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Agile Sense-Making in an Intersubjective Environment

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ABSTRACT

It is intended that this paper be a contribution to the current Command & Control (C2) focus on power to edge principles, and the search for agility through self-synchronisation. It is adopts a social science approach, drawing a great deal of input from political science for its theoretical foundation. In this regard, the paper recognizes the fundamental ontological shift from our previous understanding of *strategic interaction* based primarily on calculations from the physical domain, to modern warfare that depicts two interacting domains for *strategic reference*, one physical and the other cognitive (or ideational.) It focuses on intelligence driven planning and plans, and will engage such topics as the factors that influence the quality of both. First it suggests that agility as dependent on how effective our analysts are at managing the directional relationships, between Command function requirements (such as timeliness and flexibility) of any given set of conflict conditions, *versus,* the requirement for *properly* processed non-military information relevant to those same conditions. Secondly, it recognises that the 'complexity' of the battlespace generated by the intersubjective nature of the conflict environment, transcends the traditional understanding of levels of strategy. Thus, determining where this responsive sense-making capacity is best positioned to manage the intersubjective battlespace in a C2 organisation becomes a clear objective in the pursuit of self-synchronisation and agility.

Introduction

The objective of this paper is to contribute to the growing C2 epistemology by engaging *power to the edge* [1] research with a specific focus on the role of responsive sense-making in the pursuit of self-synchronisation[2]. In this regard it will be offering support to the transition movement from hierarchy to edge organizations, with proposals on how we move the power of knowledge development and management to the edge. The theoretical proposals in this paper will affect common C2 variables such as *information*, *predominant information flows*, *information management*, and *sources of information directly*, because of its focus on intelligence analysis and planning. As a result, secondary affects on key C2 variables such a *Command*, *Leadership*, *Control*, *Decision-making*, *Organizational Processes*, and *Individuals at the Edge* that promote the transition from hierarchy to edge organizational principles are inevitable.[3]

The focus of the paper is on the role of the military intelligence (MI) analyst in promoting agility and self-synchronisation by being more responsive to the immediate conflict environment, both in terms of sense-making as well as organizationally. C2 research to date has argued convincingly that more senior people are needed in field as an element of moving power to the edge.[4] Focusing on the human dimension, this paper will support this

[1] Alberts & Hayes (2005) Ch.1

[2] See Alberts & Hayes, (2005): 27, assumptions of self-synchronisation are a clear and consistent understanding of command intent; high quality information and shared situational awareness; competence at all levels of the force; and trust in the information, subordinates, superiors, peers, and equipment.

[3] Ibid.: 218.

[4] Ibid.: 216-221.

agenda by presenting the theoretical foundation for current research within the Danish armed forces, as to what type of analysts[5] are needed in terms of training and education at the edge, and how the 'edge' should be defined organizationally.

Part I presents the theoretical foundation that has its roots in social science, particularly international relations (IR), and the development of social constructivism as an approach to understanding the environment. Epistemologically it is built on the modern constructivist school of thought, why remaining firmly within the pragmatic end of its philosophical application.

Part II presents a conceptual C2 reference model for responsive sense-making based on the existing standard C2 model, but reflecting the constructivist theoretical foundation, and the focus on the military intelligence (MI) analyst. Part III isolates the 'who' aspect of moving power to the edge by discussing the role of the MI analyst in creating agile C2 through responsive sense-making, in an intersubjective conflict environment. In this regard, it will identify how some key aspects of asymmetric warfare specifically affect the human element of sense-making, within the MI regime, and most importantly what that environment will require of analysts terms of education and training.

However, identifying the required skill set for agile sense-making does not in itself contribute to self-synchronisation, if the trained personnel are not properly placed organizationally. Part IV proposes how personnel with the identified skill sets should be placed at the edge. The secondary objective is to assess how this analytical agility can be designed to support self-synchronisation based on flat lined information sharing and intelligence processing.

