

# Implementing Irregular Warfare Policy Using Modeling and Simulation

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## **ABSTRACT**

Senior decision makers have few tools available when implementing policy in multidisciplinary domains like Counterinsurgency (COIN) and Irregular Warfare (IW). Modeling and simulation (M&S) is offered as an appropriate analysis methodology for its ability to 1) combine contributions from multiple subject matter experts, 2) generate and analyze complex policy consequences based on various initial conditions, and 3) provide useful results in the presence of pervasive missing data. This paper works through an example irregular warfare simulation problem based on *The Quest for Viable Peace* (Covey, Dziedzic, and Hawley, 2005) or "QVP" that combines political, economic, security, and rule of law strategies. Though the QVP model was originally formulated based on America's experience in Bosnia and Kosovo in the 1990s, here it is redirected and extended based on current IW concerns in Afghanistan. Used in this way, M&S combines the best aspects of well established and recently published work bolstered by current experience and expertise. It does this first by reviewing some small System Dynamics (SD) simulations, second by reviewing the QVP economic model, and third by developing the phenomenology of IW using the SD reference mode. This inquiry shows that neither security nor development alone is sufficient to address IW, instead both must be provided in a coordinated manner. For senior policy and decision makers, M&S provides a way to structure hard problems, combine the contributions of multiple relevant experts, and learn more effectively about the consequences of potential policies and applications of national power in complex IW domains.

## 0. INTRODUCTION

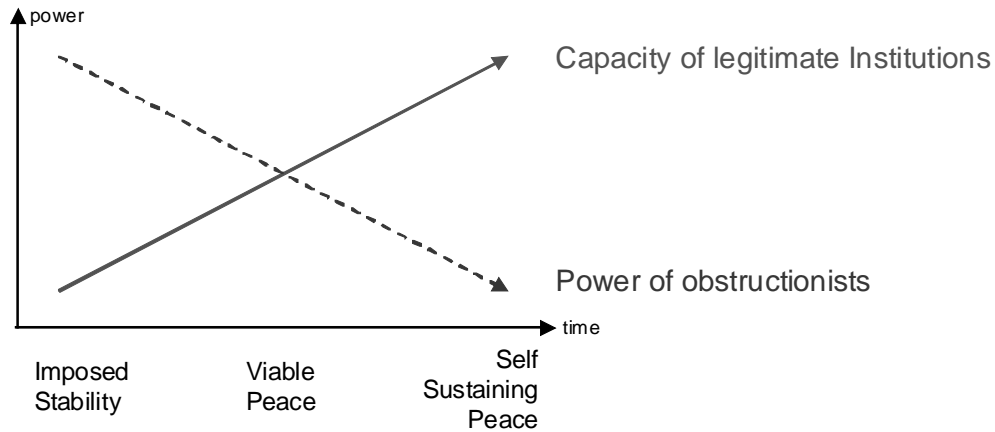
Implementing foreign policy has been described as “groping in the dark” as intended policy benefits are often overwhelmed by undesirable, unintended consequences. A well-designed, overarching strategy helps provide clarity, coherence, and coordination to foreign policy. Modeling and Simulation (M&S) can help create strategy in two ways: 1) by specifying the low-level details of a high-level strategy, and 2) by structuring and organizing the initial strategy articulation. This observation is not new. Beal (1985) outlines the need for system science to support foreign policy at the National Security Council level, and Forrester (1973) talks about the shortcomings of human decision making and how M&S can help address those shortcomings. M&S insights are specified and made tangible through the System Dynamics (SD) simulation methodology. Although SD is usually applied to questions of business policy (Forrester 1963; Sterman 2000), its application to foreign policy remains an ongoing opportunity.

This paper shows how M&S generally and SD specifically can be applied to Irregular Warfare (IW), which is done in three sections. First, some small, archetypical SD simulations are reviewed to show how M&S applies to IW. Second, the economic model from *The Quest for Viable Peace* (Covey, Dziedzic, and Hawley, 2005) or QVP is analyzed to understand both the goals of an international intervention as well as how different elements of national power combine to achieve those goals. Third, the *phenomenology* of IW is developed using the SD *reference mode*, which organizes simulation modeling as software engineering organizes coding. The first steps of the reference mode are performed to demonstrate the researching, quantifying, and connecting that should occur before creating a simulation model. In conclusion, strategy

and M&S are revisited from the perspective of Regional Combat Commanders (RCC) and the Department of Defense (DoD).

