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Abstract

Intelligence analysts must clear at least three hurdles to get good product out the door: cognitive biases, social biases and self-imposed organizational impediments. Others (e.g., Gilovich, et al., Heuer, and Kahneman and Tversky), explain the cognitive processes that can help or trip us. A less well mapped set of dangers arises in the social dynamics of communicating tasking, working with other analysts, editing and customer interaction. Finally, the mere fact of a unit's published record creates analytic inertia - an argument at rest tends to stay at rest and one in motion (i.e., ambiguous or uncertain) tends to stay in motion. (A variation of this includes groupthink.)

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1) The Problem and Challenge

Intelligence analysts must clear at least three hurdles to get good product out the door: cognitive biases, social biases and self-imposed organizational impediments. Others (e.g., Gilovich, et al., Heuer, and Kahneman and Tversky), explain the cognitive processes that can help or trip us. A less well mapped set of dangers arises in the social dynamics of communicating tasking, working with other analysts, editing and customer interaction. Finally, the mere fact of a unit's published record creates analytic inertia— an argument at rest tends to stay at rest and one in motion (i.e., ambiguous or uncertain) tends to stay in motion. (A variation of this includes groupthink.)

Organizational impediments—e.g., short cycle times and some business processes—can compel analysts to simplify concepts, minimize collection or rely on previously published material, impeding alternative hypothesis-seeking. Reluctance to change positions in the face of contrary data—with loss of face for both producers and consumers—creates a disincentive to propose alternative hypotheses. The youth bulge in the government-wide analytic corps can be a demographic impediment. To supplement overworked senior mentors, training and analytic tools will remain in demand for the foreseeable future. Athena's Prism addresses these obstacles.

Athena's Prism aims to simulate the personality, problem-solving styles, values, goals and environments of individual leaders. The software is intended to aid hypothesis *generation*. The target user community comprises analysts who need to anticipate a decision-maker's actions.

2) State of the Practice

Many computer-based analytic tools exhibit shortcomings in their design. Visual presentation or activities required of users don't reflect the skills or thinking styles of the target users. Engineers and quantitative methodologists design tools for qualitative thinkers discomfited by numbers and underlying theories. In addition, few tools help analysts understand the intentions and thereby predict the actions of specific people vice crowds and enemy units. Tools are designed generally without regard to the workflow or production platforms of the users— "integration" amounts to placing an icon on the desktop.

None of the options in the computerized game industry are of direct use to *Athena's Prism*. The relevant game genre is the diplomatic strategy roleplaying game (RPG): e.g., *Civilization, Empire Earth,* and *Rise of Nations*. The player controls a country or constituency within a given historical era or fantasy world and is a system-wide manager straddling Diplomatic, Information, Military, Economic, and Socio-cultural (DIMES) actions. However, (1) these games depict only fictional or historical contexts and generalized or fantasy AI-based agents; (2) players can't negotiate meaningfully; and (3) real-time graphics and scenery generation tax CPU resources without adding analytic value. Tabletop cousins of strategy RPGs offer a rich source of practices, although they tend to be limited to military command and control capabilities. As a result of our market survey, we realized the need to create a game from the ground up, tailored to analysts' needs, with AI that implements realistic and user-calibrated human behavior models based on social science. The AI version of Athena's Prism is soon to be delivered and its design is the topic of a separate paper. This paper focuses only on the human-to-human (roleplaying) version of *Athena's Prism.*

3) Configuration and Use of Athena's Prism

Athena's Prism can be readily configured for any real world leaders and conflict situation, compels players to deal with system-wide management concerns, requires only three to seven players, and reaches useful outcomes within two to three hours. Developed in the Python language, the tool is implemented as a collaborative client-server architecture where players sit at their own client screens. We explain the tool and game configuration using our "5P" approach (plot, people, place, properties, process) to rapidly assembling scenarios.

Plot—The plot for a given game session is centered on 'The Question' to be answered. Typically, an analyst is presented with a question from a policy maker or operational unit, such as, *Will financial sanctions force Country Z to stop sponsoring terror-*

ism? Or *How will cell "X" respond to "Y" kind of intervention?*

People—The next step is to define the critical set of leaders who have roles in the question at issue—roles assumed by the game players. The tool can accommodate with ease a wide variety of simulated players depending on the analyst's interpretation of the question being asked.

Place—Because conflicts are invariably linked to control of resources (broadly defined), a total systems perspective dictates a model of resources—people, economy, media, authority, mass communication channels, emissaries, military, WMDs, etc.—arrayed in various territories under the control of specific leaders. Rules dictate the costs of each action one wishes to perform in the world and the payoff rates for wars, attacks, labor strikes, etc., won or lost.

Properties—Resource amounts, locations, and control (Authority) greatly constrain what a given player may or may not do during game play. In addition, there are a number of political and cultural realities that further factor into a leader's decision making. Complying with or going against these properties, and treaties, cultural attributes, policies and ad hoc agreements, generate rewards or penalties; constituents' wishes and cultural norms influence players over time.

Process (Actions)—Players adopt a portfolio of strategies—high level goals (e.g., remove all WMDs in the world)—that might be implemented by any of a number of alternative actions. In all, there are nearly 100 possible actions in the current version, each of which has rules that identify action applicability, costs, constraints, management of assets, means to launch or defend against attacks, open and secret communications and espionage. Wizards and popup help messages assist the analyst-player.

The action-choice set rapidly explodes when one considers all the combinations of actions, rules and targets. Thus, the "optimal" path through a game or scenario is unknown *a priori* or even after a single playing, which enables discovery of new options and unintended consequences.

4) Some Results to Date

Athena's Prism was initially designed in 2003 as a paper-based tabletop game. The design process included numerous sessions of testing and refinement in the usual manner of game mechanics/rule tuning.

Unforeseen Hazards—Asymmetric attacks, traditional military moves, economic wars, and other "heavy stick" strategies tended to appeal to younger users. A more seasoned user learned to wait towards the end of the session, when everyone was weakened, to make the more costly and effective moves.

Desperate Measures—In all games, with all player types, the most dreaded measures occurred when a leader (player) was nearing the end of his resources and saw no real options.

Alternatives for Influencing Outcomes—The more seasoned players paid diplomatic visits, made gestures of friendship, and produced voluminous amounts of open and secret message traffic, media campaigns, and summit requests. Analyzing the accumulated message traffic revealed noticeable proportions of disinformation and phony messages to force the waste of opponent espionage resources. Users would rarely quantify exact terms immediately. Also, a fair amount of reneging on agreements was not just a form back-stabbing, but also resulted from shifting agendas or priorities.

Innovative Thinking—On occasion, a player explored radical departures from conventional policy. One user attempted blind altruism which led to better short-term relations with their worst enemies.

5) Conclusions and Next Steps

Athena's Prism has borne out part of its promise in preliminary evaluation. Results of user testing of the tabletop and computerized (but without the AI) versions have been favorable. Analysts find them believable, engaging and productive of novel ideas. The structure, process and content of the simulation tool seem to neutralize or steer clear of some of the cognitive and social hurdles noted above. Whether and how the tool improves hypothesis generation—especially after AI is added—as well as how well it affects organizational factors and integrates with the production platform are empirical questions we hope to answer in further testing and evaluation. Finally, we hope to deploy the tool within and across agencies to assess its performance in fostering collaboration. We seek partners from the community toward these ends.