Part V will close with descriptions of two campaigns of experimentation; the first is to solve the dilemma we have organizationally with defining the edge, as it is in itself contextually dependent. To resolve this issue, field studies to establish a generic taxonomy to help determine at what organizational level to place the 'agile analyst' within the context of the intelligence cycle in an asymmetric environment at the tactical and operational levels. The second campaign focuses on the strategic level, and the relationships between the intelligence cycle and the operational planning process (OPP). The intention is to test and evaluate the skill sets necessary for the senior analysts and planners, through controlled environments at staff colleges that conduct operational planning (OPLAN) exercises.

[5] In referenced research the term 'senior' has been used to categorize the movement away from hierarchical organisations to edge organisations. In this paper, the argument is for research and recognition of desired skill sets for the promotion of agility, where those people come from is not an essential concern.

PART I Theoretical Foundation

The Asymmetric Battlespace

What used to be based on simple symmetrical measures for strategic reference within the logic[6] of strategic choice for parties to a conflict is no longer valid. The last 15 years has seen the development of war fighting environments that depict two distinct ontological[7] domains for strategic reference, one physical and the other cognitive.[8] There has been much work done on the characteristics that differentiate asymmetric warfare from symmetric warfare throughout its rise to rhetorical popularity over the last decade. The view of this paper points to a fundamental ontological shift from our previous understanding of strategic interaction based primarily on calculations from the physical domain: today's interactions in warfare are depicted as two interacting ontological domains for strategic reference, one physical and the other cognitive.[9] If one accepts this view, the challenges of asymmetric warfare will stem from the fact that relying on primarily on the physical domain for strategic reference - is no longer sufficient to manage an intersubjective battlespace consisting of two interacting domains of understanding a complete reality.

Though an oversimplification, we have found out that engaging the cognitive domain after having achieved physical domain dominance – in not easy. For example consider the difficulties with establishing variables[10] to measure progress with regards to culturally dependent concepts - how can different cultures agree on accurate measures of 'democracy' or 'liberty'? [11] Compare this to the simplicity of establishing 'measures of effectiveness' for the symmetry of the physical domain - best illustrated by a body count of the enemy vs. their estimated muster.

Consequently, complexity in strategic interaction develops if one side is busy formulating strategies based on overwhelmingly means/efficiency calculations – while the opponent might not being using the physical domain as the main terms of reference for their own decision-making - including their definition of victory and defeat. It is the equivalent to sitting at the same game board with your opponents, plotting to beat them in a game of checkers, while they develop strategies to beat you in chess.

An example of this shift in strategic interaction understanding comes from the Taliban leadership themselves, where 15 years ago they defined victory by the taking of Kabul – today they define victory by a cognitive term roughly translated from several Pashto words

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[6] Edward N. Luttwak (2001):3-50. Luttwak explains the logic of strategic thinking within a the context of war, the paradoxical logic affecting the combatants was linear in terms of material/efficiency calculations, both sides referred to the same physical domain. However the same logic applies to the onset of asymmetric warfare, the physically weaker side can circumvent the overwhelming physical advantage by changing the terms of strategic reference to the cognitive domain – this choice is also a product of the logic of strategy and human innovation.

[7] Understood in this paper as simply the nature of reality.

[8] Nicholson (2006):133-136. The reference to 'domains' here is a meta-theoretical qualification only and should not reflect differences with the CCRP generic working domains (Physical/Information/Cognitive/Social) and their functions.

[9] Ibid.:133-136. Also note in terms of international relations (IR) studies- a substitute concept for cognitive would be ideational.

[10] Canadian Department of National Defence Document B-GG-005-004/Af-023. (1999); Canadian Government Doc (1999); McCafferty (1997);Waltz, (1999):7-14

[11] Nicholson (2006):139-141

as – legitimacy. They plan their operations to *de-legitimize* the Afghan government. Conversely, based on a two pronged strategy promoting security and development, North Atlantic Treaty Organization (NATO) plans operations to *legitimize* the Afghan government.

