included consideration of common characteristics descriptions and results of paired comparisons of common characteristics and Indicators of Sufficiency of rigor. To allow the researchers and the readers to understand our findings more clearly, we developed a case study that examines the cognitive workflow of an analyst and provide the context for developing our rigor profile proof of concept.

Mapping Cognitive-Related Processes in the Analytic Workflow

Cognitive processes – what goes on in the analyst’s head - are the part of analytic workflow that is the focus of this study. Our intent is to relate cognitive processes and Indicators of Sufficiency to the actual activity in the intelligence analysis process. Doing this will help us identify potential targets for risk to rigor and will also help us identify any gaps that we might have overlooked in previous reviews.

Journey maps are a common method used to map steps from goal establishment to accomplishment presented in a visual format. Key components of a journey map usually include: an actor, scenario and expectations, journey phases (high level stages), actions (can include mindsets, emotions), and opportunities or challenges.

This journey map looks at the steps/phases involved in four areas: Activity (developing an intelligence assessment), product or outcome, related Indicators of Sufficiency, and challenges. Rather than use a large, all-inclusive table that may be hard to follow, we have divided the visualization up based on different aspects or phases of the analysis as we look at all the identified steps in describing the intelligence analysis process.

Figure 2 shows the journey steps in terms of the activity of conducting an intelligence assessment.

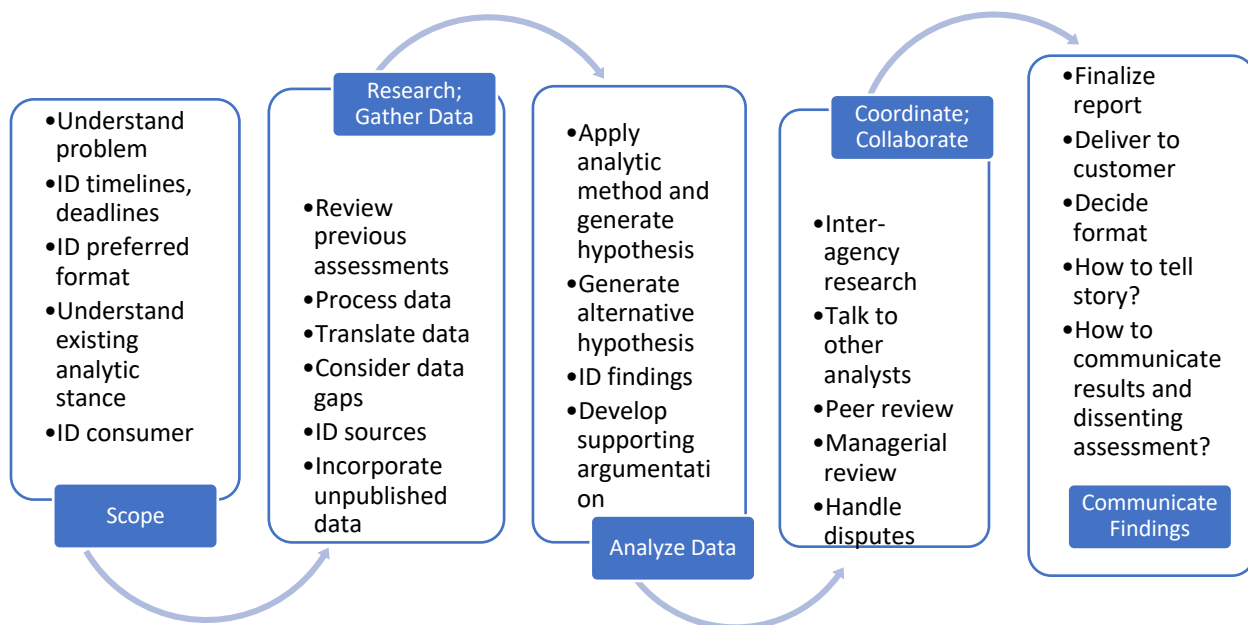


Figure 1. Conducting Analysis Journey Steps

A second perspective of the analytic process is that of the analytic outcome or product. Figure 3 outlines those journey steps.

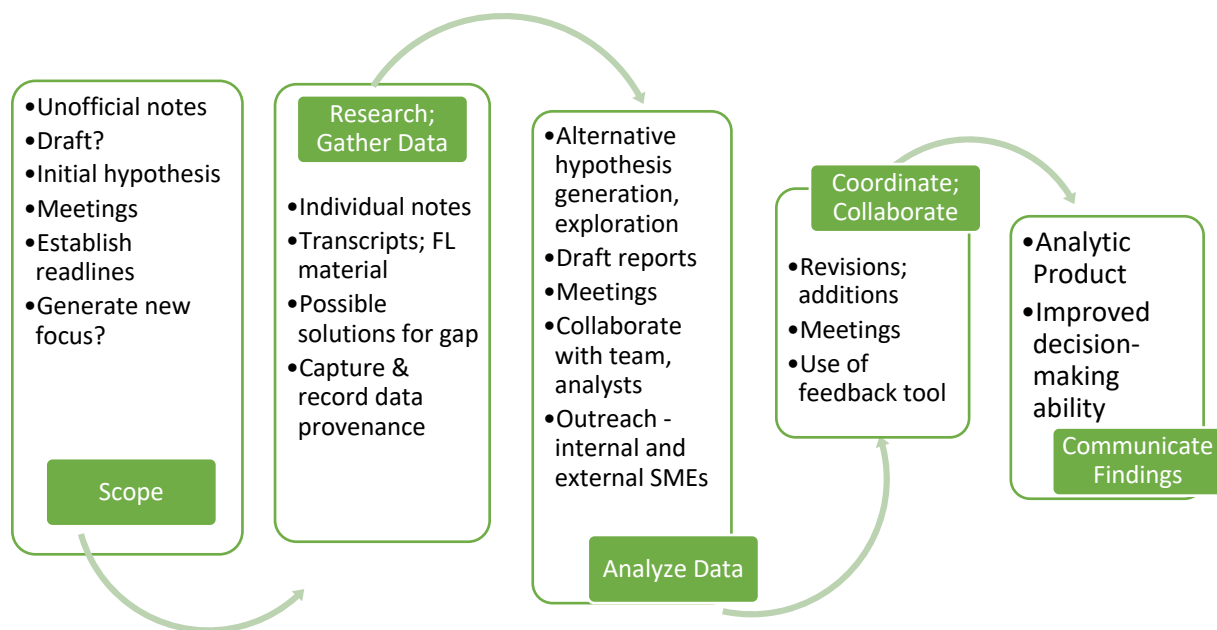


Figure 2. Product/Outcome Journey Steps

By synthesizing the information in Figures 1, 2, and 3, we identified the following challenges by journey step.

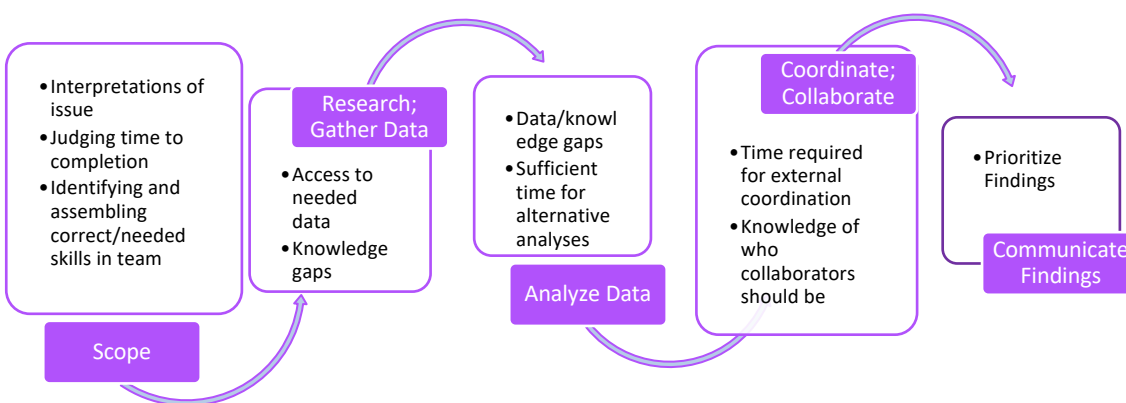


Figure 3. Challenges by Journey Steps

Based on the identified activities in the previous aspects of conducting an intelligence analysis (Figure 4), and the results from our social science subject matter experts, the location of different types of Indicators of Sufficiency. They are visualized in Figure 5.

