

# Computational Intelligence Analysis: A Contractor's Perspective

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# Background

- 15+ years experience
- Developing computational tools since 2001
- Working with CIA analysts since 2005
  - Involved in the development of approximately 20 ABMs
  - Simulation outputs employed in finished products
- Additional work with DOD, NGA, and other agencies
- Doctoral candidate in Computational Social Science
  - Ph.D. dissertation on applications of ABM in intelligence analysis and community
- Personal observations!

# Formal Modeling has a Problem

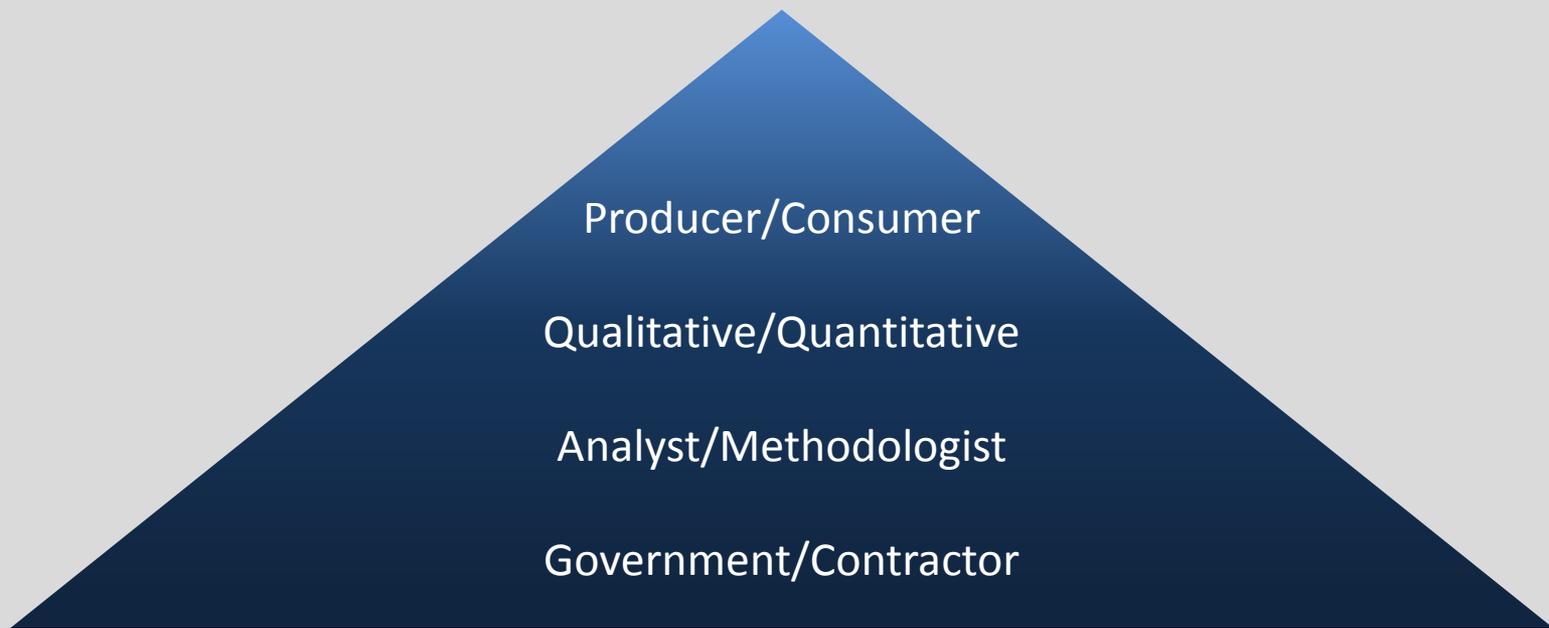
- Modelers come from a particular scientific tradition
  - Favor simplification
  - Belief in generalization and regularity
  - Analytic
  - Data *uber alles*
- Policy world is a series of one-offs
  - Favor specificity, details of individual cases
  - Uniqueness limits value of cross-case comparisons
  - Complex/synthetic
  - Major questions are counterfactuals and scenarios