Social Constructivism

Social constructivism, as it is used in this paper, is defined as the view that the material world shapes and is shaped by human action and interaction dependent on dynamic normative and epistemic interpretations of the material world.[12] This definition is developed primarily within IR and carries with it several levels of understanding with their respective debates. It is not the purpose here to devalue any particular level of debate – they all have their place.[13] However as the instrumental approach or application of constructivism here is based on the worldview rationality assumption, the scope of the relative theoretical discussion *not* to be taken up here, would be limited to presenting arguments for the exclusion of certain constructivist epistemologies that in my opinion challenge this assumption – and therefore threaten pragmatism.

The debate within social constructivism concerning metaphysics accompanied by appropriate ontological discussions is not only applicable to IR but many other social and natural sciences – including all aspects of military sciences as it is, an ontological debate. Constructivists consider interpretation as an intrinsic part of social science that stresses contingent generalisations, meaning that they do not freeze our understanding but open up the social[14] world. The ontological issues currently focused upon, originate from the belief that reflexive knowledge (interpretation of the world) when imposed on the material reality of the world becomes knowledge for the world. It is this intersubjective dynamic that suggests directly that understanding the world does not *just* depend on understanding the material - but also the ideational.[15]

Simply put, it suggests that 'social facts' can act as the objects of scholarly research endeavours emerging from the interaction between knowledge and the material world (intersubjectivity) – neither of which are fixed.16 This metaphysical standpoint has been

[12] Adler 1997: 322

[13] Adler 2002:104-109

[14] A general reference to the world of social science – not to a working CCRP domain.

[15] Checkel 1998:324-348;Reus-Smit 2001:218

[16] Adler 1997:327-328. A concept developed from earlier work of Deutsch (1957). See conventional constructivism. Ex. In Ted Hopf's "Promise of Constructivism in International Relations Theory" presented in International Security in 1998, IR scholars are presented with a clear theoretical outline of a brand of constructivism fully capable of instrumentally engaging foreign and security policy analysis (Wendt (1995: 72). Conventional constructivist approaches are described by Hopf, as drawing on the modernist social constructivist methodology and empirical approaches such as that of Barnett, while maintaining Adler's pragmatic realist undercurrents (Hopf 1998:181-185). If we subject the core conventional constructivist concepts of norms and identity to Colemans' conditions for managing optimality assessments, we can actually see their role for non-material input into optimal preference construction. (1) Actions are optimal with respect to preferences whereby the best action is chosen. (2) Preferences are optimally formed with respect to *beliefs and affects*.(3) *Beliefs* are optimally formed with respect to the information available. (4) Available information (collected/processed) is optimal with respect to affects (consequence assessment).(5)Affects are optimal with respect to the individual autonomy of the unit. The 'fixed understandings' of conventional constructivism within the functionality of identity and norms may have a direct role to play in formulating optimal preferences, specifically in conditions that require an understanding of beliefs and the process surrounding the formulation of those beliefs. Secondly, in the instrumental sense the conventions drawn by 'fixed understandings' reinforce the subjective context surrounding the objective analysis of ones' decision-making rationale, with tools to assess those beliefs and interpreting their affects.

mirrored directly in current conflicts, and wartime problem solving. For example understanding the strategic impact of the kinetically insignificant Abu Ghraib scandal, or how during the last 15 years, western militaries have developed methodologies to include information operations input into kinetic planning - a far cry from the recognition of a need for a more effective public relations (PR) capacity after the first Iraq war.

The pragmatic constructivist approach used here is built on the belief that this constructivist dynamic can exist within the scope of the main rationalist assumption, as the rationalist assumption itself only suggests that rationality is a subjective feature of individual actors, it does not argue that all action is objectively rational.[17] Therefore an objective process such as scholarly research aimed at understanding the constitution of a subjective reality of an individual actor may recognise 'social facts' that have emerged from the interaction between knowledge and the material world.

On an ontological foundation based on a pragmatic application of constructivism within a worldview imbedded in subjective rationality, the cognitive domain and non-military dimensions provide a sound methodological approach to understanding the origins of the complex battlespace. This complexity in the modern battlespace, if understood in terms of intersubjectivity, provides a sufficiently concrete position from which to evaluate what is needed in terms of analytical and planning capacities and the three main challenges we face.