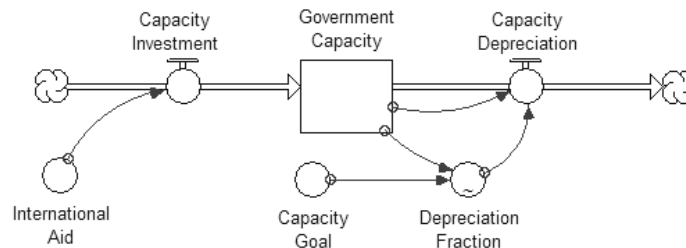
## 1. SOME SYSTEM DYNAMICS (SD) SIMULATIONS

Covey, Dziedzic, and Hawley (2005) distill the hard lessons learned by the US Government (USG) in Kosovo and Bosnia during the 1990s. In so doing, QVP introduces the concept of an “X-chart” as shown in Figure 1.



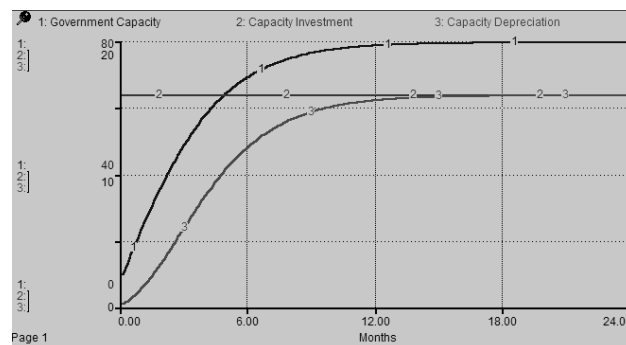
**Figure 1 – Quest for Viable Peace X-Chart**

At the outset of an international intervention, the power of legitimate institutions is at a minimum, while the power of those opposed to legitimate institutions – i.e., *obstructionists* – is at a maximum. The task of an international intervention therefore is to minimize the power of the obstructionists and build the capacity of legitimate institutions. This does not happen instantaneously but progresses through three stages over time: imposed stability, viable peace, and self-sustaining peace.



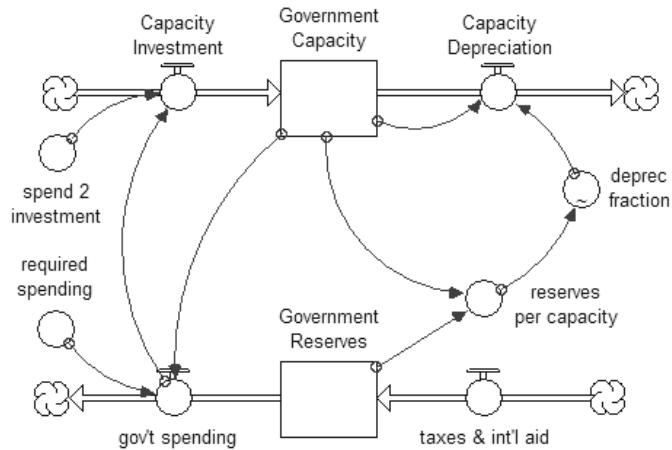
**Figure 2 – Sustainable Government Capacity**

Figure 2 shows a small SD model that begins to specify and fill out the Figure 1 X-chart. SD models are based on *stocks* and *flows* where *stocks* accumulate quantities of interest and *flows* change those quantities. Government capacity here is depicted as an accumulation of capabilities that are increased through investment and decreased through depreciation. In a QVP-style intervention, government capacity is increased, at least initially, through international aid. To the right is some logic indicating that the bigger government gets, the greater the depreciation. This makes intuitive sense as there are more people to retire, more buildings to repair, and more equipment to replace.



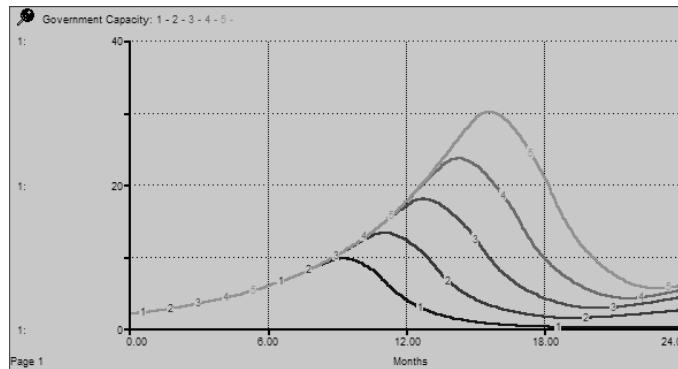
**Figure 3 – Sustainable Government Capacity Dynamic Response**

The dynamic response of the Figure 2 model is shown in Figure 3. Capacity investment comes in at a constant level, while depreciation increases as government capacity increases. Note that government capacity only increases until investment and depreciation become equal, at which point capacity levels off. Thus government capacity increases only when investment is greater than depreciation. Conversely, capacity decreases when depreciation is greater than investment.