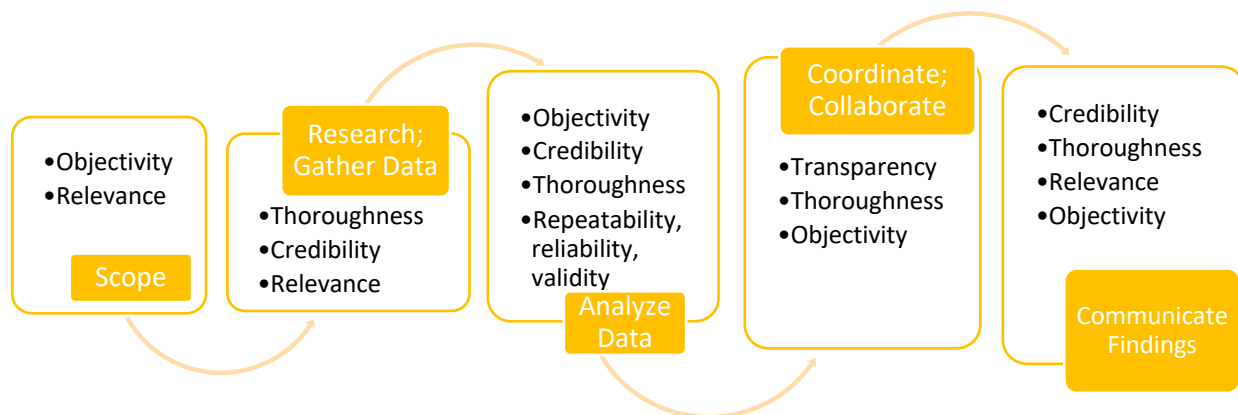


Figure 4. Indicators of Sufficiency by Journey Step

Putting It All Together, Part 1: Where Are the Risks to Rigor?

To identify where the risks to rigor might manifest in the analytic process outlined in our use case scenario, we went back to our journey map of “Conducting Analysis.” We focused on this activity because completion of this journey map did the best job of teasing out cognitive activities and thus cognitive processes that are at the heart of our study of analytic rigor and related risks.

Rigor Profile Method Step 1: Determining the Location of Risks to Rigor

During several working sessions, the team walked through the cognitive processes that would be involved for an analyst or possibly a team of analysts. From this walk through, we were able to define the activities more clearly, identify ‘targets’ of rigor risks, and tie those risks to the Indicators of Sufficiency that are part of our operational definition of “analytic rigor.”

The outcome of this analysis is pictured in Figure 6. If an activity is identified as a risk, it appears in bold in the figure. Activities that are labeled as targets of rigor risk also show labels that identify what indicator of sufficiency are relevant to the risk. Those Indicators of Sufficiency guide the development of interventions. To ensure that we were making the right connections with risks and Indicators of Sufficiency, we referred to our findings from the social science subject matter review conducted earlier in the project. The locations of the Indicators of Sufficiency from the social science review and the expert analyst review (Figure 5) compare closely to our mapping

of rigor risks in Figure 6. Minor differences between the two can be accounted for when we compare the description of cognitive processes in intelligence analysis that were provided for the social scientists in the early part of this study with the revised descriptions found in the journey map. The results of our review and identification of targets are shown in Figure 6.

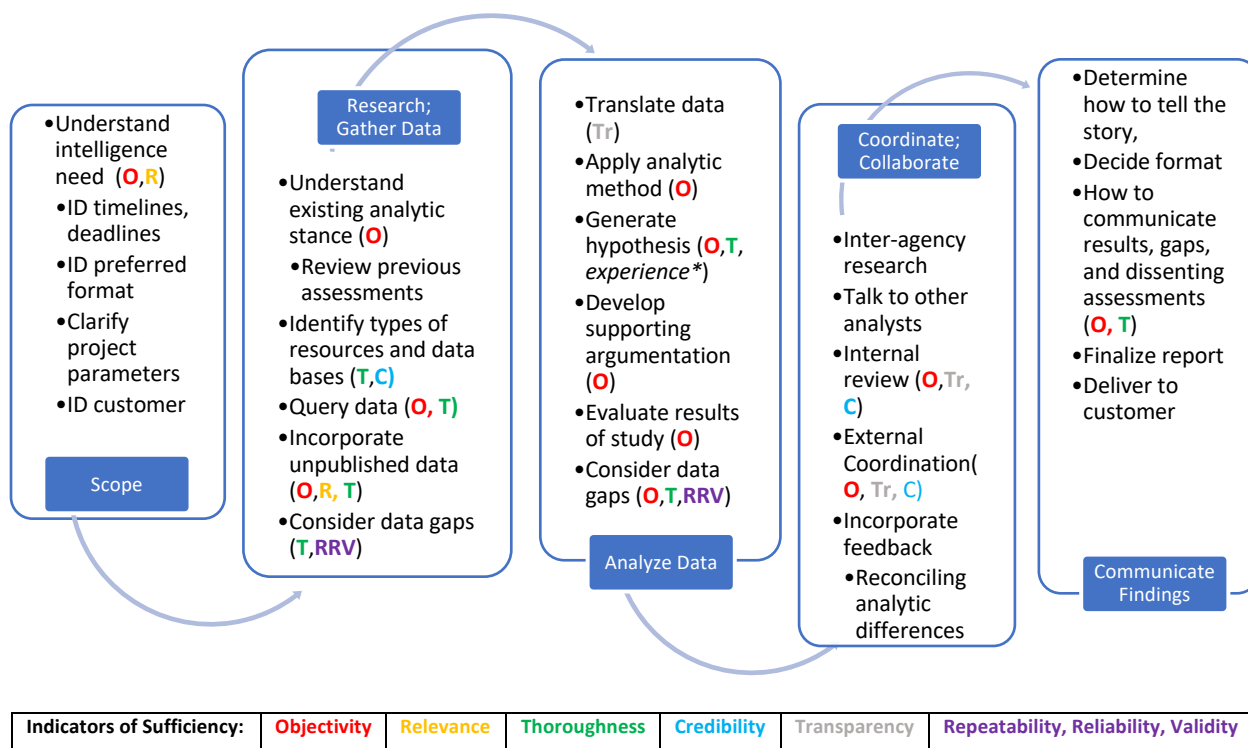


Figure 5. Targets of Rigor Risk

Rigor Profile Method Step 2: Determining the Types of Risks to Rigor

A second round of review focused on identifying the kinds of risks present for each occurrence. We organized these reviews by Indicators of Sufficiency. For example, we looked at all the activities that were determined to show a risk to Objectivity, in each of the steps (i.e., scope, research and gather data, analyze data, coordinate and collaborate, communicate findings). In addition to determining how these Indicators of Sufficiency would show risks to rigor, we also analyzed across the steps to see if Objectivity risks occurred in similar fashion, or if they were completely unique to the step.

Our findings are organized by Indicators of Sufficiency⁴. None of the claims discussed below represent an exhaustive review of all circumstances, but rather a more general view of common occurrences.

Objectivity (O)

Objectivity as an indicator of sufficiency represents the lack of favoritism toward one side or another, a freedom from bias. Determining objectivity calls for a somewhat subjective judgment concerning the existence or non-existence of favoritism and bias. The attainment of complete objectivity seems to be more of an aspiration than a reality.

Scope

We determined there would be an objectivity risk In the Scope step of conducting analysis, particularly at the point where the analyst works to **understand the problem** or question that is being presented for study. The possible objectivity risks to rigor would include: confirmation⁵ and anchoring⁶ (cognitive) biases, miscommunications, misinterpretations, and taking too narrow of a view of the problem.