Three Main Challenges

The first challenge is that intersubjectivity by definition is dynamic and not static, and it is because of this dynamic reality that we find ourselves now searching for agility and responsiveness in both sense-making and organization. Learning to manage intersubjectivity relative to the task at hand effectively should perpetuate organizational agility and responsive sense-making.

The second challenge is also rather straight forward in that systematically engaging a second ontological domain for strategic reference will undoubtedly require a significant expansion of the scope of knowledge we develop for use in the planning processes of warfighting. It highlights the need for the widening of intelligence collection and processing, and the need to incorporate non-military information for kinetic planning. We are clearly responsible for establishing an intelligence cycle that can manage both the physical and cognitive domains of a battle space, in terms of direction, collection, processing and dissemination. At the same time this expansion of the knowledge base must not undermine the functions of Command, as kinetic effectiveness is arguably a physical pre-requisite for ever being in a position of being subjected to the conditions of an intersubjective battlespace in the first place. The ability to manage the balance between the two for any particular set of warfighting conditions is proving difficult. Even if we simplify the requirement for understanding different conflict situations to some sort of deterministic taxonomy of asymmetry – the process cannot be as quickly dynamic as we would like - it is to some degree dependent on experience especially where it concerns the pursuit of self-synchronisation. The ability to learn quickly from experience is a fundamental catalyst for self-synchronisation in itself.

[17] Kurrild-Klitgaard 1997:9.

The third main challenge, and most complex from an intelligence standpoint, emerges from the interaction between the physical and cognitive domains, as we are forced by reality to accept responsibilities for intersubjective space between them and the complexities this dynamic produces. Though depicted as two separate ontological domains that philosophically cover the full range of human understandings, they are not mutually exclusive; far from it, they are so ontologically intertwined that despite 20 years of theoretical development in social science, from anthropology to international relations, we are still far from managing the full scope of their intersubjective relationship. This is despite some progress in security policy with some engagement of issues relating to strategic reference.[18]

The challenge to analysts and planners in managing the intersubjective rules of this dynamic space, where the physical meets the cognitive, transcends our traditional, if not historical, understandings of the levels of strategy and the boundaries of a Theatre. The movement between the strategic, operational, and tactical levels becomes very fluid, with tactical physical events having a cognitive/ideational impact of strategic importance, or vice-versa, and everywhere in between. Furthermore, cognitive/ideational events physically outside of a defined Theatre may have direct impact on physical operations in Theatre –or vice-versa. It is, in effect, the motor of asymmetric complexity.

Commonalities

A central commonality in all of these challenges is the requirement for agility. First 'agility' in terms of sense-making capacities related to analysts in that it will require an environment that fosters an understanding of both ontological domains, the intersubjective space between them, and the method to manage them empirically. We must not only learn to exploit the intersubjective battlespace within a given environment, but by this admission, we must also be capable of correctly defining the pragmatic limitations of exploitation vis-à-vis maintaining effective kinetic planning and robustness. Therefore the training and education of MI analysts and operational planners is paramount, we must understand how to evaluate the necessary skill sets.

Secondly, the challenge of an intersubjective battlespace that transcends traditional divisions of levels of strategy within a military campaign carries by proxy an organizational context. In this regard we have to ensure that the advantages of producing analysts capable of precipitating agility and self-synchronisation, is not undermined by dogmatic organizational process, or structure. For example, the question of where we place the expertise is important, but of even greater importance to the pursuit of agility – is recognizing that its effective placement may always be contextually dependent and require

[18] For a basic background see the road Katzenstein chose by organising and leading the research of 1996 on national security cultures. The identity concept was treated in analysis as a domestic attribute that arises from collective ideologies, which directly affected state perceptions of interest and thus state policy (Barnett, 1996). Though some of the authors of the study would later focus on the idea of 'narrative' instead of ideology, the affect of treating this understanding of identity as a domestic attribute available for a policy analysis was the precursor to the more instrumental application of conventional constructivism to MI analysis presented here. In the same ground breaking study, Michael N. Barnett laid the groundwork in "Identity and Alliances in Arab Politics" for future research that would partially correct these deficiencies with reference to individual decision-makers and strategic levels of policy providing clearer depictions of the strategy behind the norm affected decision-making. Also see Emanuel Adler (1997):318-363; Also Finnemore, Martha (2001):391-416.

adaptation. Therefore the more important question to ask is how can we determine in any given conflict where our expert analysts should be placed organizationally?