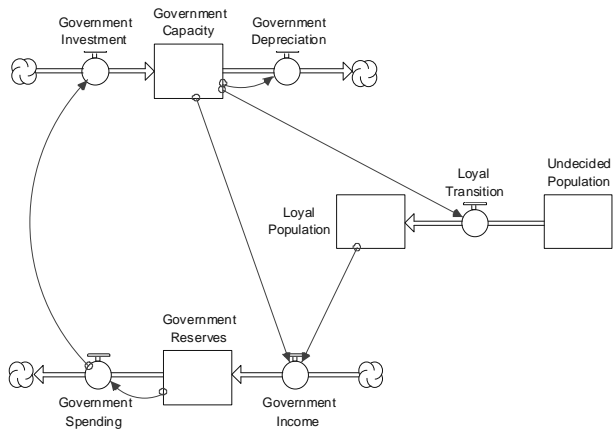
**Figure 4 – Government Finances**

Figure 4 combines two sets of stocks and flows because capacities are related but not equivalent to the money that is spent for them. This model thus relates government reserves to government capacity. Government reserves can be increased through taxes and international aid and decreased through government spending.



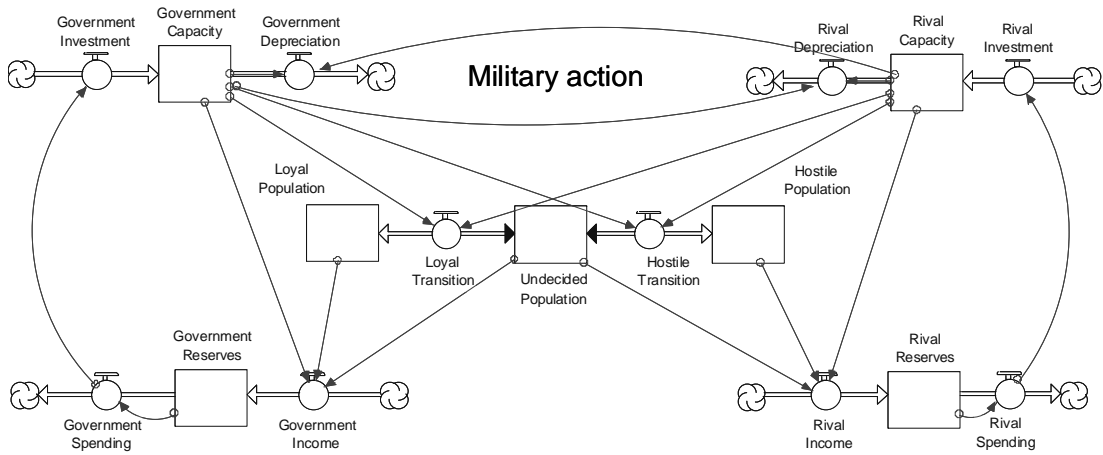
**Figure 5 – Government Finance Sensitivity Analysis**

Figure 5 shows a sensitivity analysis of the Figure 4 model with a constant amount of initial reserves and varying amounts of taxes and international aid. Figure 5 demonstrates an “overshoot and collapse” behavior mode because when the stock of reserves runs out, then government capacity has to “collapse” back to a level supportable by taxes and aid.



**Figure 6 – Population is the IW Center of Gravity**

Figure 6 introduces population into the relationship between government finances and capacity. Recall that Figure 1 depicts a transition from rule by obstructionist to rule by legitimate government. As government capacity increases, the population will become loyal to the government and thus more willing to pay taxes. Moreover, as capacity increases the government will become more able to collect those taxes. Note that this causal relationship between loyal population, government reserves, and government capacity forms a *positive or reinforcing* feedback loop.



