The Dynamics of ISIS – An Emerging State Actor.

Timothy Clancy
Worcester Polytechnic Institute
100 Institute Rd, Worcester, MA 01609
tbclancy@wpi.edu

Abstract:

This paper seeks to explain the rapid growth of the Islamic State of Iraq & Syria (ISIS) and approach the question of "what is" the Islamic State? A review of existing literature on simulation modeling of insurgencies identifies several gaps, as existing theories of non-state actors and insurgencies are inadequate to explain ISIS's performance. Additionally, there are few mathematical simulation models of insurgent behavior that can reproduce ISIS results. Finally, what models exist are not detailed enough either to conduct detailed experiments testing proposed explanations of ISIS, or evaluate policy responses aimed at containing or mitigating ISIS.

The paper offers several contributions. First is the proposal of a dynamic hypothesis that ISIS is an emerging-state actor and differs notably from traditional non-state actors and insurgencies. The theory consists of both a causal loop diagram and key propositions. The second contribution is a detailed operational simulation model parameterized for conditions ISIS faced in Iraq & Syria in 2013. This model creates a baseline simulation from 2013-2020. The propositions of emerging-state actor theory are constructed as experiments and confirm evidence of emerging-state actor behavior allowing refinement of model boundary assumptions. Additional contributions in other papers include using the simulation model to test intervention policies, and a novel approach to modeling combat simulation with endogenous geospatial feedback. The model is provided in full detail in two Appendices. Appendix A provides a sector-by-sector view of model structure and equations. Appendix B provides more discussion, analysis and sources used to develop model structure, establish parameter values and determine equations for the simulation. Due to length and other considerations, Appendix B is available only upon request. The model can be configured for other non-state actor scenarios (classical insurgencies etc.) and loaded with scenarios to simulate non-state actors in different geospatial domains: ISIS in Libya, Boko Haram in Nigeria, the returning Taliban in Afghanistan, etc.

Keywords: ISIS, ISIL, DAESH, insurgency, conflict, security, non-state actor, emerging-state actor, combat simulator, geospatial, national security.

Acknowledgements: The author would like to acknowledge Professor Khalid Saeed and Jessica Turnley for their contributions to this work.

Introduction

The rise and staying power of the Islamic State of Iraq & Syria (ISIS) has created enormous regional instability. Although its predecessor Al-Queda in Iraq (AQI) presented a threat as a traditional insurgency, ISIS appears to operate in an entirely different manner. Calling ISIS an insurgency is difficult because they operate openly. Likewise, explanations that ISIS is a messianic religious cult or some form of mafia discounts how ISIS actually governed and sought to establish civic institutions in territory it controls. So what is ISIS? How can it be contained or defeated? Can the ISIS phenomena be replicated elsewhere?

This paper proposes a hypothesis that ISIS represents a new type of non-state actor named an emerging-state actor. Emerging-state actors operate in fundamentally different modes than other non-state actors like insurgents or terrorists and this difference helps explain the rapid growth of ISIS and why other insurgencies might shift to this mode of conflict in the future. The theory of emerging-state actors as it applies to ISIS is developed within the existing framework of non-state actors. A dynamic hypothesis of an emerging-state actor is then developed through a series of logical statements connected in a causal-loop diagram. Experiments are conducted on the propositions of the dynamic hypothesis using a detailed system dynamics simulation (explained fully in Appendix B) to build confidence in the theory. The paper finishes with a conclusion that summarizes the insights, discusses limitations, and identifies future opportunities for research with the emerging-state actor theory as well as the simulation model created for this effort.

Detailed Problem Description

In 2003 Al-Queda Iraq (AQI) emerged as a potent threat to the stability of Iraq. The strength of AQI peaked in 2006 before declining as the result of three circumstances: a troop surge of US Forces, a

Sunni-Shia civil war that AQI helped spark, and the indigenous resistance to AQI growing out of the Anbar Awakening. In 2013 ISIS seized of Ar-Raqqah, a medium sized city in eastern Syria with an estimated 13,200 militants.[1] By late 2014, ISIS had grown to between 50,000-80,000 militants strong, taken control of nearly thirty per cent of the territory in Syria and Iraq, and threatened regional stability. This brief history is depicted quantitatively across key measures in Figure 1.

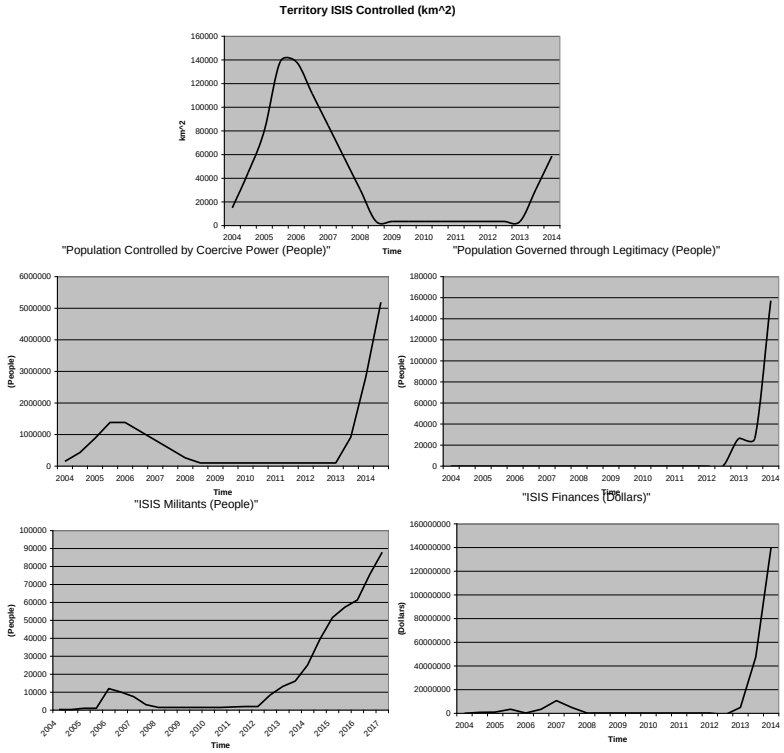

Figure 1: AQI & ISIS Performance 2004-2014

The rapid growth of ISIS represented by the final years in Figure 1 represents a problem in the study of insurgencies and how to contain them. How did ISIS grow so quickly between 2013 and 2014? Would that growth continue?

[1] All size estimates for ISIS are taken from the Department Of State. The Office of Website Management, "Country Reports on Terrorism." The entity now known as the Islamic State first appears in Country Reports on Terrorism in 2004 under the name Tanzim Qa'idat al-Jihad fi Bilad al-Rafidayn.

Literature Review

Although the literature on insurgencies is extensive, in 2009 Kilcullen argued that Cartesian or reductionist quantitative analysis to model insurgencies may not be the best approach, and instead complexity theory and systems theory approaches may be more practical.[2] There are only a handful of quantitative system dynamic efforts dealing with insurgencies or irregular warfare in the manner described by Kilcullen. An early multi-polar examination of conditions that give rise to internal violence in developing economies was conducted by Khalid Saeed in 1983. The paper analyzed how social and political factors determined long term growth. Instability in the form of dissidence and subversive activities were modeled, but not explicitly as a violent insurgency or with resources becoming controlled by the dissidents. [3] In 2010 Turnley et. al. specifically modeled an irregular warfare environment to provide a computational representation of the interdependence between kinetic and non-kinetic aspects of a battlefield. The model highlights the interaction of latent structure as it is affected by kinetic activity, but Turnley does not model the organization of the insurgency itself as a key factor in the dynamics of how it operates.[4]

In 2011 Anderson used actual data from the Anglo–Irish War of 1919-1921 to model insurgency and counterinsurgency theories indicating potential gaps in the theory when compared to simulation results. However, the IRA was never able to seize and hold territory with this approach and may not best represent the dynamics of an actor like ISIS which seizes territory to the exclusion of all other actors.[5]

[2] Kilcullen, David, *Counterinsurgency*.
[3] Saeed, "Economic Growth and Political Instability in the Developing Countries: A System View."
[4] Turnley et al., "COIN 2.0 Formulation."
[5] Anderson Jr., Edward J., "Modeling Insurgencies and Counterinsurgencies."

In 2013 Saeed et. al. developed a generic structure to model political conflict which could include insurgencies.[6] The model, like Turnley, focuses on decision-making and choices of the population rather than the explicit structure of how an insurgency like ISIS might operate.