Research; Gather Data

Whereas the Scope step is focused heavily on one activity – understanding the intelligence problem – the Research and Gather Data step includes several activities that can be subject to objectivity risks to rigor. *These activities include understanding the existing analytic stance, querying data, and incorporating unpublished data.* **Understanding the existing analytic stance** (i.e., the position on this topic developed by previous analysts and adopted by a group, office, division, or agency) has risks to rigor that are similar to those we identified in the Scope step which makes sense as they are similar cognitive activities. Objectivity risks to rigor would include confirmation and anchoring (cognitive) biases, miscommunications, misinterpretations, and taking too narrow of a view of the problem. **Querying data** provides a difference set of objectivity risks to rigor caused by potential limited knowledge of the tool being used to query and gather data, as well as expertise in interpreting the data sets retrieved, and limits to knowledge or awareness of potential resources particularly databases. **Incorporating unpublished data** refers to information and/or partial analyses that were collected for previous work, but has not been published and, as such, not gone through formal reviews related to publishing a report. Objectivity risks here relate to the absence of summative reviews and evaluation.

⁴ As a reminder, our perspective of *Indicators of Sufficiency* of rigor is that they are the elemental dimensions that need to be present, in some amount or degree, to indicate that rigor exists in a particular process or product. They include: objectivity, relevance, thoroughness, transparency, credibility, and repeatability/reliability/validity.

⁵ *Confirmation bias* is the tendency for one to believe data that agree with their expectations for the outcome of an analysis, and to disbelieve, discard, or downgrade data that appear to conflict with those expectations.

⁶ *Anchoring bias* refers to relying too heavily on the first piece of information received—an “anchoring” fact— and base all subsequent judgments or opinions on this fact. (e.g., physicians making a diagnosis).

Analyze Data

Nearly all the cognitive activities in the Analyze Data step presented potential risks to analytic rigor, i.e., apply analytic method, generate hypothesis, develop supporting argumentation, evaluate results of study, consider data gaps. The selection and **application of an analytic method** can present objectivity risks to rigor based on how and what type of analytic method is selected. Unchecked biases and preferences in selection of the method, and level of experience in using a particular method can all present risks to rigor that could also affect the accuracy of the analysis. **Generating a hypothesis** for an analytic study is foundational to the analysis but can be subject to anchoring and confirmation biases that would diminish the objectivity of the study. **Developing supporting arguments** could be subject to confirmation bias as well as group think⁷, as the analyst(s) might be influenced by preconceived notions of what is correct, or by the desire for there to be consensus at all costs. **Evaluating results of the study** also contains objectivity risks to rigor by objectivity when analysts who are reviewing results have an expectation of a particular outcome (confirmation bias), or user experience bias⁸ – where evaluation is based on prior experience with similar types of tools used in the study. Ensuring that an analysis is complete relies on **identifying (and accounting for) data gaps** in collection and analysis. Here again, rigor can be at risk when biases influence decisions about what data gaps exist and why. The biases here would include groupthink, overconfidence⁹ and confirmation bias as well as the Dunning- Kruger effect¹⁰.

Coordinate; Collaborate

In this Step, the analyst is collaborating as needed with other analysts and experts that can add information and insights to the analysis. They are also involved in eliciting **internal reviews and external coordination** of the analysis from peers, supervisors, and others who may be part of the identified coordination process. Objectivity risks to rigor can occur during both internal and external reviews in the form of limitations: of the scope of one's network or relying on siloed options only; the analyst's ability to consider all inputs and reconcile differences in a meaningful way; of availability and accessibility of the right information; time; and objectivity and diversity of peers.

⁷ *Group Think or Conformity bias* is the psychological phenomenon that occurs within a group of people in which the desire for harmony or conformity in the group results in an irrational or dysfunctional decision-making outcome. Group members try to minimize conflict and reach a consensus decision without critical evaluation of alternative viewpoints by actively suppressing dissenting viewpoints, and by isolating themselves from outside influences

⁸ *Experience bias* occurs when one takes their own perspectives (based on experience) to be the objective truth, assumes their view of a given problem or situation constitutes the whole truth.

⁹ *Overconfidence bias* refers to overestimating the accuracy of one's judgments, especially when available information is consistent or inter-correlated

¹⁰ *Dunning-Kruger effect* is the tendency for unskilled individuals to overestimate their own ability and the tendency for experts to underestimate their own ability.

Communicate Results

When the analysis is complete, the next step is communicating results. An objectivity risk to rigor can occur when **determining how to communicate results, gaps, and dissenting assessments** the analyst must make decisions about what information should be included and how it should be prioritized in its presentation. The analyst must be aware of the potential of a framing effect¹¹ on the part of their audience. It also at this point where the analyst might unintentionally omit important information.

Thoroughness (T)

Thoroughness is, in general, discussed in terms of completeness. Completeness is described by the diligence of the search and the meticulous inclusion of sources and citations of work that is drawn upon in the research or analysis. Thoroughness also can include the explanation of any uncertainties associated with judgments or decisions, as well as gaps or the absence of critical information that may be identified. Finally, thoroughness can assume a meta-description when demanding a clear and logical rationale in study-related decisions, and clear and logical argumentation in drawing conclusions and making judgments and recommendations.

Another IC regulation, ICD 206 (Sourcing Requirements), describes the importance of determining the accuracy of the source of information. Because of the nature of types of information sources in the IC, there are several criteria related to evaluating human-sourced information that are not usually included in discussions of thoroughness in academic disciplines. Where there is agreement regarding thoroughness in general and sourcing in ICD 206 is the statement that “The presentation of sourcing information... shall be in the form of source reference citations, appended reference citations, source descriptors, and source summary statements.”¹²

Research, Gather Data

There are a number of points where thoroughness risks to rigor may occur when the analyst is conducting research and gathering data for their analysis. When **identifying types of resources and data bases** it is possible that resources may be excluded without reason or including certain resources because they are the analyst’s go-to tool or data base (experience bias). When actually **querying the data**, it’s possible to fall prey to the Dunning-Krueger bias. Over or underestimating one’s ability to properly and thoroughly query data to inform the analysis will affect the overall thoroughness of the analysis. The analyst may be tempted to **incorporate unpublished data** in an effort to be as thorough as possible. However, if appropriate information about these data is not included due to its unpublished nature, the possibility for thoroughness risks to rigor based on miscommunications and misinterpretations can be strong. Finally, when **considering data gaps** in their overall analysis, the possibility of thoroughness risks to rigor may arise due to experience bias.

¹¹ Framing effect occurs when decisions are influenced by the way information is presented. Information of equal importance can be made more or less attractive based on how it is presented. In other words, the way the information is presented is more important than the information itself.

¹² Intelligence Community Directive 206: Sourcing Requirements for Disseminated Analytic Products (2015)

Analyze Data

We have a natural tendency to think of thoroughness in terms of how much information is included in an analysis. However, including different views of information also adds to the thoroughness of an analysis. Thoroughness risks to rigor can occur when **generating the hypothesis** as part of the analysis, especially if the hypothesis represents only one point of view unintentionally. It is also possible for the analyst to be influenced by experience bias when **considering data gaps**, creating a potential thoroughness risk to rigor.

Communicate Findings

Thoroughness risks to rigor may occur when the analyst is making decisions about **how to communicate results**, i.e., what information needs to be included and the priority of some information or findings over others. Additionally, it is possible here to unintentionally omit potentially important information.

Replicability, Reliability, Validity (RRV)

When discussing rigor, especially regarding quantitative research in both the physical and social sciences, the criteria of validity, reliability, replicability, and generalizability are key. An objective of quantitative research is to identify phenomena that can be applied to a number of instances beyond the research study itself, or that can be generalized to other instances. Indicators of generalizability, and hence rigor, include validity, reliability, and replicability. Briefly, validity refers to the accuracy of a measure - whether a study measures what it was supposed to measure; reliability is about consistency and refers to whether a study will yield the same results over and over again. Replicability supports determining reliability by repetition – of a study with the same process or methods, generally different situations and subjects - to determine if the same results can be achieved.

While intelligence analysis and its products are not research studies, the notion of being able to replicate an analysis and get similar results is of value in establishing the rigor of that analysis and the accuracy of its results, judgments, and recommendations.