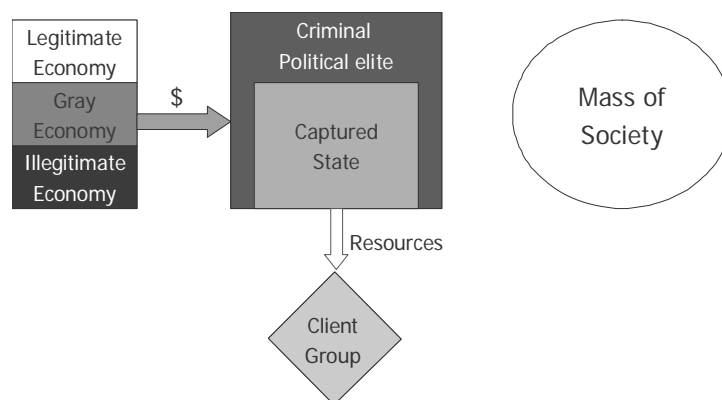
**Figure 7 – Rivalry Adds Complexity**

Legitimate governments emerging as a result of an international intervention however do not do so in isolation. Figure 7 shows the reciprocal influences of the government and a rival – the “obstructionists” from Figure 1 – both working for the loyalties of the

population, which is the centerpiece of Counterinsurgency (COIN) strategy (US Army 2006). Although the computational structures of the government and its rival look the same, the relative capacities between the legitimate government supported by the international community and the government’s obstructionist rival are likely to be unequal or *asymmetric*. Note that the capacity of the government and its rivals can be increased through additional investment or diminished through additional depreciation. Thus military activity directed towards the opposition’s capacity is implemented as increased depreciation. This complex, asymmetric rivalry for the population’s loyalties is explored in more detail in the next section.

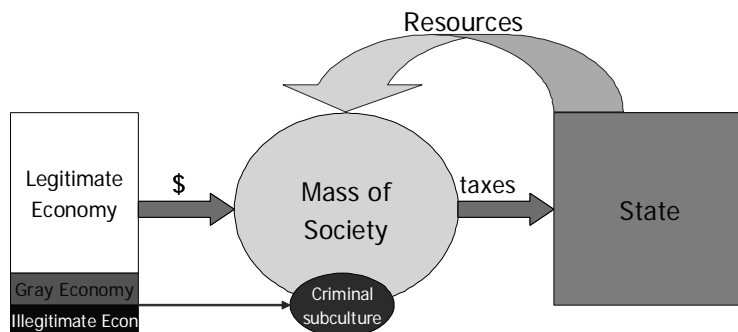
## 2. THE QVP ECONOMIC MODEL

This section articulates the inherent, asymmetric tension between the legitimate government and its obstructionist rivals as depicted in the Figure 1 X-chart. Three graphics are examined that portray the 1) “start” state of an intervention, 2) the “goal” state, and 3) the transition or “missing middle” between the start and goal states (Covey et al. 2005, chapter 8).



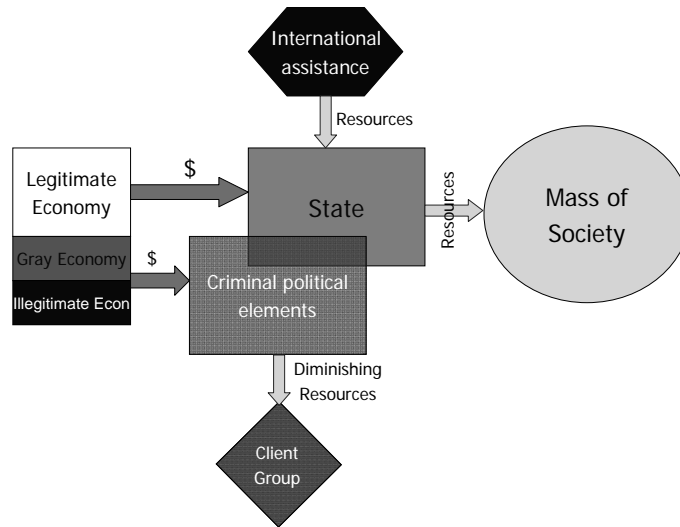
**Figure 8 – The Start State**

The political-economic situation that provides incentive for an international response is shown in Figure 8. The state has been captured by a criminal political “elite” that redirects disproportionate economic resources – whether legitimate, illegitimate, or in between (i.e., “gray”) – to a client group rather than to the mass of society that comprises the bulk of the population. This inequitable distribution of wealth leads many social ills up to and including state failure (FP 2005).