Indeed using the word '*agility*' to describe the desired end state for C2 related to planning and plans suits this paper just fine, it conveys the need for measured dynamism. When referring to the skills of a flanker on a rugby pitch, or the OPP in Afghanistan, for the dynamic inference of 'agility' to remain positive there must be contextual relevance and by proxy – contextual limitations. Those contextual limitations are defined by the conflict situation, C2 functions, *as well as organization*. With the onset of a network understanding for organization and process - there is mounting evidence that traditional hierarchical organizations inherently impede agility.

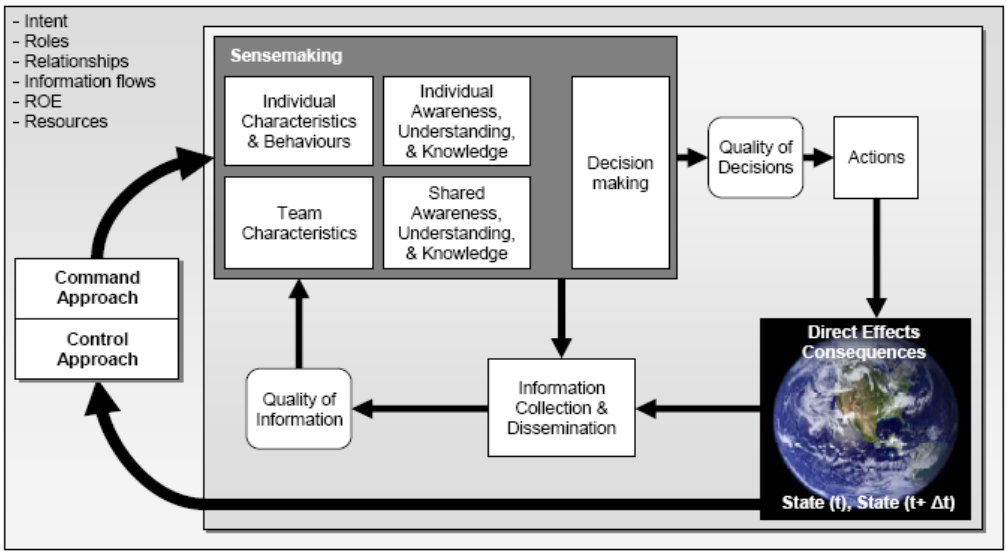
Applying constructivism to the challenge of C2 agility will not offer a complete solution; instead it is minimalist by offering a manageable process by which we can advance power to edge principles, specifically where it concerns the human aspect. It will provide the basis for a process of discovery as to who we need at the edge, and how the edge should be organized? [19]

Part 2: C2 and Self-Synchronisation in an Intersubjective Environment

The C2 Approach

In support of current research a conceptual model has been developed to provide a framework for understanding the intersubjective approach to creating sense-making responsiveness through self-synchronisation. If you examine the basic Command & Control Research Program (CCRP) C2 model shown in Fig.1, intersubjectivity is in fact represented by the 'box within a box' illustration and the assumption that the complete process is in play within any conflict environment.