Research; Gather Data

RRV risks to rigor could occur when **considering data gaps** if the logical progression of the argument is muddled, or information is excluded for no reason, or an experience bias (related to a tool or a process) is present.

Analyze Data

When considering data gaps as part of the analysis, RRV risks to rigor could occur in much the same way as in the Research; Gather Data step, i.e., logical progression of the argument is muddled, or information is excluded for no reason, or an experience bias (related to a tool of process) is present.

Transparency (Tr)

Within the IC, transparency refers generally to being able to provide information for US citizens about what their government is doing, vis a vis intelligence analysis, and in this way promotes accountability.¹³ This includes the requirement to indicate and explain the basis for uncertainties associated with major analytic judgments and confidence in judgments.

In a more general sense in academic and other communities, transparency is the characteristic of work that allows others to see what has been done by the author to conduct analysis, evaluate information, and make decisions and judgments. While it is substantively different from credibility, transparency is complementary to it.

Analyze Data

Transparency risks to rigor are possible when **translating data** from one format to another or one language to another. If the translation process isn't transparent to others, it will affect the possibility of the process being repeated (to achieve the same results).

Coordinate; Collaborate

During the processes of **internal reviews and external coordination**, transparency is important in evaluating credibility of contributors (reviewers and coordinators) and feedback, as well as the logic of inputs and feedback. A lack of transparency here would be a risk to rigor. Additionally, the biases of contributors – if not made clear in their feedback – would present risks to rigor.

Credibility (C)

Credibility is a recognized criterion for rigor in qualitative research. Credibility refers to the extent to which a research account is believable and appropriate, with particular reference to the level of agreement between participants and the researcher. It can be defined as the degree to which descriptions could be recognized by those who have experienced it (the phenomenon under study) and understood by those who have not¹⁴. In this discussion, credibility has to do with the analytic process and findings. [In IC requirements and policy discussions, particularly ICD 206 (Sourcing Requirements), credibility refers only to a source of information used in analysis.]

The rationale behind the use of these techniques is that they provide a way of checking the researcher's data, to possibly review the analysis process and ensure consistency in the findings.

Research; Gather Data

When **identifying types of resources and data bases**, it is critical for the analyst and the audience to know that they can believe and trust the accuracy of the information contained in various

¹³ President's Memorandum on Transparency and Open Government – Interagency Collaboration (2009) <https://hallways.cap.gsa.gov/app/#/doclib?document=27289> American Recovery and Reinvestment Act (2009), Title XV Accountability and Transparency, Subtitle Transparency and Oversight Requirements, Section 1512 Jobs Accountability. <https://www.congress.gov/bill/111th-congress/house-bill/1>

¹⁴ Brown, K., Elliot, S.J., Leatherday, S.T., and Robertson-Wilson, J. (2015). Searching for rigour in the reporting of mixed methods population health research: A methodological review. *Health Education Research*, 30(6), 811-839.

resources and data bases. If this is not established or is questionable, a credibility risk to rigor exists.

Coordinate; Collaborate

Within both **internal reviews and external coordination**, the analyst, reviewers, and audience need to know that the individuals involved in reviews and coordination are credible. If credibility and selection criteria are not established at this step, a credibility risk to rigor exists.

Relevance (R)

The IC standards of analytic tradecraft (ICD 203) maintain that intelligence analyses provide information and insight on issues relevant to the customers of US intelligence, as such it should be relevant to US national security. For clarity, we refer to this as external relevance.

Indicators of sufficiency are also concerned with the understanding and impact of internal relevance - that what is being performed in the course of conducting intelligence analysis is directly relevant to the question or problem that is being addressed. Relevance matters in how a problem is scoped, the sources used for data gathering, perspectives that are represented and how objectivity is applied, the application of methods, techniques, and heuristics, as well as understanding the needs of the audience and how best to disseminate findings.

Scope

Misunderstanding or miscommunicating the intelligence need leads to missing the goal of relevance in conducting the analysis. This relevance risk to rigor can undermine the entire analysis.

Research; Gather Data

When an analyst chooses to **incorporate unpublished data**, a number of potential relevance risks to rigor occur. Relevance risks can be caused by the absence of an established method for adding unpublished data. The analyst has questionable certainty regarding the recency of sources, the level of coordination or review may have taken place, changes in policy, etc., that may have been adopted since data collected.

Rigor Profile Method Step 3: Determining Interventions

To determine interventions for each of these types of risk to rigor, we considered what the goals of the interventions would be based on where the risk occurred. We used those results to determine what types of interventions would help reach the goals established.

We considered the goals for interventions and the interventions themselves in terms of the environment where they occurred, i.e., the Step of Conducting Analysis as well as the type of risk (by Indicator of Sufficiency) when recommending interventions to mitigate risks. In Step 4, we consider whether the relationship of type of risk to location of risk.

Our findings are listed in the subsequent tables.

Interventions: Objectivity

Objectivity rigor risks were the most numerous and widespread in our examination, appearing in each Step of Conducting Analysis.

Table 4. Series: Objectivity Interventions

Step	Activity	Risk	Intervention Goals	Intervention
SCOPE	Understand intelligence need	Confirmation bias	Help analysts develop disconfirming hypothesis and supporting beliefs	Job aid (online, personal, educational) to address countering these biases: increase awareness and acknowledge bias, provide strategies to minimize impact
		Anchoring bias	Help analysts develop disconfirming hypothesis and supporting beliefs	
		Miscommunication	Help analysts acquire specificity from tasker/tasking organization. Intra team: Understand task and requirements	-Policy/ Guidance: Empower analyst to directly communicate with tasking organization; establish standardized methods for clarification that allow analyst to go back to tasker and support direct communication model between analysts and tasking officers -Job aid, heuristics to ensure analyst is employing communication best practices
		Misinterpretation of tasking	Clarify tasking. Recognize disparity, Acquire direct quick turnaround guidance	Job aid – critical thinking support Policy/guidance – encourage and facilitate quick turnaround of providing guidance
		Misinterpretation of the context of problem	Help with clarifying and right-sizing the problem based on context	Job aid – assist in understanding how to determine areas that need clarification

Step	Activity	Risk	Intervention Goals	Intervention
RESEARCH: GATHER DATA	Understand analytic stance	Confirmation bias	Help analysts develop disconfirming hypothesis and supporting beliefs	Job aid (online, personal, educational) to address countering these biases: increase awareness and acknowledgement, provide strategies to minimize impact
		Anchoring bias	Help analysts develop disconfirming hypothesis and supporting beliefs	
		Miscommunication	-Help analysts acquire specificity from tasker/tasking organization. -Intra team; Understand task and requirements	-Policy/ Guidance: Empower analyst to directly communicate with tasking organization; establish standardized methods for clarification that allow analyst to go back to tasker and support direct communication model between analysts & tasking officers
		Misinterpretation	Help analysts overcome misinterpretation by clarification, recognizing disparities, and determine ways to acquire direct quick turnaround guidance	Job aid – critical thinking support Policy/guidance – encourage and facilitate quick turnaround of providing guidance SME – shared inputs
		Narrow Perspective – Taking	Help with right-sizing the problem based on context	Job aid – assist in understanding how to determine areas that need clarification
		Organizational Inertia	Help with dealing with organizational inertia	Awareness of organizational inertia, finding the balance between free thinking and cultural expectations

Step	Activity	Risk	Intervention Goals	Intervention
RESEARCH: GATHER DATA	Query data	Limited knowledge of tools	Assist analyst in expanding knowledge, awareness, expertise in selecting and using tools and databases, and in interpreting data sets retrieved	Targeted training, micro sessions, mentors, break down silos
		Limited expertise in interpreting data sets retrieved		
		Limited knowledge or awareness of potential resources particularly data bases		
	Incorporate unpublished data	Absence or partial existence of summative reviews and evaluations	Help analysts examine and prepare unpublished data for inclusion in an analysis	Checklist to determine what, if any, reviews have been done on the data and what still needs to be done. Possible development of an approved process for incorporating unpublished data.