**Figure 9 – The Goal State**

A properly functioning country is depicted in Figure 9. The benefits of the legitimate economy are directed to the mass of society, which in turn pays taxes to the state. The state then provides resources and services to the mass of society in return for those taxes. The legitimate economy has grown in relation to the gray and illegitimate economies. Additionally, the criminal subculture is reduced in importance relative to the mass of society and is forced to survive on the diminished gray and illegitimate economies.



**Figure 10 – The Missing Middle**

The task for IW strategy is to transform a situation like that described in Figure 8 to that depicted by Figure 9. This complex transition is called the “missing middle” as shown in Figure 10. International assistance directs resources to the nascent state, which does three things: first it bolsters the illegitimate economy; second it takes on criminal political elements and reduces their role in society by force; and third it directs resources to the mass of society. In other words, multiple interrelated activities occur at the same time. Irregular warfare has been likened to a mobile sculpture – touch one part and the whole system gets put into motion. Accounting for and understanding these dynamic, interrelated piece parts is the subject of the next section.

### **3. THE PHENOMENOLOGY OF IRREGULAR WARFARE (IW)**

In the first two sections, general models and simulations have been offered that provide insights into IW. However, M&S is described here as a way to synthesize multiple analytic elements into a single, coherent, and integrated analysis. This holistic process is indeed required to address the deep, long-term, and interdisciplinary problems of IW generally and Afghanistan specifically (Rashid 2008). Even the source of Afghanistan’s

current problems rests in under-appreciating its political interrelatedness. After the Soviet Union was expelled from Afghanistan, the US ignored the country, starting a dynamic in the 1990s in which Afghanistan's economic problems eventually became America's security problem (Coll 2008). The US followed Pakistan's lead regarding Afghanistan, finding out only later that Pakistan's interests were very different than America's.

Addressing the generalities of IW, the details of Afghanistan, and the need for an effective strategy requires both creative and abstract thinking. That is, the *phenomenology* of IW needs to be addressed so that relevant theories, experience, and data can be gathered, combined, extended, and tested. This is a difficult intellectual enterprise, and though advanced computer techniques may be able to aid hard thinking, they are not a substitute for it. The *SD reference mode* is employed to structure the analysis of just such dynamic, interrelated, and inchoate policy problems (Randers 1980).

A slightly modified version of the SD reference mode is presented here:

1. State the thesis
2. State ancillary thesis
3. Determine the time frame
4. Select  $7 \pm 2$  variables
5. Graph variables over time
6. Postulate causality
7. Create the simulation
8. Iterate and improve the model
9. Fix the problem

The first five steps of the reference mode are completed herein to demonstrate its applicability to foreign policy generally and Afghanistan IW specifically. Moreover, most of the hard work is completed by the analyst, not the computer-based simulation tool. The simulation package together with the attendant problem formulation methodology help

structure the problem and break it down into manageable parts, but the analyst remains responsible for developing the key analytic insights.

This study focuses on the politics and economics of Afghanistan rather than its military aspects, an admittedly counterintuitive posture for a region so lacking in security. However, the consensus is that military power alone will not solve COIN and IW problems. Instead the Diplomatic, Informational, Military, and Economic (DIME) elements of national must be combined to form an efficacious national response. That is, the social environment that gave rise to insurgency itself must be transformed. This observation has consequences for leadership as the diplomatic, informational, and economic national activities should be directed civilians, e.g. the State Department.

The ancillary thesis pertains to the military, which is placed in a supporting role. Defeating the enemy requires denying it sanctuary among the population. After all, the enemy is called “irregular” because it doesn’t wear uniforms; instead they blend into and live within the population, so they are hard to identify and engage. Consequently, there are fewer decisive battles and a greater emphasis on policing and intelligence gathering. There is also a greater emphasis placed on training, mentoring, and building up the capacity of local security forces. These tasks are uncomfortable for the American military but are mandatory for IW success.

The time-frame of the engagement and the analysis is also longer than the Department of Defense (DoD) finds comfortable. The DoD prefers to get in, commence

operations, and get out quickly. For example, Perry and Gordon (2008) note that it took only 23 days to win the conventional fight in Iraq, but the insurgency afterwards lasted for over 1700 days. Thus the 20<sup>th</sup> century American military goal of achieving decision through superior technology is being blunted by the realities of IW. Instead we find that the timeframe of engagement is being extended to years and possibly decades. For this study, the analysis begins with the American intervention in Afghanistan in 2002, continues to 2009, and extends beyond into the indeterminate future.

