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VISUALIZING IRREGULAR ADVERSARIES: APPLIED CONCEPT MAPPING IN THE MILITARY AND SECURITY DOMAIN

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Abstract. The Socio-Cognitive Systems (SCS) Section at Defence Research and Development Canada—Toronto (DRDC Toronto) has undertaken a Technology Investment Fund (TIF) Project entitled "A Conceptual Framework for Understanding Armed Non-state Actors (ANSAs): Strategic Roles and Operational Dynamics." The aim of this Project is to advance our understanding of (a) the *strategic roles* of ANSAs in the context of violent intergroup conflict, and (b) the *operational dynamics* of ANSAs that facilitate the performance of these roles. To assist us in this endeavour, we have constructed a Concept Map (Cmap) of an Irregular Adversary (Insurgent) [IA(I)], derived from Canadian Army doctrine on land and counterinsurgency (COIN) operations. This "first-cut" IA(I) Cmap will serve as the point of departure for the development of an ANSA Cmap that will provide a means to guide and manage our efforts to explore the intentions and behaviours of ANSAs the Army is liable to encounter in future expeditionary operations.

1 Introduction

We begin with a truism: Insurgencies are not static phenomena; they evolve as insurgents—and counterinsurgents, for that matter—adapt to changing conditions and circumstances within a complex operating environment. Likewise, our thinking about insurgencies and insurgents must evolve and progress. We cannot allow the critical concepts upon which we base our approach to counterinsurgency (COIN) operations to stagnate.

That is the motivation underlying DRDC Toronto's Technology Investment Fund (TIF) Project "A Conceptual Framework for Understanding Armed Non-state Actors (ANSAs): Strategic Roles and Operational Dynamics." The overall aim of the Project is to broaden and deepen our understanding of the *strategic roles* of ANSAs in the context of violent intergroup conflict within fragile or failing states, and, secondly, to understand the *operational dynamics* of ANSAs—that is, the organizational structures and processes in both their internal and external dimensions—that facilitate the performance of these roles, this in light of recent theoretical and empirical advances made in the social sciences and the practical experience gained on the battlefield in the past ten years of irregular warfare in Afghanistan, Iraq, and elsewhere. Broadly speaking, we seek to shed some light upon what ANSAs do and why they do it, situating their motivations, intent, and behaviours in the wider context of chronic intergroup conflict.

We do not start from "square one" in this investigation, however. The Canadian Army already has a detailed conception of an Irregular Adversary (Insurgent) [IA(I)] as set out in two doctrinal publications, *Land Operations* and *Counter-Insurgency Operations*, both produced by the Directorate of Army Doctrine and published in 2008 on the authority of the Chief of the Land Staff. We have sought to capture the Army's perspective in terms of a Concept Map (Cmap), a visual model for organizing and representing knowledge, consisting of a semi-hierarchical arrangement of concepts and propositions. This "first-cut" IA(I) Cmap will serve as the point of departure for the subsequent development of a more general ANSA Cmap that will provide a means to guide and manage our efforts to explore the intentions and behaviours of non-state adversaries the Army is liable to encounter in future expeditionary operations.

2 Applied Cmapping in the Military and Security Domain

From its deep roots in education, the application of Cmapping to problem solving in both industry and government has grown dramatically over the past twenty years. A recent survey of its many and varied applications (Moon, Hoffman, Novak, & Cañas, 2011) set out a sampling of the range of work sectors, domains, and applications in which practitioners have effectively adopted and used this method. A number of authors (e.g., Cañas et al., 2003; Hoffman, 2008; Moon, Hoffman, Eskridge, & Coffey, 2011) have surveyed the applications of Cmapping in the U.S. defence and security realm, and have found a range of uses. In contrast, the application of Cmapping is still in its infancy in the Canadian Army and the wider Canadian defence and security community. One of the pioneering efforts to correct this deficiency is that of Derbentseva and Mandel (2011), two colleagues in the Socio-Cognitive Systems Section at DRDC Toronto. They launched a multi-year research project in 2008, one of the goals of which was to introduce Cmapping to the defence and security community in Canada and to examine its applications. To this end, they engaged in two main activities: they

developed a Cmap knowledge model of intelligence analysis as a comprehensive resource on the topic; and they hosted a workshop for Canadian intelligence professionals in February 2010 to introduce them to Cmapping and to the intelligence analysis knowledge model they had developed, as well as to elicit feedback from them on the model and Cmapping more generally (Derbentseva & Mandel, 2011, pp. 111–112).