In 2014 Aamir presented a paper on modeling terrorist organizations using existing system dynamic models of business entities. However, except for Attacks & Agency the models Aamir used were from existing system dynamics literature on business models, built generically, rather than aiming to model the performance of any one insurgent group.[7]

This paper seeks to build upon the work of this existing literature by proposing a dynamic hypothesis that ISIS represents a new form of insurgency created by an "emerging-state" actor. In this effort I will adopt Turnley's approach of using U.S. military definition of terms, the aspects of modeling ISIS as a firm or state from Aamir, and pay close attention to the causal mechanisms (financing, recruiting, gaining equipment) that allows ISIS to operate and achieve its goals missing from the theoretical structure of Anderson and the generic structure of Saeed.

My contribution to the literature in this paper is the theory of an emerging-state actor, that ISIS is such an actor and the testable propositions of what constitutes such an actor. I test the propositions of the theory in simulation experiments to see whether they are valid within the context of the model boundaries or not, and validate those boundaries. Finally, I believe I have contributed a detailed simulation model that can simulate the performance of either an emerging-state or insurgent actor, compare performance between the two as well as each against a set of intervention policies. The model contains a combat simulator that configured by scenarios to represent different terrain and types of environments as well as starting conditions.[8] The model serves as a platform for conducting a portfolio

[6] Saeed, Pavlov, Oleg V., and Skorinko, Jeanine, "Farmers, Bandits and Soldiers: A Generic System for Addressing Peace Agendas."
[7] Aamir, "Applying Existing System Dynamics Business Formulations to Model Terror Organizations."
[8] Clancy, "Art of War: Modeling Combat Simulation with Endogenous Geospatial Feedback."

of policy tests to understand both the behavior of an emerging-state actor versus an insurgent non-state actor, but also to conduct policy tests on interventions against the actors. [9]

Hypothesis Development: What is ISIS?

Developing a hypothesis that ISIS is an emerging-state actor first requires identifying the existing perspectives on terrorism, insurgencies and irregular warfare then locating ISIS within this constellation of non-state actors. Part of that effort involves making explicit the modeling boundaries and how the problem is being sliced. This section concludes with the proposed hypothesis of ISIS as an emerging state actor.[10]

Existing terms often do not distinguish between tactics used by a non-state actor and threat to the state by a non-state actor. The two figures below, Figure 2 and Figure 3, both represent continuums along axes. Beginning with "tactics," a continuum of the methods of operations employed in furthering an agenda by non-state actors can be notionally established using terms and definitions from the U.S. Military. In Figure 2, at the left of the continuum, are non-state actors who seek to achieve their agenda through unconventional warfare defined as "…operating through or with an underground, auxiliary, and guerrilla force in a denied area."[11]

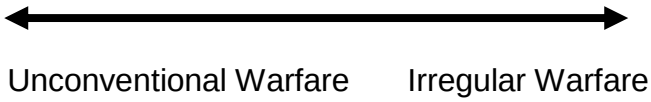

Figure 2: Tactics Continuum

On the right side of the continuum are those non-state actors who further their agenda through a "…violent struggle among state and non-state actors for legitimacy and influence over the relevant population(s),"[12] the key distinction being to what extent the non-state actors are operating in a

[9] Clancy, "Containing ISIS : Analysis of Intervention Policies."
[10] Turnley, "Where Is the Method in the Madness? Questions for Systems Dynamics Modeling Teams."
[11] "Joint Publication 1-02: Dictionary of Military and Associated Terms," 261.
[12] Ibid., 125.

clandestine or more open fashion and seeking legitimacy over the local population. The continuum ends at irregular warfare excluding conventional full-spectrum operations and nuclear war as being beyond the reach of non-state actors.

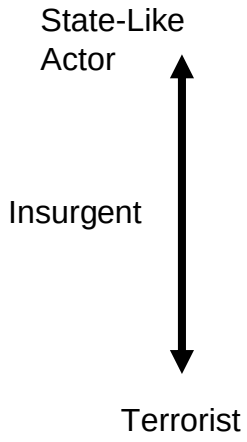

Figure 3: Threat to the State

Figure 3: "Threat to the State" represents the extent to which the agenda of a non-state actor represents an existential threat to the survival and continuance of a state. Agendas which seek change in government policy, release of prisoners, or financial demands are fundamentally different from agendas with goals to remove or replace current leadership or violently overthrow the state itself. Kilcullen distinguishes between "terrorist" and "insurgent" based on the question of how much of a threat to the state does the non-state actor pose. He describes how in "Western popular culture the conception of terrorism became that of disembodied cells of radicalized, nihilistic individuals [who]…could not and did not tap into a mass base that drew its legitimacy from popular grievances, as traditional insurgents."[13] But many insurgencies, Kilcullen continues, especially those of the 21st Century, operate in a conflict where the insurgents "challenge the state by making it impossible for the government to perform its functions, or by usurping those functions—most commonly, local-level political legitimacy; the rule of law; monopoly on the use of force; taxation; control of movement; and regulation of the economy."[14] So insurgencies differ from terrorism in their intent of challenging the state, however most insurgencies still operate in a clandestine fashion. This is because an insurgency does not yet have a monopoly on the activities within the territory they occupy, so the non-state actor can neither operate nor govern openly. This territorial control leading to open-governing distinction is vital amongst the non-state actors. Once

[13] Kilcullen, David, *Counterinsurgency*. Location 3123

an insurgency controls territory to the exclusion of any other force establishes enforcement of law, commerce, and social activity, they have evolved to something more than an insurgency. In 2007 the United States military published the Joint Operating Concept on Irregular Warfare in order to guide future joint force commanders on a wide variety of types of irregular warfare. The Joint Operating Concept briefly treats this concept of insurgencies acting in sovereign fashion in a footnote "[s]tate-like adversaries refer to non-traditional adversaries that have evolved to the point of attaining state-like power, authority, and influence over a population" and later acknowledging that "these adaptive actors may possess some of the power of states and adopt state-like structures."[15] This final definition allows the creation of a vertical continuum of the threat to the state. At the bottom, small groups of individuals pursue policy change but have little chance of disrupting state function. In the middle, an insurgency begins to threaten the governing of a state by disrupting the means to do so. At the top, an insurgency has begun to capture territory and govern openly becoming a state-like actor. Perhaps the only difference at that point remaining from a state-like actor and a state is international recognition. Using the defined horizontal and vertical axes, non-state actors can now be notionally plotted based on where they fall on both continuums. This is illustrated in Figure 4.

Further segmentation can be arrived at by illustratively separating the graph into four quadrants representing the four natural distinctions of a two-axis arrangement as: high-challenge to the state with unconventional means, high challenge to the state with irregular warfare means, low challenge to the state with unconventional means, and so on. Three quadrants are easily defined with existing terms.

---

[14] Ibid. Location 2529
[15] Olson, Mattis, and Mullen, *IRREGULAR WARFARE: COUNTERING IRREGULAR THREATS JOINT OPERATING CONCEPT*, 8 & 16.

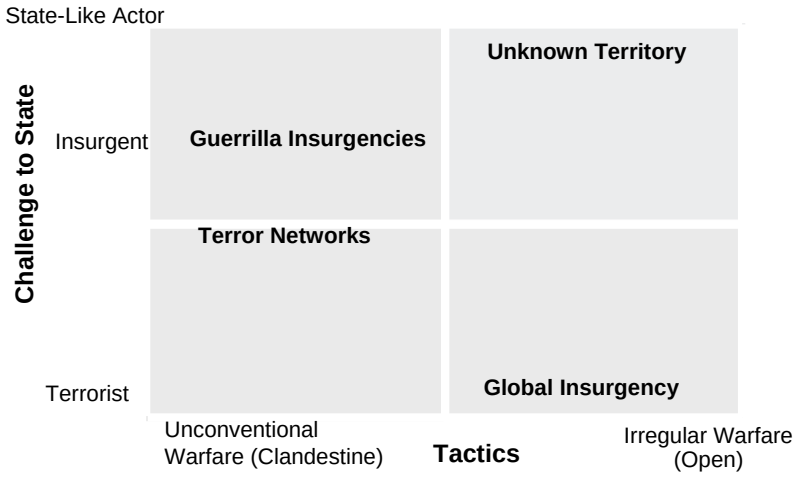

Figure 4: Non-State Actor Segmentation

It's worth noting that "Guerrilla Insurgencies" do not top the "challenge to state" axis. It follows logically that meeting the definition of a state-like actor would require the guerrilla insurgency to abandon clandestine or underground methods characteristic of unconventional warfare and begin operating in the open. Therefore as a guerrilla insurgency gains territory and begins governing, it shifts to the right upper quadrant currently named 'Unknown Territory'. The actors who occupy this space are those who conduct irregular warfare and yet present a threat to the state of equal or higher magnitude than guerilla insurgencies. Defining the characteristics of this 'unknown territory' quadrant occurs below.