# Quantitative Intelligence and Policy

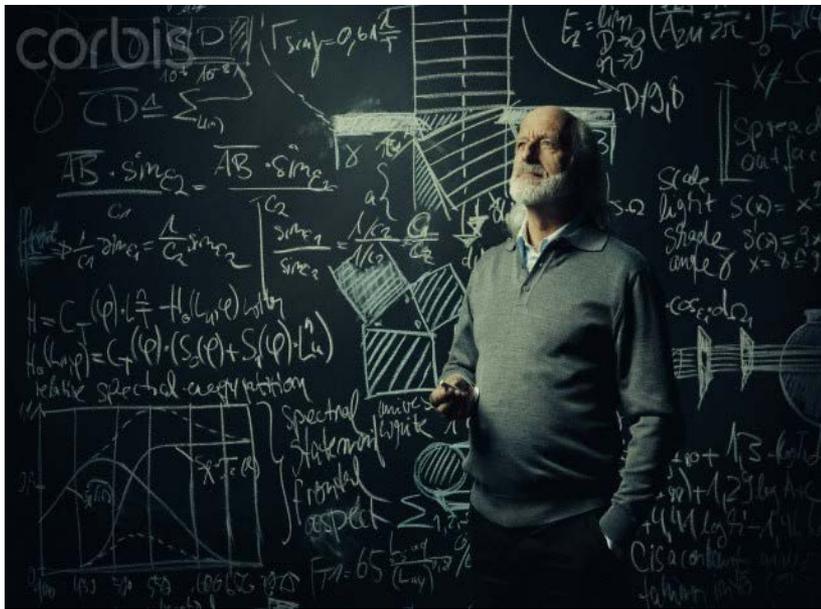
- ... analyses found in the INR documents tend to be of the most demanding kinds, involving multivariate analyses with many discrete variables, in which the relationships are frequently nonlinear and involve important time lags.
  - **As a matter of fact, the kinds of relationships found in the great majority of INR analyses represent such complexity that no single quantitative work in the social sciences could even begin to test their validity.**
  - O'Leary, et al., 1974
- As long as intelligence research is directed towards answering complex questions such as what will happen in Yugoslavia after Tito's death, or what would be the consequences of Communist party participation in the Italian government, **the narrative essay will remain the dominant form for intelligence estimates.**
  - There is, however, an important role for rigorous procedures even in such complex estimative problems. **Our work to date indicates that the kinds of analytical techniques which seem most useful for our purposes are those that help to trace the logical consequences of subjective judgments, extend the mental capacity of the individual analyst, force the analyst to make his assumptions explicit, or help to organize complexity.**
  - Heuer, 1978

# The Quest for Relevance

- Hierarchy of difficult relations within analytic community are all special cases of more general challenge
  - How to make information relevant across organizational lines?



# Two Models



# Two Models for Crossing Boundaries

- Scientific Method
    - deductive or inductive
      - theory -> model -> data
      - data -> model -> theory
    - study the world directly
    - free of bias, prestige, ideology, institutional affiliations
    - disagreements are adjudicated based on fit between theory and data
  - Fail
    - “policy critic”
    - “why won’t they listen to us?”
- Consulting Model
    - indirectly study problems
    - directly study the implications of assumptions
    - identify customer interests and assumptions
    - analyze problem through their framework
    - extend analysis to incorporate alternative assumptions and new perspectives
    - disagreements adjudicated via political power, process, and negotiation
  - Acceptance but problematic
    - can lead to telling customers what they want to hear
    - assessment can be difficult

# Difficultly Supporting Policy-Makers

- Challenges analysts face are well documented and understood
- Consumers naturally accept information they already agree with, reject what they don't
  - political and organizational agreements can be costly to negotiate or resolve
  - not easily undone once committed to particular action
  - assessments that disagree with expectations or warn of unexpected outcomes are considered a challenge to consumer's own expertise and judgment
  - largely ignored unless engaged very early in decision-making process or warning of immediate threat or opportunity

# The Difficulty of Supporting Analysts

- Few analysts have advanced quantitative expertise or training
- Few problems are directly amenable to quantitative analysis
  - missing or inconsistent data
  - theory complexity
- Deep skepticism of quantitative tools
- Turn to quantitative tools for complex reasons
  - new insights
  - novel methodology
- Validate and accept models based on ability to produce intuitive results, and challenge what doesn't meet expectations

# Developing a Usable Model

- Analysts must be engaged from start
  - provide framing of question
    - theory, data, and boundaries
  - bridge organizational gaps and secures resources
  - determines validity of modeling approach and schedule
- Clear modeling goals
  - prediction or forecasting
  - scenario exploration
  - identification of uncertainties and missing information
  - theory development and comparison
  - training, organizational, etc.
- Expectations
  - modelers cannot replace analysts
  - not “faster, better, cheaper”
  - constant engagement is needed

# Contractor Offerings

- Specialized skills
  - computational, quantitative, topical expertise
- Intangibles
  - outreach and networks, independence
  - community perspective, flexibility
- Facilities
  - computational power and classification
  - “fish bowls”
- Schedule and tasks
  - regular access to analysts
  - resourced for attention, not time
  - hedge with layered research plan
  - evolutionary or adaptive engagement
  - focus on research, not products

# Analyst Perspectives

- Use modeling as Structured Analytic Technique
  - engagement with contractors to explicate assumptions
  - model mediates and initiates conversations with peers and colleagues
  - establishes connections between assumptions, outcomes, and data
- Model results augment other analysis
  - do not stand on their own
  - must be converted back into narratives for assessment
  - validation must be negotiated
    - philosophy of history
    - level of analysis
    - model as mathematical object
- Goal is to get something better than what they have...
  - ... not a crystal ball