3 Constructing the Irregular Adversary (Insurgent) Cmap

Our own efforts in this regard have been directed toward using Cmapping to advance our understanding of Armed Non-state Actors (ANSAs). Specifically, we constructed a Cmap to answer the focus question: What is the Canadian Army's concept of an Irregular Adversary (Insurgent)? As mentioned above, the Army has set out its conception in two doctrinal publications: *Counter-Insurgency Operations* (DAD, 2008a) and *Land Operations* (DAD, 2008b). In the latter, there is a combined total of 16 pages, found in one section and one annex, focusing on irregular adversaries in general. In the former, there are some 36 pages, spread across three chapters, describing the characteristics and activities of insurgents in particular. In addition, numerous references to irregular adversaries and insurgents are found scattered throughout the body texts of these field manuals. The challenge we faced was to draw together these disparate strands and create a consolidated picture of an IA(I) to serve as the starting point for our ANSA investigation. How could we distill these extensive writings down to the essentials of an IA(I), and then effectively communicate these essentials to others?

We turned to Cmapping to help us in this endeavour. The elaboration of the propositions in the IA(I) Cmap was a relatively straightforward though labour-intensive process entailing many tens of hours of doctrinal interpretation; transformation into the Cmap structure, however, proved the most challenging task, necessitating multiple iterations before arriving at the version presented below (see Figure 2). In detail, the process involved a careful reading of the *Land Ops* and *COIN Ops* field manuals to identify statements regarding the nature, characteristics, activities, etc., of irregular adversaries in general and insurgents in particular. These scattered statements were clustered by concept and then synthesized to form the *concept → linking phrase → concept* triples or propositions that make up the skeletal structure of the IA(I) Cmap.

To illustrate, we will briefly describe the construction of the Ideational Core Block, one of the four constituent blocks or interconnected spatial regions of the overarching IA(I) Cmap. First, we derived the key concepts and linking phrases for this block through a plain-meaning reading of relevant sections in the field manuals, such as the excerpts from *COIN Ops* presented in Box 1; the highlighted elements identify the concepts and relational links that were instrumental in elaborating the propositions in the bullet list below [the excerpted section(s) germane to each proposition are listed in square brackets]. From these and other relevant sections in the field manuals, we distinguished 10 key propositions that seem to capture the ideational dimension of an IA(I)—the notion that "ideas matter" when trying to understand the intentions and behaviours of irregular adversaries:

- A core idea is central to a narrative. [§118]
- A core idea articulates a motivating central cause. [§211]
- A core idea is formalized into a guiding ideology. [§118]
- A core idea articulates a desired end state. [§305]
- A narrative articulates a motivating central cause. [§211]
- A narrative creates strategic effects. [§215.3]
- A narrative articulates a desired end state. [§307]
- A narrative motivates, empowers, justifies, & legitimates primary actors. [§§102, 215.1]
- A narrative motivates, empowers, justifies, & legitimates ancillary actors. [§§102, 215.1]
- A guiding ideology envisions a desired end state. [§109]

These propositions were then spatially arranged in the Ideational Core region of the IA(I) Cmap (see Figure 1), and the critical cross-links within the block and with other regions or blocks of the Cmap were drawn (a key step in Cmap construction that gives Cmapping its particular knowledge-generating power).