Step	Activity	Risk	Intervention Goals	Intervention
ANALYZE DATA	Select and apply analytic method	Unchecked bias in selection of method	Assist analyst in expanding knowledge, awareness, expertise in selecting and using tools and databases, and in interpreting data sets retrieved	Targeted training, micro sessions, mentors to increase awareness of bias
		Inexperience in using selected method		
		Limited knowledge or awareness of potential resources particularly data bases		
	Generating hypothesis	Anchoring and confirmation biases	Increase analyst's awareness of the potential of biases, how to recognize and provide techniques and tools to help mitigate them.	Awareness and acknowledgement of biases. Anchoring and confirmation biases mitigating techniques: Thoroughly research decisions. Checklists. Heuristics – recognition, one-good-reason, tallying
	Develop supporting arguments	Confirmation bias, groupthink (Conformity bias)		Awareness and acknowledgement of biases. Groupthink mitigating techniques: Facilitate critical evaluation of alternative viewpoints, examine dissenting viewpoints, incorporate outside influences
	Evaluating results	Confirmation bias, (User) Experience bias		Awareness and acknowledgement of biases. Counter tendency to take one's experienced-based perspective as objective truth, and/or to assume their view of the problem constitutes the whole truth.
	Identifying, accounting for data gaps	Groupthink (Conformity bias), overconfidence and confirmation bias, Dunning-Kruger effect		Awareness and acknowledgement of biases Overconfidence mitigating techniques: question accuracy of judgments even when available information is consistent or inter-correlated Dunning-Kruger effect - techniques to support accurate estimation of one's own abilities.

Step	Activity	Risk	Intervention Goals	Intervention
COORDINATE; COLLABORATE	Internal review; external coordination	Confirmation bias	Help analysts develop disconfirming hypothesis and supporting beliefs	Job aid (online, personal, educational) to address countering these biases: increase awareness, acknowledge presence of biases, provide strategies to minimize impact
		Anchoring bias		
		Limited network or awareness of experts, preferential or unequal consideration of inputs, unfairly reconciling differences, lack of objectivity, diversity of peers	Help analysts build awareness of peers and experts; build experience in reconciling differences fairly and recognizing the value of objectivity and diversity of peers to engage; and how to incorporate changes without bias	

Step	Activity	Risk	Intervention Goals	Intervention
COMMUNICATE FINDINGS	Decide how to communicate results, gaps, and dissenting assessments	Framing Effect	Help analysts mitigate framing effect	Mitigate potential impact of framing effect – i.e., ensuring that the information maintains primary importance, regardless of how it is presented.
		Accurately determining what needs to be included, unintentionally leaving out important elements	Help analysts make good decisions about what needs to be included in reports of findings	Checklist to aide decisionmaking accuracy

Interventions: Thoroughness

Thoroughness risks appeared in three of the five steps in conducting analysis.

Table 5. Series: Thoroughness Interventions

Step	Activity	Risk	Intervention Goals	Intervention
RESEARCH: GATHER DATA	Identify types of resources and databases	Experience bias - resources may be excluded without reason or included because they are the analyst's go-to tool or data base	Help analysts counter experience biases when determining which resources to use.	Job aid to address countering these biases: increase awareness and acknowledgement, provide strategies to minimize impact
	Query data	Dunning Kruger Bias	Help analyst maintain a fair and objective view of their own abilities to properly and thoroughly query data that will inform analysis	Awareness and acknowledgement of the potential for over or under-estimating one's ability; heuristics or checklist that will assist in this
	Incorporate unpublished data	Possible lack of appropriate information; miscommunication; misinterpretation	Help analysts balance need for thoroughness in the analysis with establishing thoroughness and accuracy of unpublished, unreviewed data	Checklist and/or established processes for determining appropriateness for use of unpublished data and documents. Provide critical thinking support to guard against miscommunications and misinterpretations
	Consider data gaps	Experience bias	Help analysts make good decisions about what needs to be included in reports of findings	Checklist to aide decision-making accuracy

Step	Activity	Risk	Intervention Goals	Intervention
ANALYZE DATA	Generate hypothesis	Limited perspective-taking	Help analysts understand that thoroughness includes different views of information, etc.	Heuristics to increase awareness of various perspectives and how best to use that to increase thoroughness
	Consider data gaps	Experience bias	Help analysts counter experience biases when identifying data gaps and determining their origins	Job aid to address countering these biases: increase awareness and acknowledgement, provide strategies to minimize impact

Step	Activity	Risk	Intervention Goals	Intervention
COMMUNICATE FINDINGS	How to communicate results	Experience bias; unintentionally omitting information; improperly prioritizing findings	Help analysts make good decisions about what needs to be included in reports of findings; Help analysts make good decisions about what needs to be included in reports of findings	Checklists to aide decision-making accuracy

Interventions: Repeatability, Reliability, Validity

Risks to analytic rigor presented by repeatability, reliability, and validity issues occurred in the Considering Data Gaps steps of both the Research; Gather data and Analyze data Steps.

Table 6. Series: RRV Interventions

Step	Activity	Risk	Intervention Goals	Intervention
RESEARCH: GATHER DATA	Consider data gaps	Faulty logical progress of argument; unintentionally omitting information; experience bias	Help analysts recognize elements of logical arguments, make good decisions regarding about what needs to be included in analyses, and help counter experience biases when identifying data gaps and determining their origins	Checklists to aide decision-making accuracy Job aid to address countering these biases: increase awareness and acknowledgement, provide strategies to minimize impact
ANALYZE DATA				

Interventions: Transparency

Transparency risks to rigor appeared in the Analyze Data and Coordinate; Collaborate steps of conducting analysis.

Table 7. Series: Transparency Interventions

Step	Activity	Risk	Intervention Goals	Intervention
ANALYZE DATA	Translate data	Accuracy	Help analysts make good decisions about what needs to be included in reports of findings; Help analysts make good decisions about what needs to be included in reports of findings	Checklists to aide decision-making accuracy
COORDINATE; COLLABORATE	Internal reviews; external coordination	Recognition of credible contributor, logic of inputs and feedback, biases of contributors	Help analysts critically examine inputs and feedback for biases	job aides to counter biases; Micro-sessions to train critical examination of inputs

Interventions: Credibility

Credibility risks to analytic rigor occur in the Research; Gather Data and Coordination; Collaboration steps of conducting analysis.

Table 8. Series: Credibility Interventions

Step	Activity	Risk	Intervention Goals	Intervention
RESEARCH: GATHER DATA	Identify types of resources and data bases	Trust of accuracy	Help analysts understand how to judge trustworthiness of information contained in various resources and data bases.	Checklists and micro-sessions to aide judgments of accuracy and trustworthiness of information as it appears in resources and data bases.
COORDINATE; COLLABORATE	Internal reviews; external coordination	Unreliable contributors	Help analysts determine credibility of contributors; incorporate into selection criteria	job aides and Micro-sessions to train critical examination of credibility and trustworthiness

Interventions: Relevance

Relevance risks to analytic rigor were identified in the Scope and Research: Gather Data steps of conducting analysis.

Step	Activity	Risk	Intervention Goals	Intervention
SCOPE	Understand intelligence need	Misunderstanding; miscommunication	Help analysts clarify concepts and communication of ideas in order to establish relevance.	Heuristics to ensure analyst is employing communication best practices Checklist to assist in alleviating misunderstanding
RESEARCH: GATHER DATA	Incorporate unpublished data	Lack of certainty ; absence of established method for incorporating unpublished data; questionable certainty regarding recency of sources, level of prior coordination or review, changes in policy since data collected.	Help analyst establish process for examining unpublished data to ensure its relevance.	Create process (if none exists) to examine unpublished data that will make it current, useful, reliable. Job aide to implement such a process or provide critical elements for consideration.

Table 9. Series: Relevance Interventions

Rigor Profile Method Step 4: Determining the Generalizability of Rigor Risks and Intervention

The final step in this method is to examine results and determine whether our findings regarding rigor risks and interventions are generalizable and under what circumstances. For example, are rigor risks the same as they occur in different steps of the component? Are the related interventions the same in these circumstances? Are rigor risks the same across different types of analysis? The answers to all or any of these questions have pretty significant implications.