First we must trace the path of ISIS's history and shifting modes of operation. Previous to 2003 what would become AQI operated as at best a terrorist network of cells, the lower left quadrant. From 2003–2013 as AQI operated as an insurgency in the upper left quadrant threatening various governments conducting attacks, gaining criminal revenues all from within clandestine networks hidden within the population. However, AQI never openly governed any population. With the capture of Ar-Rakkah in 2013 this mode shifted from clandestine to open territorial seizure – moving to the highest point on the vertical scale. ISIS no longer sought to just deny governmental functions to the states (Syria and Iraq),

but through the seizure of territory and establishment of Shura Councils to create their own state. From a perspective of means although ISIS continued its clandestine methods, it also began attacking in the open with uniformed troops and marked vehicles more in alignment with Irregular Warfare than Unconventional. Because of this shift in approach and end goals, ISIS is now better located in the upper-right quadrant and deserving of a term representative of insurgencies that govern openly and no longer unconventional operations but embrace all aspects of irregular warfare. As ISIS set up courts of law, collected taxes, established government services, and enforced social norms the group clearly began operating as a "state-like" actor, and given its rise might be better termed "emerging-state" or "proto-state" actor. Indeed the qualities of an "emerging-state" actor well qualify the upper right portion of the previously established quadrant. Locating ISIS in this space along with illustratively placing other non-state actor groups, the graph now appears as in Figure 5.

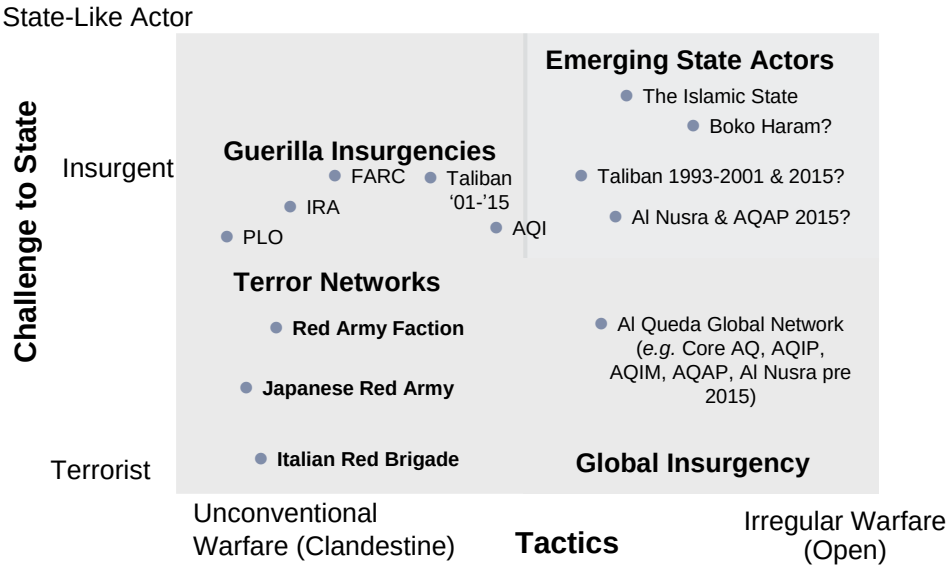

Figure 5: Illustrative Location of Non-State Actors in Segmentation

This structure now provides a shaping context for the discussion of "what is ISIS" and a point of alignment in the modeling effort: the amount of relevant population under some form of control by ISIS.

From Turnley, two forms of control over a population are identified: control through coercive power and control through government via legitimacy. Coercive power results from the exercise of "coercion and reward" and is "particularistic as it is support for a specific action or specific person, not for an institution or a system of government." Coercive power is more resource intensive as it "requires the investment… to induce compliance whenever necessary." [16] Legitimacy is a form of power that relies on the function of procedures that the governed considers fair established with credibility over time. Unlike coercive power used to ensure compliance, control by others is replaced by self-control, which socially is a much cheaper way to ensure social order."[17] Turnley illustrates the transitioning distribution of a population controlled through coercive power and governed through legitimacy with a diagram presented as Figure 6.

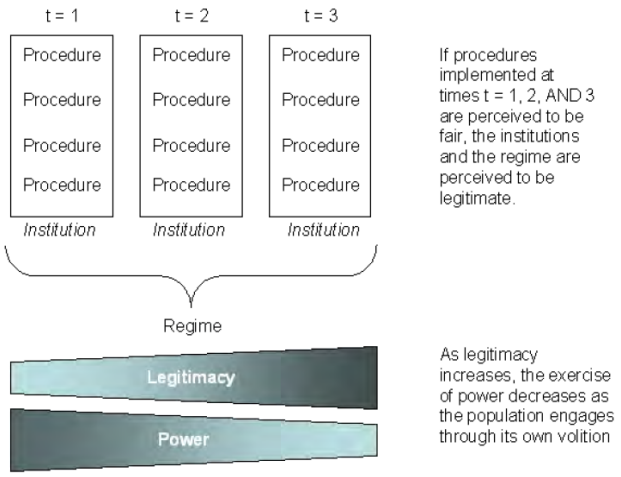

Figure 6: Power & Legitimacy

Institutions are created at times t1, t2 & t3, each deploying a series of procedures to execute their purpose. As each procedure by an institution is considered "fair," the amount of Power (coercive power) decreases as Legitimacy (governed through legitimacy) increases. Additionally, the succession of credible and fair institutions also decreases the amount of Power needed versus Legitimacy. This means

[16] Turnley et al., *COIN 2.0 Formulation*, 37-38.

Legitimacy is a function of the successful execution of each function as well as the length of time in which all previous functions have also been successfully executed. Likewise, the length of time it takes to transition a population from control through Coercive Power to Legitimacy determines the overall resources required to govern that population.

Modeling Boundaries & Approach

Prior to creating a simulation model, the proposed theory to be tested must be developed into a strong logical argument. In system dynamics these logical structures are made visual and explicit with causal loop diagrams (CLD) that distill into to a few key feedback loops of the hypothesis of what is generating the proposed behavior. From this CLD, the detailed simulation model of hundreds of equations can be constructed. However, since models can never truly represent reality, boundary selection must be made explicitly clear. For the proposed hypothesis that ISIS as an emerging-state actor reasonable boundaries can be selected through a "slicing approach" to complex systems as advocated by Saeed in 1992.[18] In complex systems modes of behavior can exist in time, geography (both a geography of 'terrain' and a geography of 'things'), and simultaneous modes. In this paper the complex system will be sliced as depicted in Table 1. Additional commentary on these selections is provided in the Appendix B.

Table 1: Proposed Slicing of Simulation Model

Axes	Slice Modeled	Slice Not Modeled
Mode	Exponential growth of Governed Population	Behavioral Limits to Growth
Time	Duration = 2013-2017 Unit = 6 months, dt = .0055 (or 1 day) (later changed to 2013-2020 during model boundary validation)	Pre-2013 and greater than 5 year feedback loops
Geography	Territory: Iraq & Syria Provinces & Cities Ethno-Social Populations: Kurds, Shia & Sunni Forces: ISIS vs. Everyone Else	Cross Regional Flows Tribal Structures Towns & Villages
Policy	Exogenous Policies	Latent Structure Policies

[17] Ibid., 38–40.
[18] Saeed, Khalid, "Slicing a Complex Problem for System Dynamics Modeling."

Responses		

Hypothesis Design through Causal Loop Analysis

Existing causal loop structure for insurgencies in the literature is limited as discussed previously. Because the models used by Aamir were already extant, he did not provide an integrated causal loop structure.[19] In their 'Farmers, Bandits, and Soldiers' model Saeed et. al. likewise did not depict a causal loop diagram.[20] Only in Anderson's paper was a causal loop diagram of his theoretical construct created, as depicted in Figure 7.[21]

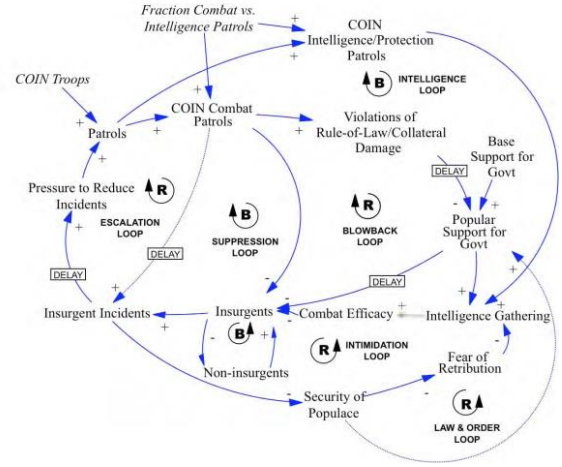

Figure 7: Anderson COIN CLD

Anderson's model is limited in its utility in examining ISIS and other emerging state actors using irregular warfare. This is because Anderson's model is built on the premise that insurgents are fighting a "classic" insurgency following O'Neill's definition that largely confines insurgents to operating in a guerrilla manner, e.g. "raids, ambushes, bombings, etc."[22] This is consistent with the Joint Forces definition of unconventional warfare of "operating through or with an underground, auxiliary, and

[19] Aamir, "Applying Existing System Dynamics Business Formulations to Model Terror Organizations," 8.
[20] Saeed, Pavlov, Oleg V., and Skorinko, Jeanine, "Farmers, Bandits and Soldiers: A Generic System for Addressing Peace Agendas."
[21] Anderson Jr., Edward J., "Modeling Insurgencies and Counterinsurgencies," 8.
[22] Ibid., 3.

guerrilla force in a denied area."[23] This does not comport with behavior that is state-like, or defined above as emerging-state behavior.