We must admit that the resulting Cmap is not "scientific" in the sense that another Cmapper independently following this construction method could *precisely replicate* the IA(I) Cmap presented here. Undoubtedly, there would be a large measure of overlap. We are confident that our interpretation of the Army's doctrinal writings is not completely "off base," and that other defence analysts by and large would identify the same concepts and

102. INSURGENCY
7. At the basis of an insurgency will be a narrative, a story. Central to this narrative is the idea that motivates the insurgents and is formalized into an ideology. It empowers the insurgents and lends them legitimacy and provides justification for their ends and means. (p. 1-12)

109. DEVELOPMENT OF AN INSURGENCY
4. Each insurgency will have its own set of causes, aims and desired end-state. Some insurgencies will stem from a political, social and/or religious ideology that envisions an improved (even utopian) state of affairs. (p. 1-12)

118. IDEOLOGY
1. At the basis of an insurgency is a narrative that contains an idea and founding cause for the insurgency. This core idea becomes formalized as an ideology. (p. 1-19)

211. MOTIVATING CENTRAL CAUSE
1. In most insurgencies there will be legitimate grievances that may result in a central, motivating cause to the insurgency…The cause is articulated in the motivating idea and resulting narrative…(p. 2-8)

215. NARRATIVE
1. At the basis of an insurgency is a narrative that contains an idea and founding cause for the insurgency. It motivates the primary and ancillary actors and allows the idea to be formalized as an ideology.

3. …Narratives (or stories) influence the ability to recall and understand history, motivate people to act, temper emotional reactions to events, cue certain heuristics and biases, structure problem-solving capabilities and ultimately perhaps even constitute individual identity. (p. 2-10)

305. UNDERSTAND THE COMPLEX DYNAMICS OF THE INSURGENCY, INCLUDING THE WIDER ENVIRONMENT
3. The dynamics of an insurgency may include:
…b. central idea (the narrative) of the insurgency—this may be an ideology or religious ideal that also identifies a strategic end-state…(p. 3-7)

307. SEPARATE THE INSURGENTS FROM THEIR PHYSICAL AND MORAL SOURCES OF STRENGTH
b. **Moral Separation**. …This narrative will highlight real or perceived grievances and provide a vision and strategic end-state as an alternative to the existing government or society. (p. 3-9)

Box 1. Excerpts from *Counter-Insurgency Operations* (DAD, 2008a).

links between concepts that we have. However, the semantic expression of these essential elements—the concept labels and connecting phrases used to express the propositions—are likely to differ to some degree. In their research involving the development of the human-centered computing prototype STORM- LK (System to Organize Representations in Meteorology—Local Knowledge), Hoffman, Coffey, and Ford (2000) found that external expert evaluation produced changes to approximately 10 percent (on average) of the propositions in the Cmaps (p. 733). Crandall, Klein, and Hoffman (2006) attribute this finding, not so much to differences between experts over the substance of a Cmap's concepts and propositions (though they acknowledge that such disagreements cannot be completely ruled out—more on this below), but, rather, to differences in wordsmithing, "a reflection of their [i.e., the experts'] differing emphases, their judgments of what is important, and the subtleties of word choice (e.g., "promotes" versus "causes")" (p. 63). Indeed, word choice is possibly the most difficult task in constructing a Cmap (Cañas, 2009). As Novak and Gowin (1984) remark, "Often there are two or three equally valid ways to link two concepts, but each will have a slightly different connotation…each proposition thus generated has a similar but not identical meaning" (p. 35). Yet, the choice of linking words and phrases—as well as concept labels—in itself is revealing in so far as it manifests the cognitive framework of the individual Cmapper. The resultant Cmap brings to light "the nuances of meaning a [Cmapper] holds for the concepts embedded in his or her map. When concept maps are conscientiously constructed, they are remarkably revealing of [the Cmapper's] cognitive organization" (Ibid.).

