The Foreign Population Analytic Framework: A Meta-Framework for the Rapid and Constant Integration of Social and Behavioral Sciences into Intelligence Analysis

Dr. Piotr M. Zagorowski, MAJ(P) Thomas Pike, {piotr.m.zagorowski, thomas.d.pike}.mil@mail.mil

Disclaimer: The analytic frameworks and software programs discussed in this article does not imply any endorsement by the U.S. Army Intelligence Center of Excellence, U.S. Army, or any U.S. government agency, and the content does not express the views of the U.S. Army, the Defense of Department or any government agency.

"Military efforts in the recent past have produced many tactical and operational gains, but rarely achieved desired political objectives and enduring outcomes in an efficient, timely, and effective manner. The elusiveness of success, despite unmatched U.S. conventional combat capabilities, highlights that militarily defeating adversary forces, in and of itself, does not automatically achieve strategic objectives" [1]. This truth has profound implications for intelligence analysis from the tactical to the national level. Historically, intelligence has focused on describing adversary capabilities and predicting their actions so decision makers can devise ways to defeat the adversary [2] [3]. However, if "[t]he measure of strategic success is ultimately the change in relevant actor behavior, in addition to physical results on the battlefield", analysts must also assess the underlying interdependencies of a foreign population, in order to understand anticipated behavior [4]. Analysts are now tasked to develop ways to coerce change in the local populace in pursuit of U.S. objectives. They are doing so without the requisite framework, understanding, or tools to successfully do so. In order to overcome this shortcoming this paper proposes of the integration of Complex Adaptive Systems (CAS) theory into current military doctrine and the use of agent based models (ABM) as the essential tool for intelligence analysis. The integration of CAS theory, introduction of ABMs, and continual refinement based on scientific advancement will make the Intelligence Community (IC) more competitive.

As the Department of Defense retains the largest proportion of Intelligence Community analysts, this paper uses the doctrinal framework Joint Intelligence Preparation of the Operational Environment (JIPOE) as a point of departure. The integration of CAS theory ensures the approach is scalable from the village to the supra-national level, applicable to a variety of scenarios and can be widely fielded. The result is the Foreign Population Analytic Framework (FPAF) framework which is described in detail below.

As an initial step, a preliminary model using Netlogo that analysts can use for specific problem sets was developed [5]. The goal is to further develop the model along two fronts. First,

make the model more user friendly and customizable so analysts across the IC can apply the FPAF framework. This is achievable by making the user interface intuitive to anyone trained in the FPAF, knowledgeable of CAS, or familiar with ABMs. Second, the FPAF model will serve as a technological and theoretical bridge between knowledge accumulation and analytical exploitation. Unfortunately, the majority of analysts have neither the time or the requisite background knowledge to evaluate developments in economics, political science, demography or numerous other social science and behavioral disciplines, much less the technical expertise required to integrate cutting edge theory into the analytic processes. Using models as a technological and theoretical bridge will allow the U.S. analytic community to incorporate these new discoveries with occasional updates to the meta-frameworks.

The primary model draws heavily from DoD military intelligence analytic framework JIPOE. It is a direct descendant of the Army's Intelligence Preparation of the Battlefield (IPB) and follows a nearly identical four-step process. The first step, define the operational environment, identifies the aspects of the environment which are assessed as relevant to the mission. Second, describe the impacts of the operational environment. Third, evaluate the adversary; forces, groups, or individuals that can negatively impact the mission. Fourth, determine adversary courses of actions [6].

JIPOE was initially designed for a traditional force on force confrontation and is not particularly well suited for unconventional or gray zone conflict. Although JIPOE has adopted in recent years' a systems perspective to look more holistically at the situation, the decision to adopt a macro view of the system has contributed to the deliberate discounting of the heterogeneous micro-dynamics of the system being analyzed [7]. It is these heterogeneous micro-dynamic interactions that spawns emergent behavior [8] [9]. It is through the careful analysis of those emergent behaviors that decision makers will have the opportunity to apply a targeted foreign policy with an increased possibility of success.

Addressing JIPOE shortcomings requires the transition away from the composition and disposition of various entities to focus on interactions between and across agents and the environment. The result is a six-part framework: Define the Operating Environment (OE), Describe the Fitness Landscape, Evaluate Major Group(s), Evaluate Major Group(s) COAs, Assess Group(s) Interactions, and Evaluate Population Behavior [10].