The next step of the SD reference mode is to identify  $7\pm 2$  key variables. If we are to take COIN theory seriously, then primacy must be given to the local population, which is the center of gravity or, “the prize.” The more the population supports the legitimate government, the harder it is for insurgents to exist within the people. Second, the political and military capabilities of the key power rivals must be evaluated, which includes the legitimate government, the Taliban, and the warlords. Third, the size and relative balance between the legitimate and illegitimate economies must be quantified. Afghanistan is the third poorest country in the world, so its legitimate economy is not extensive, but its illegitimate economy in the form of poppy growing and heroin production is indeed formidable. Fourth, cross-border flows must be noted with NATO aid flowing to the legitimate governments and friendly warlords, and other aid flowing to the Taliban from Pakistan and other Arab states. Fifth, the infrastructure of Afghanistan needs to be characterized in terms of schools, medicine, oil, electricity, roads, communications, as well as other systems deemed important by the population.

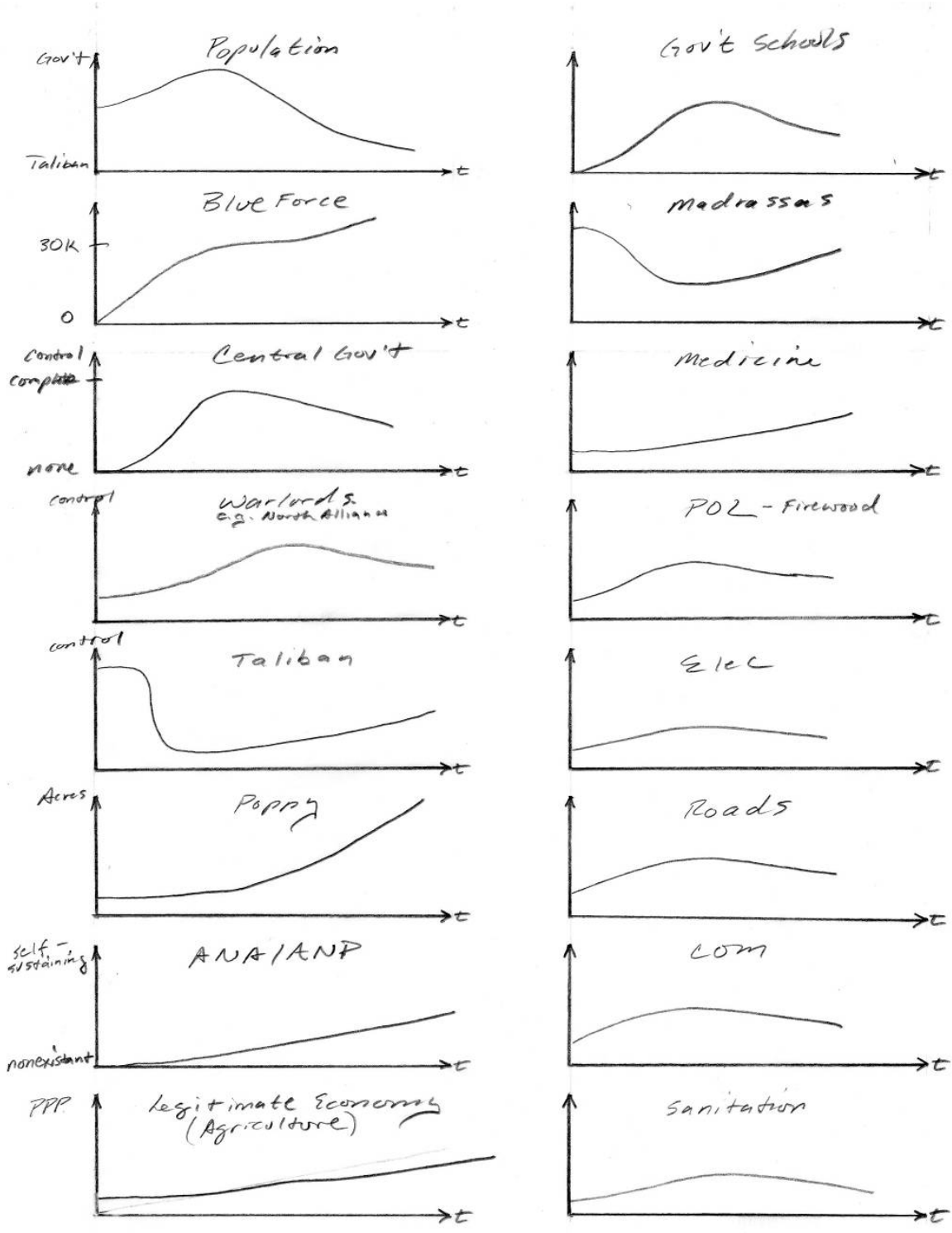


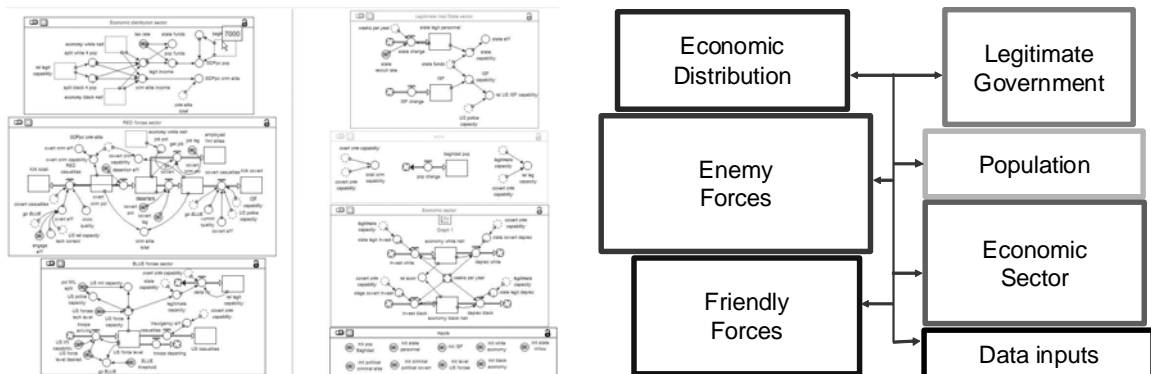
Figure 11 -- Key Variables Graphed Over Time

Figure 11 shows the key selected variables graphed over time, which accomplishes several things. First, it allows for deeper thinking about the variables, how they might be measured, and their units of measurement. Second, it provides a repository for collected data as well as the rationale to collect more data. Third, this exercise provides structure for the consideration of how variables change over time relative to