On the other hand, we should not discount the strong possibility that the differences likely to emerge between competing IA(I) Cmaps reflect more than word choice, but may stem from differences in the *fundamental understanding* of the concepts that make up the Cmaps. Harter and Moon (2011) discuss this

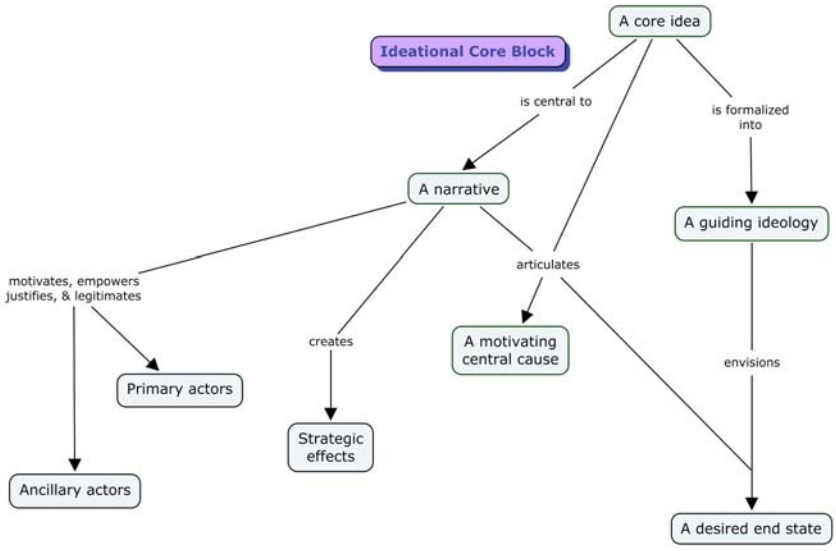

Figure 2. Ideational Core Block.

problem for the security analysis and risk management profession in which key concepts such as "risk," "threat," and "vulnerability" lack standardized meanings and interpretations. They describe a methodology using Cmapping to integrate various definitions of (ostensibly) identical concepts—in their case study, the term "asset"—to create common models and definitions of those constructs. What is relevant from their discussion for our purposes is to note that the unlikelihood that another Cmapper will replicate exactly our IA(I) Cmap may not be just a matter of wordsmithing, but also may be attributable to unspoken differences in understanding of the concepts making up the Cmaps.

Secondly, the spatial organization or arrangement of the propositions reflects our personal visual aesthetics. The importance of visual aesthetics in computer-assisted Cmapping (using CmapTools) and in human-computer interaction more generally has been increasingly recognized. Users' needs go beyond usability and utility to encompass a broader personal experience including emotions and visual aesthetics (Moshagen & Thielsch, 2010, p. 691). Visual aesthetics is a multidimensional construct. Lavie and Tractinsky (2004) distinguish two dimensions to this construct: (a) *classic aesthetics*, referring to orderliness in design, and (b) *expressive aesthetics*, reflecting perceptions of the designers' creativity and originality (cited in Moshagen & Thielsch, 2010, p. 693). Building on this research, Moshagen and Thielsch (2010) identify twelve broad content domains describing the visual aesthetics of websites (p. 692, Table 1). Through their experimental research, they distill these content domains down to four (Ibid., p. 704):

- *Simplicity*, comprising aspects of unity, homogeneity, clarity, orderliness, and balance;
- *Diversity*, comprising visual complexity (also visual richness), dynamics, novelty, and creativity;
- *Colourfulness*, involving the selection, placement, and combination of colours; and
- *Craftsmanship*, defined as "the skillful and coherent integration of all relevant design dimensions" (Ibid., p. 704).

The point here is that our structuring of the IA(I) Cmap is very much a reflection of our choices in these four (and possibly other) content domains—the mix of simplicity, diversity, colourfulness, and craftsmanship that we personally find visually appealing. This will clearly differ among Cmappers depending upon their own aesthetic tastes, though the broader Cmapping community's "best practices" will undoubtedly have an influence as well. In summary, for these semantic and aesthetic reasons, Cmap construction is inevitably idiosyncratic. No two Cmappers will ever independently create precisely the same Cmap, even when using the same reference material. In that sense, Cmap construction is as much if not more an art than a science. Indeed, it may not be too much of an exaggeration to describe a Cmap as a "work of art."