Causal loop diagrams can demonstrate the differences between a traditional insurgency and emerging-state actors. From these differences manifests the theory of emerging-state actor behavior and performance. These differences can then be tested in the simulation model for validation against the hypothesis that ISIS is an emerging state actor. A notional "classic" insurgency causal loop diagram is depicted in Figure 8.

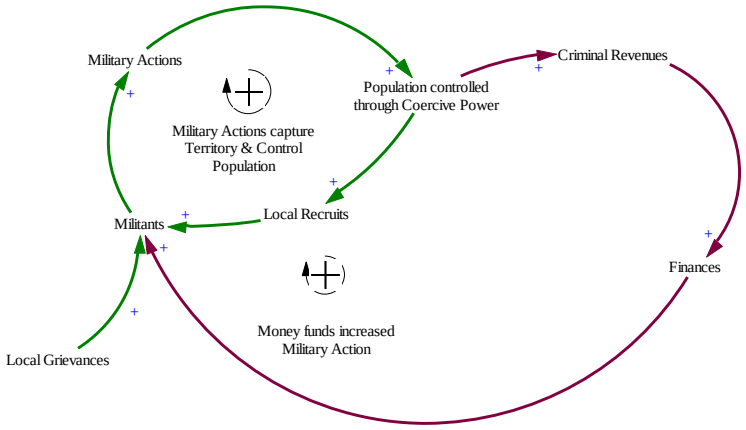

Figure 8: Notional CLD of a Classical Insurgency

The classical logic of an insurgent begins with local grievances leading to an increase in militants willing to conduct violence against the state. The causes of local grievances are irrelevant for purposes of this paper. What is key is that positive polarity indicates that as local grievances increase, so do militants, and if local grievances were to decrease, militants and their actions would also decrease. This is illustrative of the importance of resolving local grievances, often through political reform, as a sustained approach to ending an insurgency over time.[24] After that the non-state actor gains militants from local grievances, a feedback loop initiates, where they conduct military actions, which allow them

[23] "Joint Publication 1-02: Dictionary of Military and Associated Terms," 261.
[24] Kilcullen, David, *Counterinsurgency*, 6–7 location 173–199.

to control a population through coercive power (intimidation). The insurgency then seeks to gain local recruits from the population by exploiting the local grievances, which increases the number of militants and allows them to conduct more military actions. The non-state insurgent actor funds its operations from criminal activities conducted within the territory they influence. These could be criminal activities targeting populations that are not aligned with the insurgents such as ransoms, extortion, reselling of stolen property, looting, and selling of blood-antiquities (stolen historical artifacts). Criminal activities also include activities which are illegal globally but may be tolerated locally such as the illegal drug trade. Finally, criminal revenues include informal taxation schemas that bear more resemblance to extortion than a formal state levied tax. These funds increase non-state actor insurgents finances, allowing them to support and pay more Militants. The loops feedback – an increase in militants allow insurgencies to gain in strength and increase in staying power. Logically, a sustained reduction in local grievances through reconciliation, ability to gain finances, or reduction of militants through military action all hold the potential to reduce the feedback loops that powers the classic non-state actor insurgent, especially when applied in combination.

The first difference with the emerging state actor CLD is the input of non-local grievances that bring foreign recruits to an area. These militants may be aligned to the local grievances at first, but a reduction in local grievances will not result in a reduction of foreign intervention since those grievances are non-local. The second difference is that military actions in this model are designed not only to terrify or intimidate populations, but also to seize territory. This territory then enables an additional feedback loop of "territorial revenues" to be activated. Control of territory allows a non-state actor to control the resource extractions that occur in that territory. These territorial revenues require coordination of workers and leveraging infrastructure, and they are difficult to secure when an insurgency operates in a classical clandestine manner. In Afghanistan the Taliban took advantage of opium farming, while in

Nigeria Boko Haram helps fund itself through oil while in Columbia the Revolutionary Armed Forces of Columbia (FARC) exploited the production of cocaine. For ISIS, the territorial revenue is oil and to a lesser extent blood antiquities located in the territories they seize. These additional financial inputs produced from lucrative, fungible, globalized trade charge the feedback loop that runs through finances to obtain more militants, conduct more military actions and thus gain more territory.

Seizing territory opens another powerful feedback loop of enabling non-state actors to begin governing the population. This creates the processes by which coercive power shift to legitimate power. Populations controlled through legitimacy are less resource intensive to control, since the population "self-controls" and also allows taxation of normal commerce and individuals. The shift to Legitimacy also feeds back on itself. The more people governed through Legitimacy, the easier finances are collected through taxation, which fund local governance mechanisms. In ISIS's case, taxation funds their Shura Councils. These local governance mechanisms can provide the services that only a sovereign state actor can provide: law enforcement, judicial proceedings, building infrastructure, social services, and other government services that may have been lacking in the area.

When we add these aspect to our existing CLD structure, three loops emerge: seizure of territory, control of population through legitimacy, and foreign recruiting by playing on global grievances. The larger CLD is depicted in Figure 9.

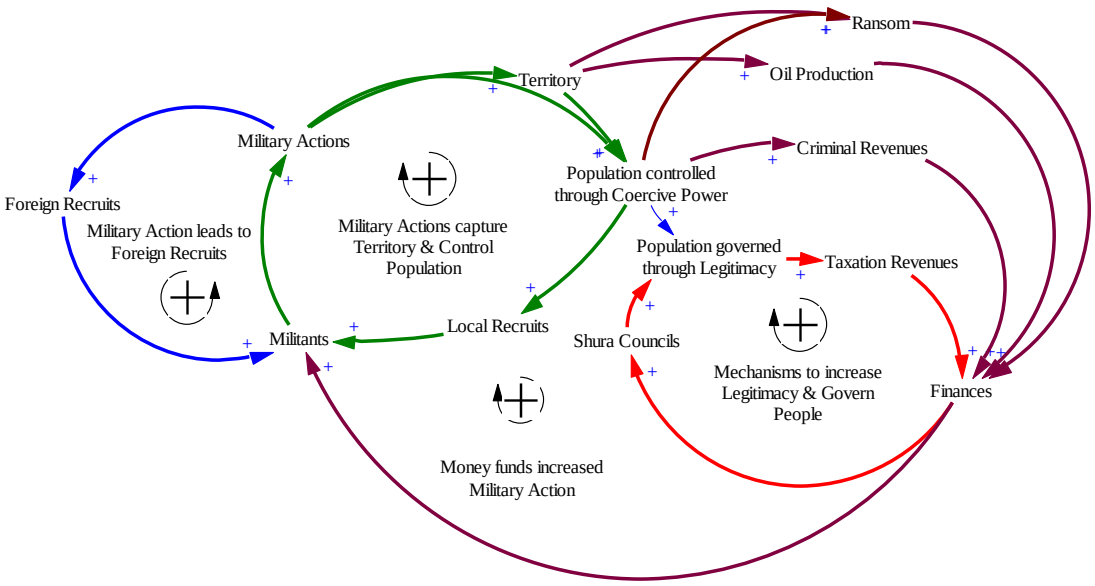

Figure 9: CLD of an Emerging State Actor

The emerging state actor theory to this point can be summarized as:

1. Local & non-local grievances bring militants and a non-state actor either emerges or is drawn into conflict.
2. The non-state actor uses militants and finances to conduct military actions to gain territory.
3. As the non-state gains controlled population begins extracting coercive revenues through criminal activities and recruiting locally from within the controlled population.
4. Within its territory, the non-state actor attempts to monopolize the use of force, taxation, control of movement, and regulation of the economy. By operating in a sovereign manner, the non-state actor shifts to an emerging state actor.
5. Coercive revenues & territorial revenues are used to finance governing mechanisms which can begin building legitimacy to shift the controlled population into a governed population.
6. As the emerging-state actor gains a governed population, it also gains taxation revenue and increases its draw of non-local foreign recruits by propagandizing its non-local grievances, which may or may not align to local grievances.
7. The loops complete into a positive feedback loop of exponential growth. More militants mean more military actions, which means more territory and access to controlled populations, which can begin to be governed, fueling finances, which fund more militants and military actions.