Step 1: Define the OE, combines the define and describe phases of the JIPOE. In JIPOE analysts identify the key systems and subsystems of the area of responsibility using everything from traditional obstacle overlays to matrices and link diagrams. Forcing the analyst to know everything about the OE simultaneously from the local to the regional level. Preference is given on the fidelity and frequency of detail rather than a nuanced understanding of compounding variables throughout the area of operations. Rather than trying to capture every piece of data analysts should focus their efforts on identifying the characteristics that directly influence individual decision making efforts. This approach will transition analysts from the macro descriptions of PMESII (Political, Military, Economic, Social, Infrastructure, Information) and ASCOPE (Area, Structures, Organizations, Peoples and Events) to micro-level interdependencies within and across the population.

Step 2: Describe the Fitness Landscape, pertains to the defining of individual level decision making. Borrowing from economics and political science we assume individuals are both rational and inherently interested in maximizing their utility [11] [12]. Rational actors possess the ability to apply connective and transitive logic to a specific situation and evaluates the anticipated consequences. Actors subsequently use those skills to identify the choice that yields the greatest benefit [13]. Human action, however, rarely takes place in isolation and issues of preference, salience, communication, and influence further complicate the decision-making process [14].

Today, few issues are binary in nature. Issues are no longer seen as black or white rather positions are staked in terms of degree and coincide with shades of gray [15]. Knowing an individual's preference is important, however, it is insufficient to determine an outcome. Increased accuracy can be achieved when information about how important or a salient a position is available.

Furthermore, the communication literature demonstrates that how people communicate with one another can profoundly influence individual preference. The frequency of communication is not a guarantee of comprehension or understanding [16]. Content matters and messages that closely resemble either an already held position or a radically different one are unlikely to be effective [17]. Messages that are received from multiple sources are more apt to be accepted [18]. Finally, the ability to communicate is moderated by physical distance despite increased access to electronic communication [19].

The variables identified in this step should directly impact individual utility functions. The number of variables and the complexity of interaction can be scaled to fit the requirements of a given situation. By defining the fitness landscape, analysts are also inherently developing hypotheses regarding the malleable dynamics of the operational environment and the stability of the OE.

Step 3: Evaluate Major Groups. In JIPOE *the* adversary remains the focus of attention. FPAF departs from JIPOE for two reasons. First the analyst must identify friendly, hostile, neutral, and non-aligned organizations. Second, once identified each groups' fitness or capacity to act must be considered within the scope of the defined operational environment. FPAF is receptive to the notion that individuals make decisions and coalesce into groups that have shared characteristics and preferences. It is from this shared heritage that groups derive their power tempered or enhanced by the size of their membership and the ability to communicate effectively and efficiently.

Step 4: Evaluate Major Groups COAs. Here the aim of JIPOE and FPAF are identical create reasonable predictions about the groups course of actions. Using historical data as a point of departure analysts can identify the tools available for the respective groups. At the core, analysts must consider the myriad of threat templates that are acceptable, complete, distinguishable, feasible, and suitable for each group [20]. Given each tactic the analyst needs to consider how such action, given success or failure, impacts the fitness landscape of the OE. Groups actions readily change the behavior of individuals and other groups within the population, which in turn changes the characteristics of the OE, which impacts the constitution and capacity of individuals and groups.

Step 5: Assess Group Interactions. The previous step identifies the realm of possible actions for groups in isolation. Here the analyst considers those possible courses of action with the full knowledge that other groups will respond within the constraints of the OE. These alliances alter the decision calculus of others and may impact COA selection. Analyzing this complex interaction of groups is effectively war gaming, analyst consider first and second order effects but the process is more complex than the force on force contests traditional military staffs analyzed.. The conflict in the Iraq, specifically the Anbar awakening, demonstrated the propensity of individuals and groups to form alliances, merge, or split in pursuit of their respective goals [21].

Anbar also demonstrated the merging and splitting of groups may not be peaceful rather frequently change coincided with fratricide. Organski & Kugler argue two factors drive the

probability of conflict: the distribution of power and the challengers' satisfaction with the status quo. Groups that are satisfied with the status quo have no reason to fight; inversely those that are dissatisfied have reason to fight. The desire to fight, however, does not automatically facilitate conflict; rather the potential challenger must also possess to resources necessary to present a credible challenge the status quo [22][23][24].

Step 6: Evaluate Population Behavior. Here the analyst is capable of varying the initial conditions of the fitness landscape in a nearly infinite number of combinations. By simulating the interactions of individuals and groups under a variety of initial conditions insight into the dynamics governing overall societal level behavior is gained. Then statistical analysis can then be used to identify the fitness variables that are most closely aligned with desired outcomes.