To answer the generalizability question, we need to look at the specific first. The following tables display pertinent information regarding the risks to analytic rigor, Indicators of Sufficiency of rigor, and the cognitive processes involved in conducting analysis which we identified within the Steps of Conducting Analysis. When we examined the activities in the cognitive processes, we attempted to be as complete as possible. We saw several risks to rigor show up throughout all the steps of conducting an analysis, as shown in Table 11. For the most part the related interventions are tied to the type of risk, regardless of where they appear in the steps of conducting analysis.

Rigor Risk	Risk Mentions	Indicators of Sufficiency (6)	Location in Steps of Conducting Analysis (5)
Bias	21	4	3
Lack of knowledge	7	5	2
Lack of Experience	6	3	2
Miscommunication	4	3	2
Misinterpretation	4	3	2
Perspective Taking	2	2	2
Absence of Review	2	1	1
Accuracy	2	2	2
Diversity of Thought	1	1	1
Prioritization Issues	1	1	1
Reliability of Contributors	1	1	1
Organizational/Cultural Issues	1	1	1

Table 10. Frequency, Type, and Location of Risks to Rigor

The most prevalent risk to analytic rigor was related to biases of several different kinds (i.e., confirmation, anchoring, experience, groupthink, overconfidence, Dunning-Kruger effect, framing effect). Bias risks appeared in all five steps in conducting analysis and the types of risks presented by biases were found in four of the six Indicators of Sufficiency. However, **eleven other types of rigor risks were identified as well**. In total, all Indicators of Sufficiency were affected, and risks were found in all steps in conducting analysis. Table 12 shows which Indicators of Sufficiency were in play for each of the types of rigor risks identified.

Rigor Risk	Indicators of Sufficiency					
	Objectivity	Thoroughness	RRV	Transparency	Relevance	Credibility
Bias	X	X	X	X		
Lack of knowledge	X	X	X	X	X	
Lack of Experience	X		X	X		
Miscommunication	X	X			X	
Misinterpretation	X	X			X	
Perspective Taking	X	X				
Absence of Review	X				X	
Accuracy				X		X
Diversity of Thought	X					
Prioritization Issues		X				
Reliability of Contributors					X	
Organizational/Cultural Issues	X					

Table 11. Rigor Risks by Indicators of Sufficiency

Because of the number of different types of risks identified, objectivity is the Indicator of Sufficiency that can be most vulnerable in the cognitive processes found in conducting analyses. Thoroughness and relevance are not far behind in the number of risks affected. Looking across Indicators of Sufficiency, lack of knowledge is a risk that can affect all but one, and an argument might be made that credibility could be at risk as a result of lack of knowledge. The most significant finding for us, however, was that each of the indicators of sufficiency was represented in this activity overall. This phenomenon could speak to the adequacy of our definition of analytic rigor, including the Indicators of Sufficiency of rigor.

Rigor Risk	Steps in Conducting Analysis (i.e., Cognitive Processes)				
	Scope Intel Question	Research; Gather Data	Analyze Data	Collaborate; Coordinate	Communicate Findings
Bias		X	X	X	
Lack of knowledge		X	X		
Lack of Experience		X	X		
Miscommunication	X	X			
Misinterpretation	X	X			
Perspective Taking		X	X		
Absence of Review		X			
Accuracy		X	X		
Diversity of Thought				X	
Prioritization Issues					X
Reliability of Contributors				X	
Organizational/Cultural Issues		X			

Table 12. Location of Rigor Risks

Rigor risks appear in each of the steps in conducting analysis, which represent cognitive processes. **The steps/cognitive processes that are most vulnerable to analytic rigor risks are**

Research & Gather Data and Analyze Data. This is likely because these two steps are the most cognitively labor-intensive steps and, some would argue, the most complex.

We propose that the risks to rigor, as they are clustered in the cognitive processes, are generalizable to conducting many different types of analysis as identified by ODNI's descriptions of types of expertise discussed earlier in this paper. To confirm this, testing using case studies of other types of analysis would be required. However, we have discovered some qualitative findings that would support the argument for generalizability.

Two elements that have emerged from this study help make the case for generalizability: the **relation of intervention to risk**, and the **relation of the risk-intervention partnership to location**. Throughout this study, we determined interventions to address specific goals related to mitigating identified risks to rigor (For descriptions of types of interventions included in this study, see Appendix C). For example, when we identified risks that were a result of unchecked bias, our recommended intervention typically involved increasing awareness and acknowledgement of the possibility of bias and the type of bias, followed by actions that would help lessen the impact of a bias including education. This proved true for bias risks regardless of what indicator of sufficiency was under study. We also found that the risk and recommended intervention pairing remained the same and continued to be relevant regardless of the location (cognitive process, step in conducting analysis) of the risk. **The consistent appearance of these two elements (risk-intervention, risk-intervention to location) in a variety of settings (Steps/cognitive processes, Indicators of Sufficiency) makes a strong qualitative case for generalizability – within this type of analysis.** Exploration of other types of analysis should be explored using the methodology presented here to determine generalizability across types of analysis. We believe determination of generalizability across types of analysis would be likely and would provide the foundation for a powerful method of addressing risks to analytic rigor.

Putting It All Together, Part 2: Suggested Use of Rigor Profile

We suspect that there could be a number of applications of the rigor profile as developed here. The basic application would be to prepare and support an analyst as they conduct intelligence analysis. Figure 6 (Targets of Rigor Risk) would be a job aid that could be used throughout the life of the analysis for awareness, preparation, reminding, and recommending. At the outset, the analyst can review the rigor profile (aka Figure 6) to prepare for what might arise in the analysis ahead. As they plan throughout the analysis, the analyst can use the profile to determine what they might need to do to increase the rigor of their analysis – in the process of analysis, not when it is complete. The tables (Tables 5-10) provide specific information about what needs to be done to help mitigate risks. These tables can act as recommenders to the analyst for increasing rigor.

Additionally, if there is a reasonable knowledge management system in place, the analyst could catalog what interventions were used, worked effectively, and should be used again in a place that they could reference going forward. This library of information about interventions could also include what didn't work and other recommendations about interventions that would be

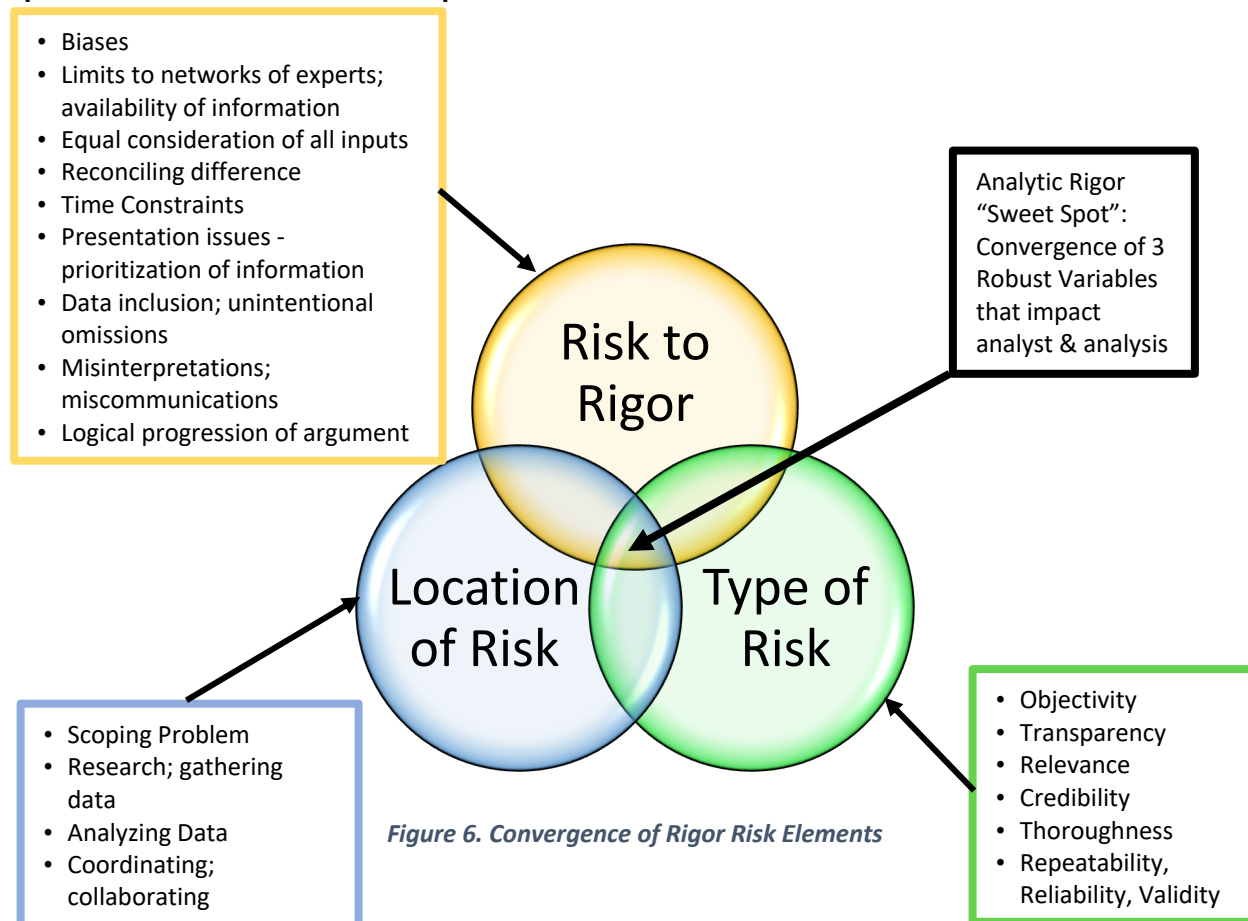
useful not only for the analyst, but also for supervisors, educators, and researchers within the community.