The shift from a classic non-state actor insurgency to an emerging-state actor insurgency, in this sequence, occurs at step 4 and completes in step 5. This can be described in another way. For a non-state actor to become an emerging-state actor it must at some point:

A. Control territory to the exclusion of all other state actors.
B. Seek to govern that territory in an open manner to build legitimacy.

In the case of ISIS's predecessor AQI, the group was able to reach step 3 and partially step 4. Even though AQI certainly influenced a population and extracted criminal revenues from them, AQI was never able to meet the two criteria above to complete the transition from 4 to 5. In this formulation, an emerging-state actor is self perpetuating, a foregone conclusion once militants enter the system. To complete the CLD in Figure 10, balancing loops are added representative of various limits to growth.

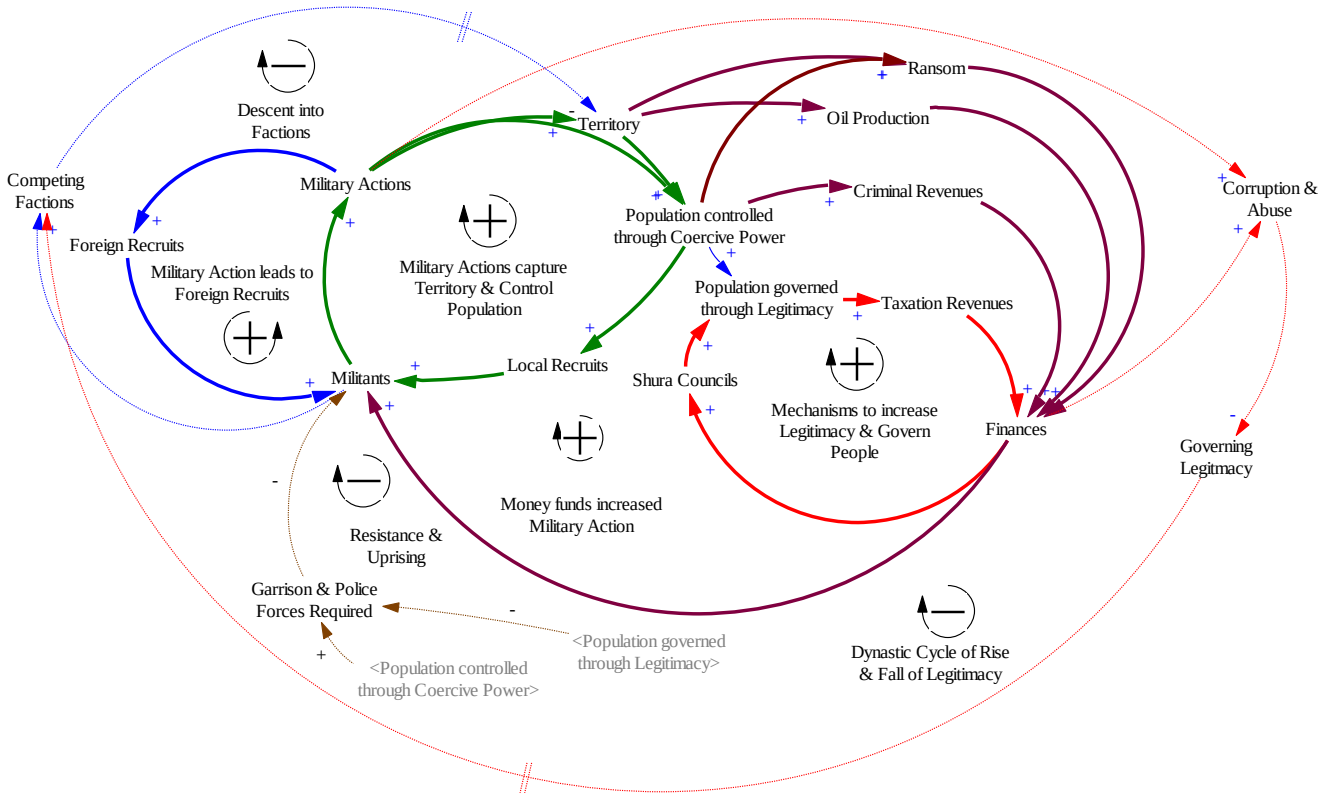

Figure 10: Emerging State Actor with Balancing Loops

These are endogenous limits—externalities imposing limits on the emerging-state actor, but even with absent external pressure, some form of these limits can emerge over time. The "Resistance & Uprising" loop activates as an emerging-state actor controls more population – requiring more forces to garrison than population in order to prevent uprisings against their rule. This reduces the number of militants available to gain more territory. Furthermore the force ratios (as discussed in Appendix B) for garrisoning a population controlled through coercive power are higher (ranging from 8:1 to as high as 55:1) than the ratios necessary to police a population (~2.8:1) governed through legitimacy. Another negative feedback loop in the emerging-state actor theory is "Descent into Factions." ISIS owes its existence to the activation of this loop within Al-Queda as a previous incarnation split from the global terrorist network in 2013. A third negative feedback loop, the "Dynastic Cycle" loop begins with the corruption and abuse of arbitrary power available to a state, similar to that described by Katouzian's theory of arbitrary state and society.[25] These abuses erode governing by legitimacy, feeding both the Uprising & Resistance loop and the Descent into Factions loop. However, Descent into Factions and the Dynastic Cycle loops have significant delay functions and therefore may develop well after an emerging-state actor has established itself. As modeled by Langarudi, the Katouzian dynastic cycle can take decades to manifest.[26] The Afghanistan Taliban, as an emerging-state actor, maintained its governing legitimacy despite widespread abuses until the post-9/11 U.S. invasion in 2001. For this reason in the attached simulation model, Dynastic Cycle and Descent into Faction feedback loops are not explicitly modeled as being outside the time horizon identified by the boundary assumptions. However, that coercive power is more resource intensive than legitimate power indicates that the Resistance & Uprising loop may have lower delay functions and is worth modeling.

[25] Langarudi and Radzicki, "A Simulation Model of Katouzian's Theory of Arbitrary State and Society," 7.
[26] Ibid., 10–16.

The emerging-state actor theory can help explain not only the rise of ISIS in 2013, but the collapse of AQI forces in 2006–2007. The inability of AQI to establish institutions and processes with which to govern legitimately meant it relied only on coercive and often abusive power. This activated the Resistance & Uprising negative feedback loop from local fighters beginning in the Anbar Awakening of 2006 that was followed soon thereafter with an U.S. troop surge. AQI as a classical insurgent could not sustain itself in that environment, perhaps a lesson learned by its members and carried forward into the new incarnation of ISIS.

Hypothesis that ISIS is an Emerging State Actor

Based on the previous theoretical development, I propose the following dynamic hypothesis*:* the Islamic State (ISIS) is an emerging-state actor, which uses methods of irregular warfare to capture territory in order to influence populations ("coercive power"), which it then attempts to govern in furtherance of its objective to become a functioning state ("legitimate power"). I recognize that although the term for this category might be new in this application, the behavior and model is not, as other actors, such as the Taliban in Afghanistan and Hezbollah in Lebanon have taken this route as indicated by the segmentation.

To test the hypothesis I created a simulation model of sufficient detailing (27 stocks) to test the propositions of the emerging-state actor theory and the hypothesis that ISIS is an emerging-state actor. The model is created in two sections: a strategic architecture of ISIS, and a world model within which ISIS operates. The strategic architecture identifies the resources and capabilities that determine performance at any point in time. This strategy-dynamics approach to modeling recognizes that these resources accumulate or deplete driven by flow-rates and the changes in the resource.[27] Sub-systems representing the constants, parameters, information flow, and leadership decisions, as well as the

[27] Warren, Kim, *Strategic Management Dynamics*.

influence of other resource levels, all combine to affect the rates of change. Reinforcing and balancing feedback interactions between these resources can be used to explain the dynamics of strategic performance. This aggregate strategic architecture is depicted in Figure 11.