By the same token, we must take care not to overstate the "artistry" of Cmapping. The use of colour, for example, is not solely a matter of aesthetics; it is not simply a way to make a Cmap look "pretty." Colour can convey important information. In the IA(I) Cmap (see Figure 2), there are eight concept nodes corresponding to different agents or actors found in the operating environment. The area or *fill* within each of these nodes is

assigned a colour indicating the *affiliation* of that agent—that is, the actor's position or stance relative to the campaign objective—as per the colour conventions in NATO military symbology. Specifically, the colour blue denotes friendly forces (in the Cmap, the two nodes *A supporting nation [SN]* and *A domestic populace*); red denotes hostile forces (*An Irregular Adversary (Insurgent) [IA(I)]*); green denotes indigenous or host-nation authorities and forces (*An established authority [EA]*); white denotes non-combatants or a local population (*A local populace*); and yellow denotes unknown affiliation (*Other elements & entities*, *An external populace*, and *An external state*). The use of this simple colour technique, while undeniably enhancing the visual appeal of the Cmap, greatly adds to its inherent power to transmit knowledge.

The fruit of our labours—the IA(I) Cmap—is presented in Figure 2. As can be seen from the Cmap, the Army's conception of an IA(I) is quite extensive. Indeed, according to our analysis of the relevant sections in the field manuals, there are some 79 major propositions and 78 subordinate propositions that define an IA(I). These are grouped into four major blocks that allow one to focus more easily on smaller spatial regions of the Cmap; these blocks—(a) Organizational and Contextual Block, (b) Strategic Decision Making Block, (c) Ideational Core Block, and (d) Social Competition Block—are saved as separate Cmaps in the Project's IA(I) Cmap folder. In addition, the IA(I) Cmap incorporates 10 nested nodes, identified by heavy-black, dashed borderlines around the nodes. [A *nested node* is an inclusive "parent" concept that encloses, or *nests*, selected "child" Cmap items (i.e., concepts and linking phrases) (IHMC, no date)]. Clicking on a nested node icon expands the node to reveal a series of subordinate propositions related to the parent concept. This facilitates "drilling down" into the concepts, that is, temporarily displaying additional propositions describing complex, multidimensional concepts. Conversely, the facility to collapse a nested node and hide this additional information avoids the problem of congested "spaghetti diagrams" whose visual clutter confuses more than clarifies [for a particularly egregious example of this, see the PowerPoint slide "Afghanistan Stability/COIN Dynamics" in Mail Foreign Service (2010)]. [Unfortunately, given space restrictions, we cannot list here the 157 major and subordinate propositions of the IA(I) Cmap, nor reproduce the four block Cmaps with their expanded nested nodes. All these may be found, however, in a forthcoming DRDC Toronto Technical Memorandum (Moore, 2012).]