We feel that this approach will further the advancement of increasing analytic rigor in the process of intelligence analysis. Increased analytic rigor in the *process of intelligence analysis* will further analytic rigor in the *final product of intelligence analysis* and help eliminate last minute challenges to fix or improve it.

Study Insights

Finally, we provide our insights based on the development of rigor profiles.

When looking at the information we collected about rigor risks in aggregate, we came to a startling realization. As shown in the figure below, risk to analytic rigor is a phenomenon that is comprised of three separate, but interactive, aspects: the risk itself, the type of risk (identified by indicator of sufficiency), and the location of the risk (cognitive process in conducting analysis). We refer to this as layers of risk. Taken together, these aspects or layers become multiplicative in terms of potential problems the analyst needs to be aware of and attempt to mitigate in the course of conducting an analysis. **The “Sweet Spot” for the risk shows a convergence of 3 specific variables with over 500 possible combinations – and this is not an exhaustive list.**



The most significant insight from our work this year is **the number and complexity of risks to analytic rigor** we were able to identify. When you consider what kind of impact a loss of rigor might create in an intelligence analysis, the opportunities for risk we identified were numerous and somewhat daunting to attempt to mitigate. These potential risks, especially when quantified, put great responsibility and pressure on analysts. ***This study has shown that determining methods to help analysts increase awareness of risks to rigor AND providing them with tools and strategies they can use to mitigate these risks should be a priority.***

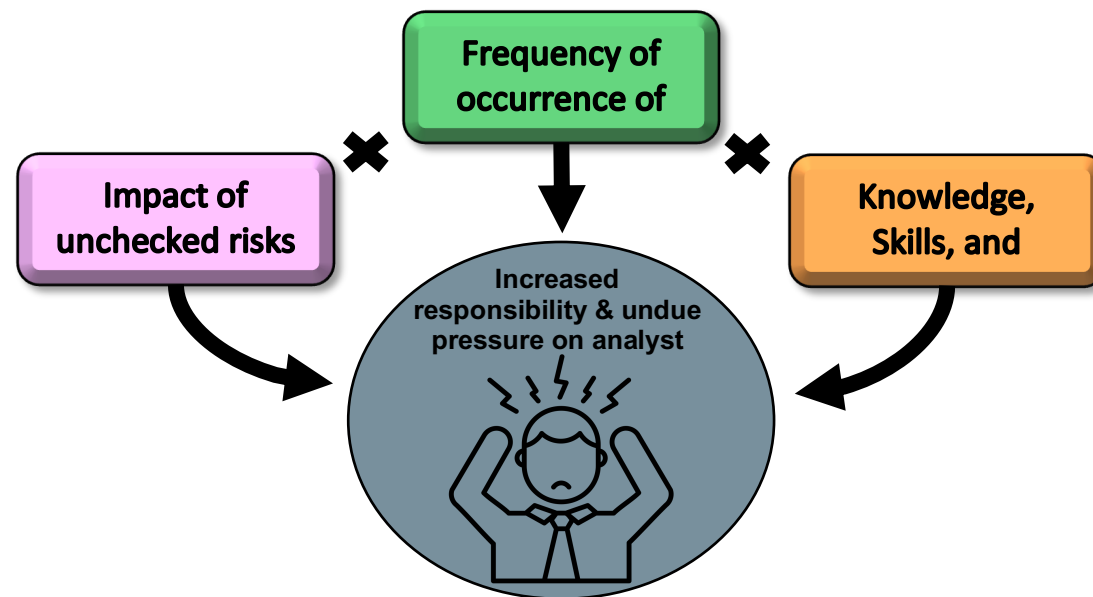


Figure 7. Impact of Complexity of Risks to Analytic Rigor

Appendix A: Indicators of Sufficiency Defined

Thoroughness

Thoroughness is, in general, discussed in terms of completeness, i.e., the diligence of the search and the meticulous inclusion of sources and citations of work that is drawn upon in the research or analysis. Thoroughness also can include the explanation of any uncertainties associated with judgments or decisions, as well as gaps or the absence of critical information that may be identified. Finally, thoroughness can assume a meta-description when demanding a clear and logical rationale in study-related decisions, and clear and logical argumentation in drawing conclusions and making judgments and recommendations.

Replicability, reliability, validity

When discussing rigor, especially regarding quantitative research in both the physical and social sciences, the criteria of validity, reliability, replicability, and generalizability are key. An objective of quantitative research is to identify phenomena that can be applied to a number of instances beyond the research study itself, or that can be generalized to other instances. Indicators of generalizability, and hence rigor, include validity, reliability, and replicability. Briefly, validity refers to the accuracy of a measure - whether a study measures what it was supposed to measure; reliability is about consistency and refers to whether a study will yield the same results over and over again. Replicability supports determining reliability by repetition – of a study with the same process or methods, generally different situations and subjects - to determine if the same results can be achieved.

While intelligence analysis and its products are not research studies, the notion of being able to replicate an analysis and get similar results is of value in establishing the rigor of that analysis and the accuracy of its results, judgments, and recommendations.

Transparency

Within the IC, transparency refers generally to being able to provide information for US citizens about what their government is doing, vis a vis intelligence analysis, and in this way promotes accountability.¹⁵ This includes the requirement to indicate and explain the basis for uncertainties associated with major analytic judgments and confidence in judgments.

In a more general sense in academic and other communities, transparency is the characteristic of work that allows others to see what has been done by the author to conduct analysis, evaluate information, and make decisions and judgments. While it is substantively different from credibility, transparency is complementary to it.

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Credibility

Credibility is a recognized criterion for rigor in qualitative research. Credibility refers to the extent to which a research account is believable and appropriate, with particular reference to the level of agreement between participants and the researcher. It can be defined as the degree to which descriptions could be recognized by those who have experienced it (the phenomenon under study) and understood by those who have not¹⁶. In this discussion, credibility has to do with the analytic process and findings. [In IC requirements and policy discussions, particularly ICD 206 (Sourcing Requirements), credibility refers only to a source of information used in analysis.]

Relevance

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Indicators of sufficiency are also concerned with the understanding and impact of internal relevance - that what is being performed in the course of conducting intelligence analysis is directly relevant to the question or problem that is being addressed. Relevance matters in how a problem is scoped, the sources used for data gathering, perspectives that are represented and how objectivity is applied, the application of methods, techniques, and heuristics, as well as understanding the needs of the audience and how best to disseminate findings.