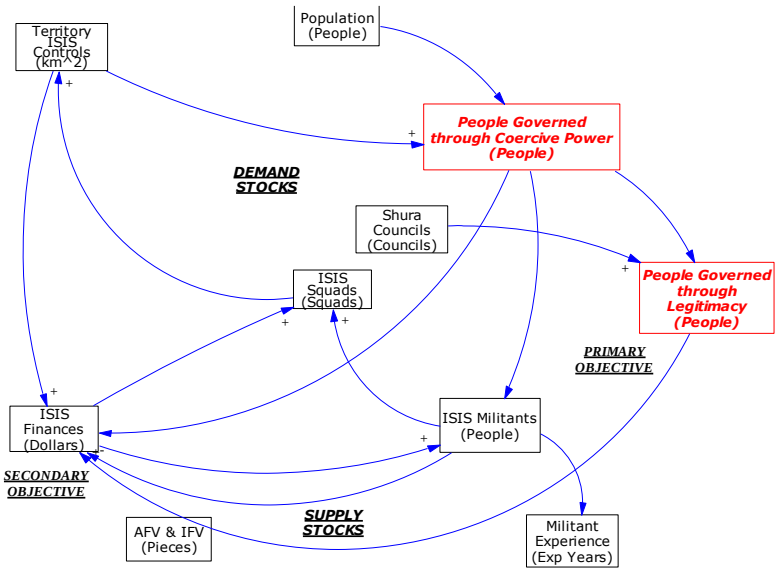

Figure 11: ISIS Strategic Architecture

The demand stocks in the strategic architecture represent first and foremost the "target population" that the state and emerging-state actor are competing over, and important attributes of said population. Likewise the mechanisms by which insurgents gain access to the "target population" which requires establishing some form of governance are the demands that ISIS is trying to meet. In order to achieve these demands, ISIS will use supply-stocks representing its capabilities and capacity.

The ISIS strategic architecture is then located in a world model, as shown in Figure 12. The world model defines the "environment" within which subsystems interact with local conditions (where recruits and resources are located relative to what is controlled), competitors (who will resist expansion and what means are used), and even internal dynamics (how effectively revenue and expenses are managed) interact with the subsystems.

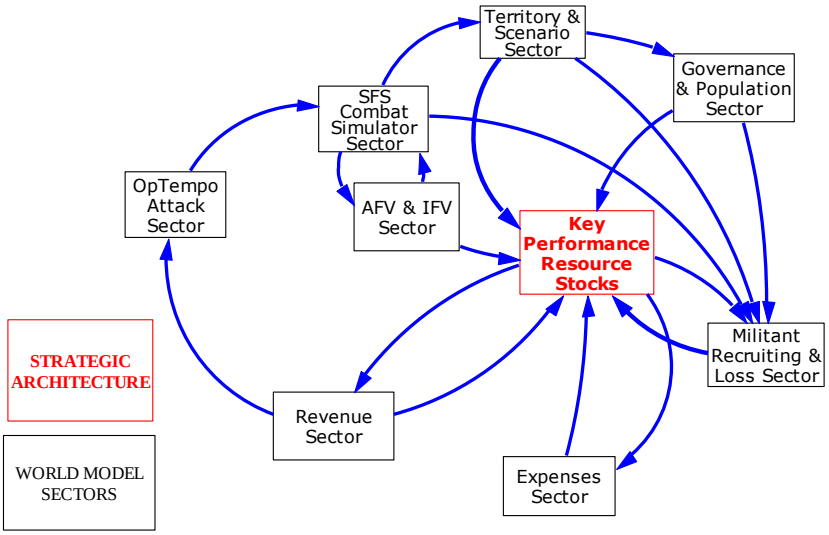

Figure 12: World Model

The simulation of a baseline scenario seeks to replicate the conditions in Syria and Iraq beginning in 2013 and the expansion of ISIS as an emerging state-actor. Notably the baseline scenario is absent the significant intervention of third parties through 2020. When simulated at baseline parameters, the model replicates closely—but not exactly—the exponential growth of ISIS. Geographic boundaries at this point are represented in the illustratively hand-rendered map below in Figure 13.

Figure 133: Illustrative Map of Extent of ISIS Gain in Baseline Simulation

Clearly this does not reflect reality. ISIS never took and held Kobani, and with the intervention of numerous state-actors not modeled in the baseline, ISIS has already lost territory by mid-2016. The

baseline simulation however successfully replicates the behavior mode on which the dynamic hypothesis is based as well as the early growth and resilience of ISIS. The quantitative dashboard of various performances is provided in Figure 14 and discussed in the narrative below generally following the emerging-state actor dynamic hypothesis.

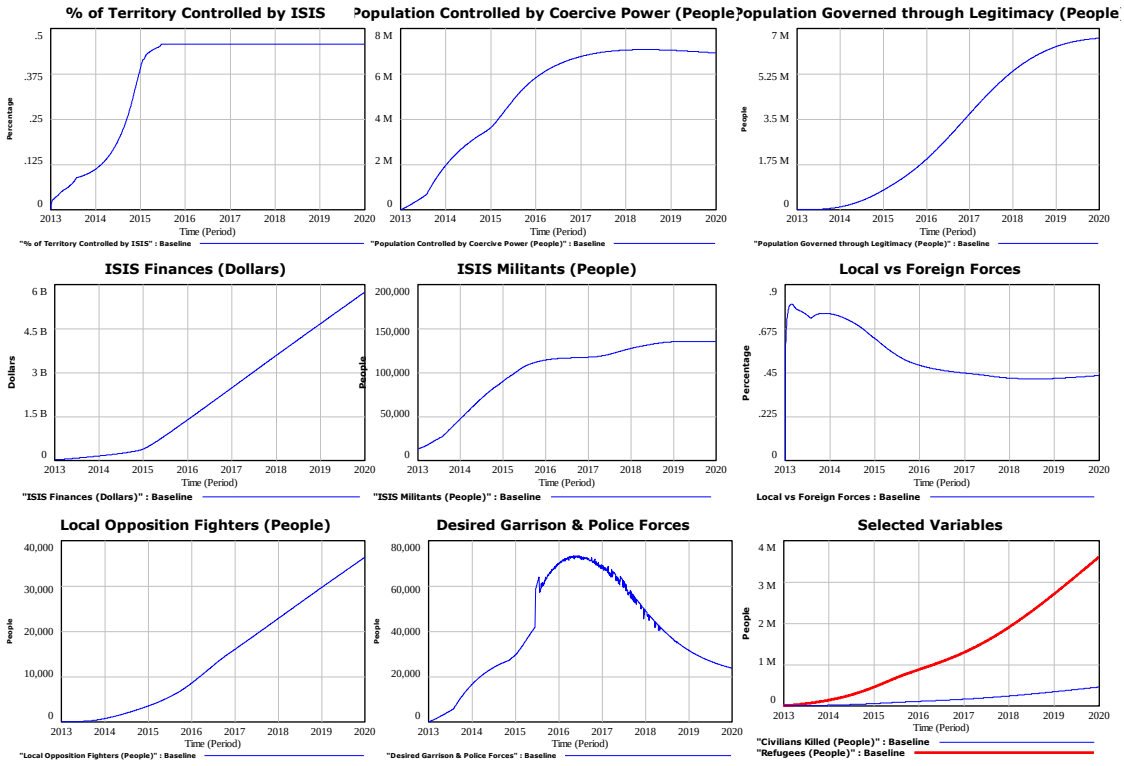

Figure 14: Baseline Dashboard of Performance

ISIS reaches an "outer envelope" of expansion at about ~46-47% of the territory. This limit is caused by three key factors. First the blue force opposition to ISIS becomes heaviest as they reach the strongly defended cities of Aleppo, Baghdad, Kirkuk etc. Second, the territories on which ISIS must fight to gain that next incremental amount of territory consists of densely packed urban areas that are not as favorable to its style of fighting. Third, the ethnographic makeup of the population in the territory being taken shifts away from ISIS's favor, reducing their ability to recruit local militants. What was once a 9:1 ratio of local to foreign militants drops to almost 1:1. This activates the Resistance & Uprising

limit to growth negative loop identified in the CLD. Even though by converting the populations they have controlled to being governed over time, reducing the rate at which opposition fighters accumulate, the aggregate external and internal threats means "just staying still" for ISIS isn't sufficient. The emerging-state actor must continue recruiting locally and from abroad to hold onto what they have. In essence ISIS has reached its limit to growth – at least for the remainder of the simulation duration.

Experimentation to Test the Hypothesis

Having formed a logical construct of the hypothesis and its simulated baseline, it is worth returning to the proposed dynamic hypothesis: the Islamic State (ISIS) is an emerging-state actor which is using methods of irregular warfare to capture territory in order to influence populations ("coercive power") which it then attempts to govern in furtherance of its objective to become a functioning state ("legitimate power"). This hypothesis can be tested against the simulation model. Six propositions emerge from the dynamic hypothesis. Propositions 1-5 are formulated as experiments where a simulation is run *ceteris paribus* with the only change being the stated formulation change to the subject proposition. Significantly worse experimental performance from baseline indicates potential validity of the proposition within the boundaries of the model, eg. *without this element ISIS would've performed much worse.* Proposition 6 is an experiment comparing a classical insurgency performance against the baseline of ISIS. Where appropriate a limited range of contingencies are tested to identify the boundaries of this validity, such as the value of the underlying resource or the time the transition to legitimacy may take The list of experiments and formulation changes is described in Table 2.