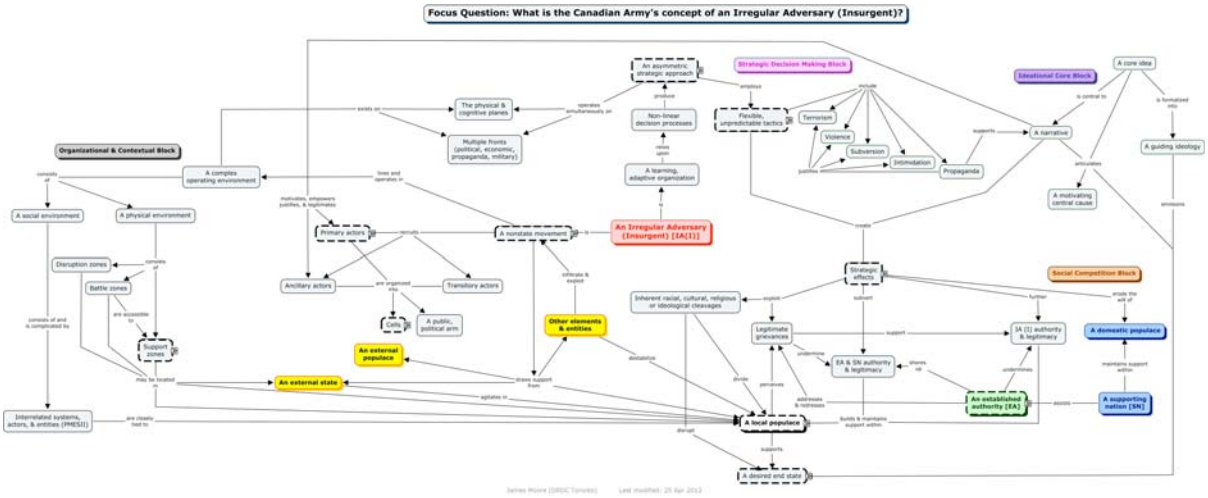

Figure 3. The Irregular Adversary (Insurgent) Concept Map.

4 Reflections on the End Product: The ANSA Cmap

The IA(I) Cmap is not the endpoint but, rather, the jumping-off point for constructing the end product of this Project, the ANSA Cmap, that will provide a means to guide and manage our efforts to explore the intentions and behaviours of ANSAs the Army is liable to encounter in future expeditionary operations. Specifically, the end-product ANSA Cmap will serve as a *cognitive model*—or "primer" on one class of irregular adversary—facilitating the development of a broad knowledge base of the contemporary operating environment in support of future Army COIN and peace support campaigns in failed or failing states. An effects-based approach to operations is predicated on a sound understanding of each actor within the battlespace, "the role they play in the environment, their aims in relation to the campaign and overall success, and the influence they have on other systems within the environment" (DAD, 2008b, p. 5-41). Key to this understanding is the development during force preparation and pre-deployment of a *broad knowledge base* of the operating environment. Drawing upon all available resources, the knowledge base provides the commander with an appreciation of the human

environment in which the Army will be operating, such that he/she will know "what, who, and how to engage within the campaign to move towards the desired objectives and end state" (Ibid.).

The ANSA Cmap can play a significant role in the development of this knowledge base. Encompassing the strategic and operational as well as the structural and ideational dimensions of these actors, it will help the military intelligence operator give the commander a more holistic understanding of ANSAs in the context of their environment and their interactions with that environment. But, to be useful, the Cmap must be adapted to the particulars of each individual group and its operating environment. There is no "one size fits all" model of an irregular adversary, all elements of which are equally relevant to all such groups in every conceivable circumstance. The ANSA Cmap will be, in the first instance, a generic conceptual architecture, setting out the range of key concepts and propositions that have been identified as relevant to the description and analysis of these irregular adversaries, without prejudging or predetermining the relative importance or weight that can or should be assigned to each. This, though, is just the point of departure. In its practical application, the elements of the Cmap will necessarily be tailored to the unique circumstances of the particular ANSA under scrutiny. Graphically, the different weights assigned to the relationships in the Cmap can be accented using a variety of visual modalities either alone or in combination (e.g., colour and/or line weight). (The idea to use colour and line-weight modalities came out of informal discussions of the IA(I) Cmap with Canadian intelligence operators.)