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Appendix B: Paired Comparison Activity

Determining Relative Weights of Indicators of Sufficiency by Common Characteristics

Method:

A team of experienced intelligence analysts and social scientists conducted a paired comparison of Indicators of Sufficiency as they occur in different descriptors of the rigor profile (a revised version of the Common Characteristics). Research on paired comparisons recommends the use of teams/groups as opposed to individual judgments because the group is better able to represent perspectives of more stakeholders than the individual. The team members judged each pair of indicators of sufficiency on the matrix to determine which was the more important indicator of sufficiency of rigor within the boundaries of the project case study.

The team reviewed the definitions of the Indicators of Sufficiency and of the Descriptors of Rigor Profile (7 Common Characteristics). Then, they discussed their preferences for each eligible pair. In judging the pairs, choices could be that one of the pair of indicators is more important than the other, or that both could be equally important. A consensus was reached for each judgment in each available cell. Those cells that represent pairs of the same Indicator of Sufficiency (for example, which is more important – Transparency or Transparency?) contain an X since no comparison can be made.

Upon completion of judging pairs for a particular descriptor, frequencies of occurrence of the Indicator of Sufficiency were calculated as simple percentages to indicate likelihood of occurrence. This will inform weights if we need to apply them in the future when determining which rigor risks might have more importance

Descriptors of Rigor Profile

Foundational Mission Objective

	Transparency	Thoroughness	RRV	Relevance	Credibility	Objectivity
Transparency	X	T	RRV	R	C	O
Thoroughness	X	X	RRV, T	R	C	O
RRV	X	X	X	R	C	O
Relevance	X	X	X	X	R	R
Credibility	X	X	X	X	X	O
Objectivity	X	X	X	X	X	X

Frequency Analysis for FMO:

Indicator of Sufficiency	Frequency of Rating	Percentage Equation	Value
Thoroughness	2 of a total of 16	$2/16 = .125$	12.5%
RRV	2 of a total of 16	$2/16 = .125$	12.5%
Relevance	5 of a total of 16	$5/16 = .3125$	31.25%
Credibility	3 of a total of 16	$3/16 = .1875$	18.75%
Objectivity	4 of a total of 16	$4/16 = .25$	25%

Customer

	Objectivity	Thoroughness	RRV	Credibility
Objectivity	X	O	RRV,O	C,O
Thoroughness	X	X	T	T, C
RRV	X	X	X	C
Credibility	X	X	X	X

Frequency Analysis for Customer:

Indicator of Sufficiency	Frequency of Rating	Percentage Equation	Value
Objectivity	3 of a total of 9	$3/9 = .333$	33.3%
Thoroughness	2 of a total of 9	$2/9 = .222$	22.2%
RRV	1 of a total of 9	$1/9 = .111$	11.1%
Credibility	3 of a total of 9	$3/9 = .333$	33.3%

Analysis Topic

	Objectivity	RRV	Relevance
Objectivity	X	O	O,R
RRV	X	X	R
Relevance	X	X	X

Frequency Analysis for Analysis Topic:

Indicator of Sufficiency	Frequency of Rating	Percentage Equation	Value
Objectivity	2 of a total of 4	$2/4 = .50$	50%
Relevance	2 of a total of 4	$2/4 = .50$	50%

Purpose of Analysis

	Thoroughness	Credibility	Transparency
Thoroughness	X	C	T, Tr
Credibility	X	X	C, Tr
Transparency	X	X	X

Frequency Analysis for Purpose of Analysis:

Indicator of Sufficiency	Frequency of Rating	Percentage Equation	Value
Thoroughness	1 of a total of 5	$1/5 = .20$	20%
Credibility	2 of a total of 5	$2/5 = .40$	40%
Transparency	2 of a total of 5	$2/5 = .40$	40%

Type of Resources

	Reliability (RRV)	Thoroughness	Credibility	Relevance
Reliability (RRV)	X	T	C	R
Thoroughness	X	X	C, T	R
Credibility	X	X	X	C,R
Relevance	X	X	X	X

Frequency Analysis for Type of Resources

Indicator of Sufficiency	Frequency of Rating	Percentage Equation	Value
Thoroughness	2 of a total of 8	$2/8 = .25$	25%
Credibility	3 of a total of 8	$3/8 = .375$	37.5%
Relevance	3 of a total of 8	$3/8 = .375$	37.5%

Expected Use of Analysis

	Relevance	Thoroughness	Transparency	Credibility	Objectivity
Relevance	X	R	T,R	C	O
Thoroughness	X	X	T,Tr	C	O
Transparency	X	X	X	C	O
Credibility	X	X	X	X	O
Objectivity	X	X	X	X	X

Frequency Analysis for Expected Use of Analysis

Indicator of Sufficiency	Frequency of Rating	Percentage Equation	Value
Relevance	2 of a total of 12	$2/12 = .167$	16.7%
Thoroughness	2 of a total of 12	$2/12 = .167$	16.7%
Transparency	1 of a total of 12	$1/12 = .083$	8.3%
Credibility	3 of a total of 12	$3/12 = .25$	25%
Objectivity	4 of a total of 12	$4/12 = .333$	33.3%

Type of Product & Its Dissemination Method

	Relevance	Thoroughness	Transparency	Credibility	Objectivity
Relevance	X	T	R	C	O
Thoroughness	X	X	T	C	O
Transparency	X	X	X	C	O
Credibility	X	X	X	X	O
Objectivity	X	X	X	X	X

Frequency Analysis for Type of Product & Its Dissemination Method

Indicator of Sufficiency	Frequency of Rating	Percentage Equation	Value
Relevance	1 of a total of 10	$1/10 = .10$	10%
Thoroughness	2 of a total of 10	$2/10 = .20$	20%
Credibility	3 of a total of 10	$3/10 = .30$	30%
Objectivity	4 of a total of 10	$4/10 = .40$	40%

Appendix C: Descriptions of Candidate Interventions

Several different interventions were recommended in this report. The purpose of this Appendix is to provide brief descriptions of some of the more predominant interventions.

Awareness and acknowledgement of biases. This is pretty straightforward. The first steps in tackling biases are awareness of the potential of their appearance and acknowledging that it is possible they may show up in the analytic process. All biases that were described in the footnotes of this report share the need for awareness and acknowledgement before anything else can be done to mitigate them. Once these steps are accomplished other, more specific interventions can be implemented.

Checklists are precisely what you would think – lists of things to do, questions to ask, steps to take in conducting analysis that the analyst can use to ensure that they are hitting all the important considerations as they move through the analysis. Checklists can be tailored to different issues or risks, but their purpose – to remind the analyst of considerations and steps – remains the same.

Heuristics are rules-of-thumb that can be applied to guide decision-making based on a more limited subset of the available information. Because they rely on less information, heuristics are assumed to facilitate faster decision-making than strategies that require more information but can also be less accurate because less information is considered. In cognition, a heuristic is an experience-based strategy for solving a problem or making a decision that often provides an efficient means of finding an answer but cannot guarantee a correct outcome. [introduced by Herbert A. Simon; developed by Daniel Kahneman and Amos Tversky]. In the social sciences, a heuristic is a conceptual device, such as a model or working hypothesis, that is intended to explore or limit the possibilities of a question rather than to provide an explanation of the facts.¹⁷ Both the cognition and social science types of heuristics are appropriate as interventions in this study.

Repositories of resource information can be very useful because they provide an on-demand, go-to source for analysts to attempt to answer questions they have while conducting intelligence analysis. These repositories can be found in people, especially mentors, i.e., senior analysts or subject matter experts. They are a subset of knowledge management.

Knowledge management is the process by which an enterprise gathers, organizes, shares, manages, and analyzes the knowledge (process, capability, and institutional knowledge) and experience of employees to increase the workforce's overall knowledge in a way that is easily accessible to employees. Knowledge management involves data mining and some method of operation to push information to users to make it easily accessible. The primary goal of knowledge management is to improve efficiency, productivity and retain critical information within the company.

¹⁷ American Psychological Association. *Dictionary of psychology*. Retrieved from <https://dictionary.apa.org/heuristic> on December 19, 2021.