Initial testing indicated a boundary issue in simulation duration. The negative feedback loop of Resistance & Uprising did not seem to be creating any difference in scenarios 3a–3d, exactly where they would most logically occur. However, when model duration was extended from 2017 to 2020, these

behaviors began emerging and played a significant limiting role in further growth of ISIS. Continuing boundary tests of duration out to 2050 identified additional behavior of interest emerged in 2030–2040 (ISIS was able to "regroup" and continue expanding). However, I considered this too far on the horizon to be of much practical use and instead re-ran all simulations with a new experimental duration boundary of 2020.

Table 2: Proposition & Experiments

Propositions Tested as Experiments	Change Summary	Subsystem & Formulation
Experiment 1: ISIS must take and control territory.	Remove ability to gain territory as a result of combat.	Combat Simulator Changes: FLOT Movement Rate (FMR) = ((FMR Base1+FMR Base2)*"High Intensity FLOT Movement Rate (FMR) Multiplier")*Disable FLOT Disable FLOT = 1 (normal) OR 0 (Experiment 1)
Experiment 2a: The territory must have valuable resources. 2b: Black market price of oil is $22/bbl 2c: Black market price of oil drops to $11/bbl.	Sever link to oil production from captured territory or adjust price per bbl.	Territory Subsystem Changes: Available Oil Production = 5.013e+008*Disable Oil Disable Oil = 1 (normal) OR 0 (Experiment 2) 2b: Price per Barrel of Oil is reduced from $45/bbl to $22/bbl & 2c: Price per Barrel of Oil is reduced from $45/bbl to $11/bbl
Experiment 3: The transition from coercively controlled to legitimately governed population cannot be too slow.	Increase Normal Time to Transition by 200%, 300% and 400%.	Governance & Population Subsystem Changes: Normal Time to Transition to Governance = 1 (6months) is changed to: 3a = 2 (12months), 3b = 3(18 months) 3c = 4 (24 months) and 3d= 100 (disabled)
Experiment 4: Local grievances are required for local recruiting.	Disable local recruiting only.	Militant Recruiting & Losses Subsystem Changes: (Recruit able Population of Controlled Population*Local Recruiting Rate*"Effect of Remaining Recruits on Local Recruiting (Opposition & Militant)")*Disable Local Recruiting Disable Local Recruiting = 1 (Normal) or 0 (Proposition 4)
Experiment 5: Foreign recruits are required.	Disable foreign recruiting in the model.	(Actual Recruits per Suicide Attack*"Suicide Actions (Military Actions/Period)")*Foreign Recruiting Eliminated)*Bankruptcy Switch Foreign Recruiting Eliminated = 1 (Normal) or 0 (Proposition 5)
Experiment 6: A "classical" insurgency is modeled with no transition to governance or significant foreign recruiting.	Combine Experiments 3d & 5.	See above.

The results of these tests and final values against four measures compared to baseline are summarized in Table 3. The evidence for Experiment 1 & 2a indicates that an emerging-state actor must take territory upon which some valuable resource exists. However, the contingency tests of 2b & 2c indicate that the resource need not be all that valuable relative to the expenses of maintaining the

emerging-state actor. ISIS still performs just as well when black market oil sells for $22bbl and $11bbl respectively vs. $45bbl. The reason why is there is some path-dependency in emerging-state actor systems. Once ISIS has reached a tipping point of a sufficient Controlled Population that begins to shift to Governed by Legitimacy, the resource revenues become less important to local operations. By 2020, even with lower oil revenues, ISIS still achieves significant performance according to the model. It holds only slightly less cash reserves, though still measured in billions. Outside of model boundaries or experiments it can presumably funnel this surplus into global expansion.

Table 3: Proposition Test Results

Ending 2020 Values	*Territory % Controlled*	*"Population Controlled by Coercive Power (People)"*	*"Population Governed through Legitimacy (People)"*	*"ISIS Finances (Dollars)"*	*"ISIS Militants (People)"*
Baseline	46%	6,916,093	6,623,453	$ 5,738,208,768	135,069
Experiment 1: No Territory	0%	239,010	235,555	$ (42,046,628)	5,056
Experiment 2a: No Oil	0%	504,660	882,578	$ (11,257,459)	9,291
Experiment 2b: Oil is $22/bbl	46%	6,922,469	6,641,158	$ 2,745,061,888	133,984
Experiment 2c: Oil is $10/bbl	46%	6,876,500	6,567,161	$ 1,216,870,528	144,871
Experiment 3a: Gain in Legitimacy 2x Slower	46%	6,912,644	5,533,945	$ 5,557,155,328	140,954
Experiment 3b: Gain in Legitimacy 3x Slower	44%	6,508,733	4,587,748	$ 5,356,189,184	126,160
Experiment 3c: Gain in Legitimacy x4 Slower	28%	5,943,307	3,915,551	$ 5,164,296,704	54,517
Experiment 3d: Gain in Legitimacy x100 Slower	22%	5,714,829	233,571	$ 4,906,823,168	47,802
Experiment 4: Disable Local Recruiting	5%	1,407,003	1,464,055	$ 1,112,226,560	13,854
Experiment 5: Disable Foreign Recruiting	44%	6,601,304	6,415,755	$ 5,530,777,088	73,308
Experiment 6: Combine Experiment #3 & #5	23%	5,767,964	226,966	$ 4,890,185,216	33,360

Experiments 3a–3d confirms the time it takes to transition from coercive power to legitimate power is important, but there are contingencies. Transition periods between 6-18months (baseline, 3a & 3b) still allowed ISIS to grow rapidly. However, periods of 24 months (3c) and higher (3d) sharply

reduced performance. Experiments 4 & 5 confirm that both local recruiting and foreign recruiting are essential. Although it may not be surprising that local recruiting is essential, the significant difference foreign recruiting makes in comparing Proposition 5 performance to the Baseline is noteworthy.

The final experiment, simulating a "classical insurgency" (Proposition 6) and comparing it to emerging-state actor theory (baseline) is worth comparing in greater detail given the dynamic hypothesis as depicted in Figure 15.

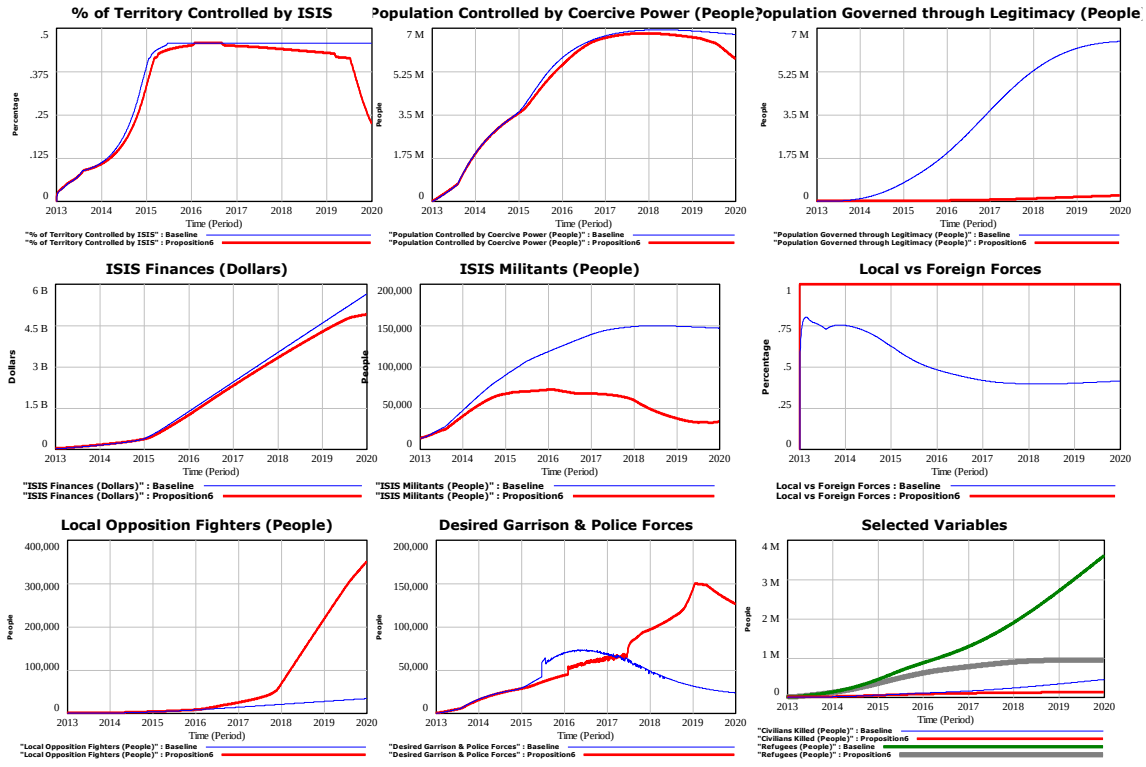

Figure 15: Dashboard Performance Baseline (Emerging-State Actor) vs. Proposition 6 (Classical Insurgency)