To illustrate, consider, for example, the adaptation of our "first-cut" IA(I) Cmap to the specifics of two ANSAs, the Somali jihadist group al-Shabaab and the Afghan Taliban. In the Organizational & Contextual Block of the IA(I), we have two major propositions: (a) "Support zones [that is, sanctuaries, safe havens, rear bases, etc.] may be located in an external state," and (b) "Support zones may be located in a local populace." These two propositions apply in different measure to the two groups. Safe havens located in the frontier regions and provinces of Pakistan are critical to the Taliban's ongoing insurgency in Afghanistan. Sanctuaries in neighbouring countries are far less important to al-Shabaab, which controls large swaths of south-central Somalia and from which it mounts its military operations against the Transitional Federal Government (though its control is under serious challenge from recent Kenyan and Ethiopian military offensives into insurgent-held territory). The differential weight accorded these two propositions for each ANSA can be represented in their respective Cmaps using a heavy-weight, red-coloured line, as in Figures 3 and 4 below. Using these simple line-weight and colour modalities, the generic IA(I) Cmap can be tailored to the specifics of the particular ANSA. As this example demonstrates, in practice, the generic ANSA Cmap that we ultimately construct will be—and, indeed, must be—made case-specific and context-dependent.

Second, the ANSA Cmap will serve as a *knowledge model*, a repository for the information accumulated during the development of the knowledge base. A Cmap is a powerful knowledge structuring and building tool, serving as a "template or scaffold" to organize and manage the overwhelming mass of all-source information on irregular adversaries that comes across the intelligence operator's desk, and making possible the creation of powerful knowledge frameworks that permit knowledge retention and the use of this knowledge in new contexts (Novak & Cañas, 2008, p. 7). The ANSA Cmap will be used to generate and organize information concerning specific real-world adversaries in line with the concepts and propositions of the Cmap. More specifically, it will support the efforts of the intelligence staffs within the Army to provide the National Command Authority and mission commanders with the strategic and combat intelligence required to flesh out as complete a picture of the adversary as possible. As the ANSA Cmap will combine the strategic and operational levels of warfare within a common representational frame, it will also help to overcome the "stove-piping" and compartmentalization that often obscures the emergent linkages and connections between the strategic, the operational, and the tactical levels of activity.

5 Conclusion

Where do we go from here? On the basis of a series of studies and reports produced in earlier phases of the Project, we will refine the concepts and propositions of the IA(I) Cmap—revising (i.e., clarifying or rewording) retained propositions, removing unfounded propositions, and adding strongly grounded ones—such that we can have increased confidence from both a theoretical and empirical perspective in the overall fitness for purpose of the resulting ANSA Cmap. Having refined its skeletal structure, the task will then be to populate the ANSA Cmap, that is, to provide its propositions with substantive content. The intent here will be to create a "back-end wiki" for the Cmap. That is, a wiki page—varying in length from a short paragraph to a 2–3 page summary article, depending on the complexity of the subject matter—will be written for each proposition, providing an overview of the substance of that proposition based on the extant scientific literature. The combined Cmap/wiki

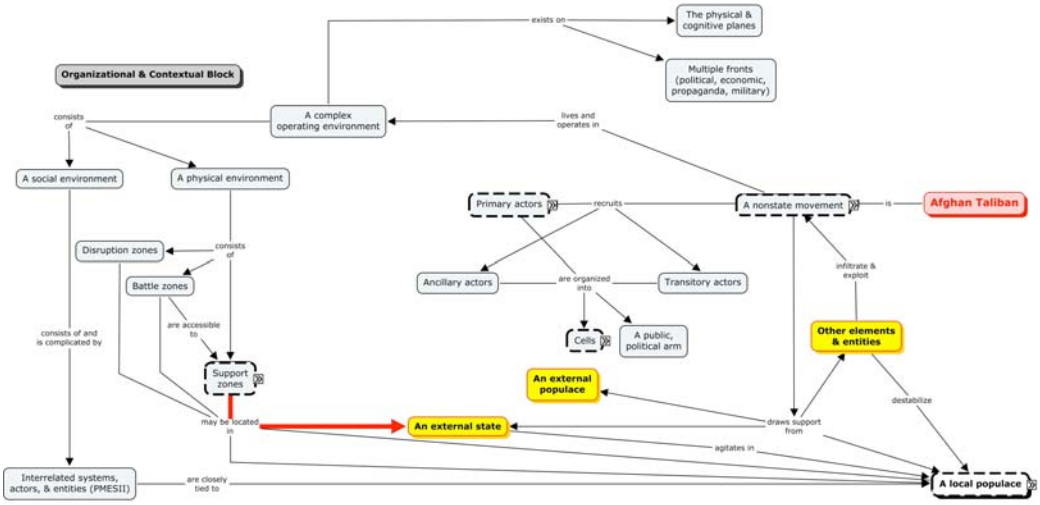

Figure 4. Afghan Taliban Concept Map.