Analyzing a complex foreign environment in order to take action and influence it will be a persistent problem. The challenge is how intelligence analysts can more effectively address the problem today than they did previously. This paper proposes one such approach, if only to begin a substantive discussion. Leveraging the military's use of doctrine, we propose a modification to the existing JIPOE framework. We then propose an ABM that analysts can use to aid and improve their understanding. The use of ABMs are critical as they can add theoretical rigor to the analysis, reduce costs associated with learning and incorporate new theories esoteric to the Intelligence Community. ABMs also provide the ability to explore how actions may influence foreign environments, enhancing situational understanding as the environments they wish to influence are non-linear and fundamentally beyond the ability of human cognition or even closed form mathematical equations. The U.S. Government is trying to influence complex adaptive systems, whether they are identifying areas at risk of becoming terrorist safe-haven, shaping the outcome of gray zone conflicts or influencing foreign populations to neutralize hostile regimes and models are necessary to understand these systems. On the point of whether or not models should be integrated into decision making processes there should be no debate. And our current inability to integrate the tools necessary to analyze these systems is a failure to recognize the class of problem the IC has been given.

References

1. United States. Joint Concept for Human Aspects of Military Operations. Washington, DC: Joint Chiefs of Staff. 1, (19 October 2016)
2. United States. Intelligence: ADRP 2-0, Washington, DC: Headquarters, Dept. of the Army
3. United States. Intelligence, Joint Publication 2-0, Washington, DC: Joint Chiefs of Staff
4. United States. Joint Concept for Human Aspects of Military Operations.
5. Wilensky, U.: NetLogo. Evanston, IL. Center for Connected Learning and Computer-Based Modeling, Northwestern University (1999)
6. United States. Joint Intelligence Preparation of the Operational Environment, Joint Publication 2-01.3, Washington, DC: Joint Chiefs of Staff (16 June 2009)
7. Troitzsch, Klaus G. and Nigel Gilbert. Simulation for the Social Scientist. Open University Press, (2005).
8. Epstein, Joshua M. and Robert Axtell. Growing Artificial Societies. MIT Press, (1996)
9. Miller John H. and Scott Page. Complex Adaptive Systems: An Introduction to Computational Models of Social Life. Princeton University Press, (2007).
10. Zagorowski, Piotr M. and Thomas Pike; "Complex Intelligence Preparation of the Battlefield: An Effort to Operationalize the Integration of Political Theory to Improve Analysis Across the Intelligence Enterprise" Annual Meeting of the International Studies Association, Baltimore, MD, February 22-25, 2016.
11. De Mesquita, Bruce Bueno; "Globalization and its Challenges in the 21st Century". Address to the Hong Kong Conference, *International Studies Association* (2001)
12. De Mesquita, Bruce Bueno. *The Logic of Political Survival*. MIT press, (2005)
13. Raiffa, Howard. *Decision Analysis: introductory lectures on choices under uncertainty.* Addison-Wesley, (1970).
14. Dixit, Avinash K., and Susan Skeath. *Games of Strategy: Fourth International Student Edition*. WW Norton & Company, (2015).
15. Efird, Brian, et al. "Negotiating peace in Kosovo." *International Interactions 26*(2), 53-178 (2000).
16. Berlo, D. K., Lemert, J. B., & Mertz, R. J.: Dimensions for evaluating the acceptability of message sources. *Public opinion quarterly*, *33*(4), 563-576 (1969)
17. Siero, F.W., Doosje, B.J.: Attitude change following persuasive communication: integrating social judgement theory and the elaboration likelihood model. Eur. J. Soc. Psychol. *23*(5), 541-554 (1993)
18. Corman, S. R., Tretheway, A., & Goodall, B.: A 21st century model for communication in the global war of ideas. Consortium for Strategic Communication, Report, 701 (2007)
19. Siero, F.W., Doosje, B.J.: Attitude change following persuasive communication
20. Joint Publication 2-01.3, II-70
21. Staniland, Paul. "Between a rock and a hard place insurgent fratricide, ethnic defection, and the rise of pro-state paramilitaries." Journal of Conflict Resolution 56(1), 16-40 (2012).
22. Organski, Abramo FK, and Jacek Kugler. *The war ledger*. University of Chicago Press, (1981).
23. Abdollahian, Mark, and Kyungkook Kang. "In search of structure: the nonlinear dynamics of power transitions." *International Interactions 34*(4), 333-357 (2008).
24. Benson, Michelle, and Jacek Kugler. "Power parity, democracy, and the severity of internal violence." *Journal of Conflict Resolution* 42(2), 196-209 (1998).