In both simulations ISIS expands to roughly the same territorial extent by mid-2016 where both simulated ISIS entities stall in expansion after having reached the outer envelope as depicted Figure 13. However, without being able to draw in foreign recruits or transition to a governing system, ISIS as a classical insurgency would struggle to garrison an ever-increasing restive population, despite being an "entirely local" force. Eventually, the insurgency ISIS could not garrison its holdings sufficiently to

retain them while also maintaining its external borders. Mass uprisings in late 2017 would lead to a complete collapse in 2019. It is possible that AQI suffered a scenario such as this in 2006 when it rapidly gained coercive control of a population of nearly one million civilians but was unable to sufficiently "garrison" its area of influence nor transition to an open system of governance due to the requirements to remain clandestine due to the presence of US forces. When local opposition conducted an uprising during the Anbar Awakening even as pressure remained high from "blue force" (coalition) AQI was unable to maintain cohesion and collapsed. The rapid decline of ISIS in the Proposition 6 model bears similarities to the AQI collapse in 2006 as shown in Figure 1.

Conclusion

In this paper I used the growth and staying power of ISIS to present the theory of an emerging-state actor. Confidence in the theory of an emerging-state actor and its key propositions was gained, though the theory remains unproven, through a limited initial simulation tests conducted in this paper. Calling upon global rather than local grievances the emerging-state actor draws foreign fighters and seizes territory upon which it exercises sovereign control and begins openly governing. The use of governing mechanisms shifts the population from being controlled by coercive power to being governed by legitimacy, freeing up garrison troops to continue expansion and territorial gain. My dynamic hypothesis that that the Islamic State is an emerging-state actor using the means of irregular warfare to usurp existing state-actors to gain control of target populations is shown to be plausible. This dynamic hypothesis is better able to explain ISIS's behavior pattern than traditional insurgency models. This paper also offers a detailed scenario-based simulation model for future use with ISIS, and as the basis of other insurgency and emerging-state actor models. Limitations related to modeling choices are covered at the conclusion of the Appendix B. Limitations to the theory exist that there may be other plausible

explanations for ISIS's performance localized to Syria and Iraq that are not transferable to other regions such as sectarian tensions. Additional limitations lie in model boundary selection. Adjusting the duration boundary from 2017 to 2020 revealed new behavior modes. Since all models are reflective of these modeling choices, simulations made outside the boundaries may point to different causes. Finally, there is no mental model of the behavior or ideation of the participants and this may overlook significant factors of agent motivation.

Future work could build upon initial policy analysis for determining intervention and containment policies against ISIS or emerging-state actors.[28] Modeling and simulation of this kind still faces significant methodological challenges of which this model only addresses a few.[29] Future work on emerging-state actor theory could involve significant boundary validation as well as confidence building in the model under a variety of circumstances. This could include additional testing of ISIS as well as other emerging-state actors in different time and regional spaces such as the Taliban in Afghanistan, East India Company in India, the Angles in England etc.

Bibliography

"2014 Iraq Military Strength." Accessed January 2, 2015. http://www.globalfirepower.com/country-military-strength-detail.asp?country_id=iraq.

"2014 Syria Military Strength." Accessed January 2, 2015. http://www.globalfirepower.com/country-military-strength-detail.asp?country_id=syria.

Aamir, Munaf. "Applying Existing System Dynamics Business Formulations to Model Terror Organizations." In *SAND 2014-2212 C*, 17. Cambridge, MA, 2014.

Anderson Jr., Edward J. "Modeling Insurgencies and Counterinsurgencies." *System Dynamics Review* 27, no. 2 (June 2011): 111–41.

Bacci, Alessandro. "Syria's Oil Sector in the Fall of 2014." *Alessandro Bacci's Middle East*, November 6, 2014. http://www.alessandrobacci.com/2014/11/syrias-oil-sector-in-fall-of-2014.html.

"Battle for Iraq and Syria in Maps." *BBC News*, December 26, 2014. http://www.bbc.com/news/world-middle-east-27838034.

Bennet, Bruce W., Bullock, Arthur M., Fox, Daniel B., Jones, Carl M., Schrader, John, Weissler, Robert, and Wilson, Barry A. "JICM 1.0 Summary." National Defense Research Institute: RAND, December 14, 1994.

[28] Clancy, "Containing ISIS : Analysis of Intervention Policies."

[29] Clancy, "Art of War: Modeling Combat Simulation with Endogenous Geospatial Feedback."

Clancy, Timothy. “Art of War: Modeling Combat Simulation with Endogenous Geospatial Feedback.” In *34th International Conference of the System Dynamics Society*, Pages TBD. Delft Netherlands: System Dynamics Society, 2016.

———. “Containing ISIS : Analysis of Intervention Policies.” In *34th International Conference of the System Dynamics Society*, Pages TBD. Delft Netherlands, 2016.

Cohen, David S. “‘Attacking ISIL’s Financial Foundation.’” Remarks, The Carnegie Endowment For International Peace, October 23, 2014. http://www.treasury.gov/press-center/press-releases/Pages/jl2672.aspx.

Department Of State. The Office of Website Management, Bureau of Public Affairs. “Country Reports on Terrorism,” April 27, 2005. http://www.state.gov/j/ct/rls/crt/.

“Joint Publication 1-02: Dictionary of Military and Associated Terms.” United States Department of Defense, n.d.

Kilcullen, David. *Counterinsurgency*. Oxford ; New York: Oxford University Press, 2010.

Langarudi, Saeed, and Michael Radzicki. “A Simulation Model of Katouzian’s Theory of Arbitrary State and Society.” *Forum for Social Economics*. Accessed March 22, 2016. http://www.tandfonline.com/doi/abs/10.1080/07360932.2015.1051076#aHR0cDovL3d3dy50YW5kZm9ubGluZS5jb20vZG9pL3BkZi8xMC4xMDgwLzA3MzYwOTMyLjIwMTUuMTA1MTA3NkBAQDA=.

Olson, Admiral Eric T., General J. N. Mattis, and General Michael G. Mullen. “IRREGULAR WARFARE: COUNTERING IRREGULAR THREATS JOINT OPERATING CONCEPT.” Department of Defense, May 17, 2010.

Roggio, Bill. “Islamic State Touts Training Camp in Northern Iraq.” *Long War Journal*, n.d. http://www.longwarjournal.org/archives/2014/07/islamic_state_touts.php.

Saeed, Khalid. “Economic Growth and Political Instability in the Developing Countries: A System View.” In *Sessions Papers*, 455–68. Chestnut Hill, MA, 1983.

Saeed, Khalid. “Slicing a Complex Problem for System Dynamics Modeling.” *System Dynamics Review* 8, no. 3 (Fall 1992): 251–61.

Saeed, Khalid, Pavlov, Oleg V., and Smith Alexander Skorinko, Jeanine. “Farmers, Bandits and Soldiers: A Generic System for Addressing Peace Agendas.” *System Dynamics Review* 29, no. 4 (December 2013): 237–52.

Sanger, David E., and Julie Hirschfeld Davis. “Struggling to Starve ISIS of Oil Revenue, U.S. Seeks Assistance From Turkey.” *NY Times*, September 13, 2014. , http://www.nytimes.com/2014/09/14/world/middleeast/struggling-to-starve-isis-of-oil-revenue-us-seeks-assistance-from-turkey.html.

Turnley, Jessica G. “Where Is the Method in the Madness? Questions for Systems Dynamics Modeling Teams.” presented at the System Dynamics Winter Camp, Alberquerqe, NM, January 9, 2015.

Turnley, Jessica G., Zoe A. Henscheid, Matthew T. K. Koehler, Sarah K. Mulutzie, and Brian F. Tivnan. “COIN 2.0 Formulation.” Bedford, MA: MITRE Corporation, December 2010.

“U.S. Military, Partner Nations Conduct Airstrikes Against ISIL in Syria.” *US Central Command (CENTCOM)*, September 24, 2014. http://www.centcom.mil/en/news/articles/u.s.-military-partner-nations-conduct-airstrikes-against-isil-in-syria.

Warren, Kim. *Strategic Management Dynamics*. 1st ed. Wiley, 2008.

Zanella, James. “Combat Power Analysis Is Combat Power Density.” Monograph. Fort Leavenworth, Kansas: School of Advanced Military Studies United States Army Command and General Staff College, January 2012.