other variables. For the population graph, the population starts off positively disposed to the government, and this support increases over time. As the Taliban re-infiltrate society though, people realize their security cannot be guaranteed by the government, which results in reduced government support as the population hedges their bets as a matter of self-preservation. The blue forces of the international intervention increase to the level of about 30,000 personnel and above as several more Brigade Combat Teams are slated to go to Afghanistan. The capability of the government goes up as the Taliban are pushed out of the country, but as the Taliban return this affects the government.

Poppy growing, a staple of the illegitimate economy, has increased and has funded the return of the Taliban. The Afghan National Army and Police (ANA/ANP) are being trained, equipped, and mentored, but their capabilities are growing slowly. Additionally, the legitimate economy, which consists primarily of agriculture, is growing slowly. Government schools and Islamic Madrassas show an inverse relationship as Government schools grew initially but then became targets for the Taliban, and now the Islamic schools are returning. Regarding schools, note that the Taliban can replace government schools with an acceptable Islamic substitute. With regard to medicine, there is no Islamic alternative, so the Taliban have left new medical facilities alone rather than attack

them and risk the wrath of the population. The rest of the infrastructure variables – Petroleum, Oil and Lubrication (POL), Electricity, Roads, Communications, and Sanitation – all have essentially placeholder dynamics that indicate the need for additional research and data collection.