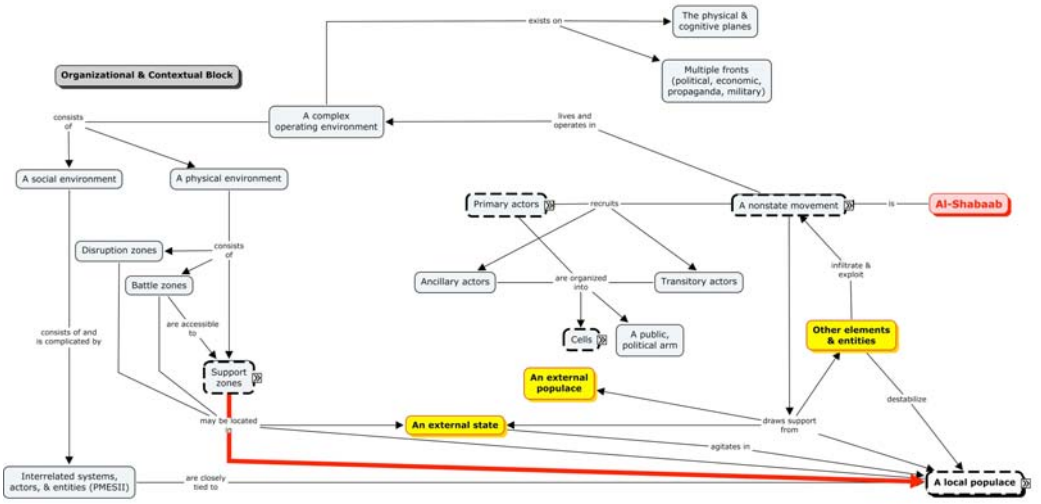

Figure 5. al-Shabaab Concept Map.

format will allow for the evolution—the continual editing and updating—of text entries as further information reflecting the latest scientific thinking becomes available. It will also facilitate the interconnection by hyperlink of wiki pages within the Cmap as well as links to other textual, audio, and video resources on the Web.

Once completed, the ANSA Cmap, with its associated rules and modalities for application, must be validated to ascertain its usefulness as a practical analytical tool for civilian and military intelligence operators (the IA(I) Cmap presented here will not be tested since it is only a "way-station" enroute to the end-product ANSA Cmap). Though it is beyond the scope of this paper to delve into the particulars of the experimental design, suffice it to say that a select group of intelligence operators will be asked to test the ANSA Cmap tool under controlled experimental conditions. How does the Cmap fare against other methods of knowledge acquisition? How well does it facilitate the desired result of the learning exercise—in this instance, increased operator understanding of the motivations, intentions, and behaviours of ANSAs—as compared to, say, an unguided search of the Internet for multimedia resources related to ANSAs (arguably the default option for many analysts absent more specific direction from colleagues or supervisors)? In other words, how effective is the Cmap as a cognitive model and knowledge model, identified above as the principal functions of the ANSA Cmap?

In conclusion, the comment above on the dynamic nature of the Cmap and its associated wiki deserves repeating. The so-called "final" version of the ANSA Cmap built from the IA(I) Cmap presented here will be final only in the sense that it is the end product of this specific Project. Cmaps—as is the knowledge upon which they are based—are not static. They will and must evolve to reflect future theoretical, experimental, and empirical advances in the social sciences. As Crandall et al. (2006) aptly put it, "it is wise to always consider

Concept Maps as 'living' representations rather than finished 'things'" (p. 54). In that sense, the ANSA Cmap we will develop will always be a "work in progress."

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