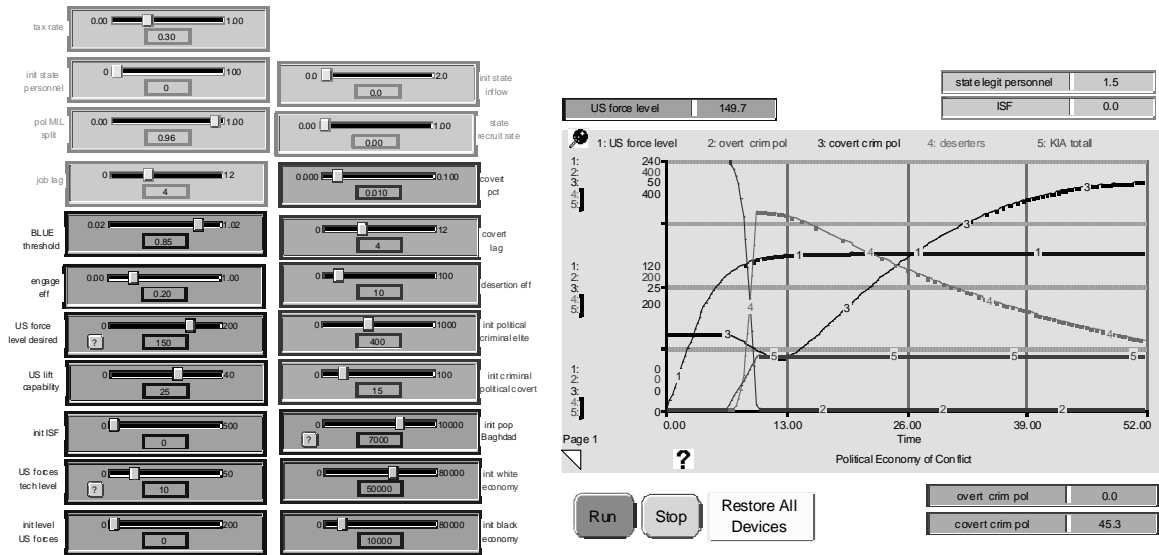
The next step would be to postulate connections among these variables. For example, how do the infrastructural variables just discussed affect popular attitudes towards the government? Are roads and gasoline areas of vital concern for the average Afghan citizen, or do other topics dominate their thinking? Such relationships can easily be represented within a simulation, but they must reflect actual realities for the simulation to be useful in the execution of policy.



**Figure 12 -- Example COIN Simulation and Sections**

Figure 12 shows an example set of COIN relationships using the QVP baseline as described in Figures 8—10. To the left, causal connections are articulated, defined, and quantified using the iThink System Dynamics modeling tool (ISEE 2004). To the right are the model sections connected with the simulation. These interconnections provide a critical contribution to COIN policy because they integrate the political and military

aspects of the country system. So important and central is this capability to COIN that the second chapter of US Army (2006) is, “Unity of Effort: Integrating Civilian and Military Activities.” Simulation is almost unique in its ability to integrate these complex social system sections.



**Figure 13 -- Simulation Graphical User Interface (GUI), Input Policy Levers and Output Metrics**

As useful as models of the type shown in Figure 12 might be in integrating political and military concerns, the graphics and underlying computational complexity tend to intimidate more than aid senior government decision makers. Figure 13 shows an example Graphical User Interface (GUI) that hides this complexity with input policy levers to the left and output metrics to the right. Decision makers can experiment with different combinations of policy inputs and then see their impact on the graphical display, an actual, active manifestation of the Figure 1 X-chart. In so doing, unexpected behaviors arise, which leads to a question: Is this an insight or an error? The simulation expert will then need to dive into the Figure 12 logic to determine if the unexpected behavior is an interesting counterintuitive result or a relatively uninteresting logic error.

Figures 12 and 13 provide a starting point for what can be accomplished using M&S in this area. The relationships among variables within the COIN and IW contexts require continued development, and these connections must be guided by the *phenomenology*, the theory, and the understanding of the key causal relationships to be developed. M&S can provide structure to guide the analysis, capture the variables, and generate possible scenarios, but this does not alleviate the IW analyst from the need to think carefully. Automation does not obviate thinking. To the contrary, M&S provides an environment that supports if not requires careful thinking.

#### **4. CONCLUSION**

COIN and IW policy is implemented by Regional Combatant Commanders (RCCs), and they are frustrated by the metrics they receive. The data are presented out of context as stoplights, so the RCCs are left unsure about what the data mean, how the variables relate to one another, and how the variables are likely to change over time. M&S answers these questions by developing metrics, relating them to one another, and providing scenario analysis capability.

More than that though, M&S provides a way structure analysis about hard, dynamic, and interrelated problems that allows theory, data, and expertise to be synthesized and integrated in a manner that allows for strategy development. An IW conflict cannot be won with military power alone; yet bringing the DIME elements of national power to bear in a coordinated fashion remains an ongoing policy opportunity. M&S provides a credible and defensible starting point for this strategy development process.

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