Fig. 1 C2 Approach

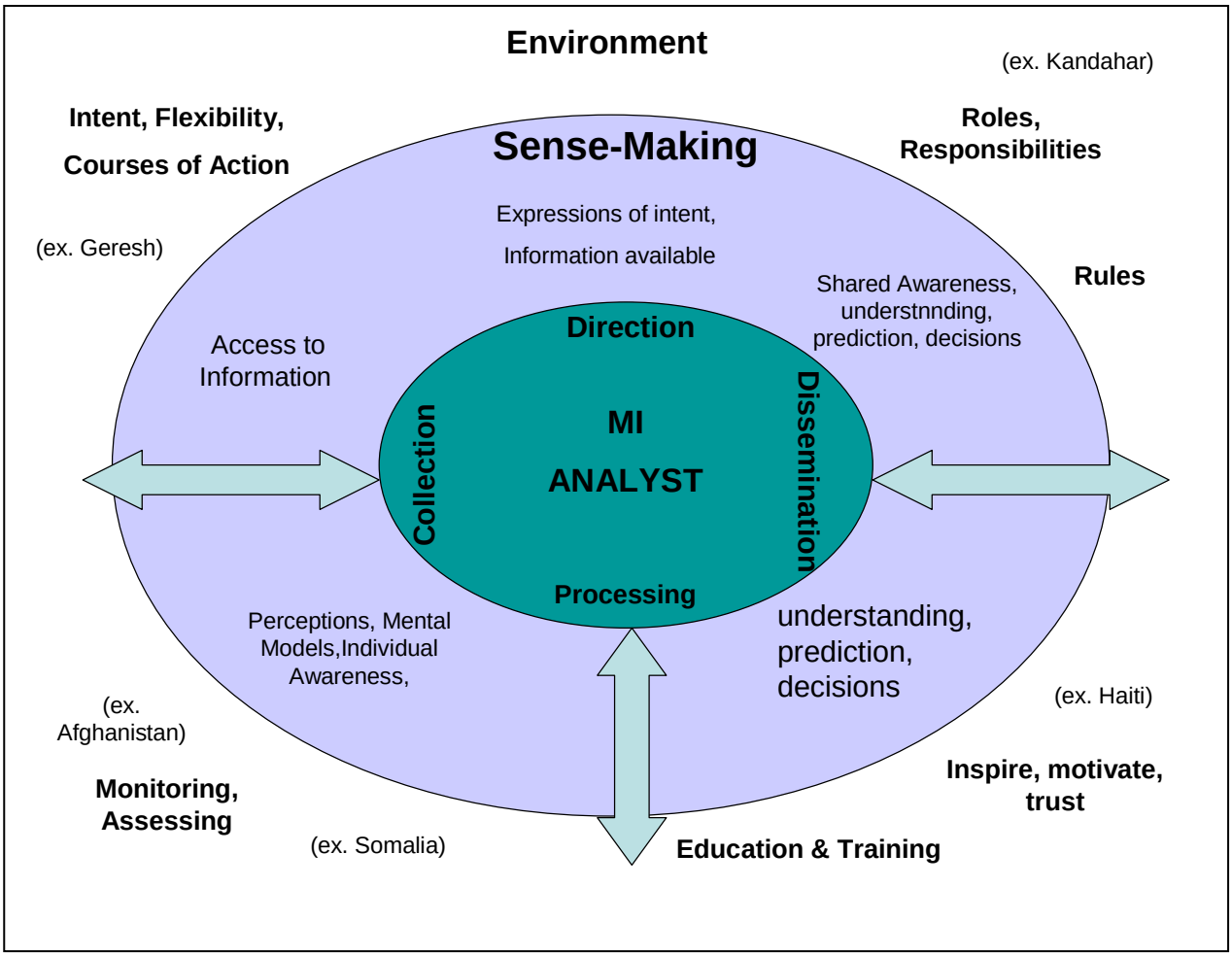


SAS-050 CCRP/NATO. (2006) Final Report: Exploring New Command and Control Concepts and Capabilities. Pg. 8
Figure 3. C2 Approach

[19] Alberts & Hayes (2005) Ch.8.

However to reflect the emphasis of this paper on intersubjective character of the battlespace and the focus on the MI cycle, a C2 reference model has been developed. In Fig. 2, the intersubjectivity of the analysts' reality in terms of sense-making is clearly illustrated via the two way arrows. While sense-making itself affects the functions of C2, sense-making is simultaneously being affected by the C2 functions. One notable difference between this representation and the C2 Model of Fig.1 representation is a lack of procedural process; instead it should be understood as an *ideal* dynamic state, a state of constant learning, adapting, and production that happens instantaneously. This feature will have a direct impact on how we see and pursue self-synchronisation. It represents a sense-making node in contact with any given conflict situation or reality, of which itself – including the attributes of any respective C2 functions - is a part. This is the 'intersubjective' representation of the analysts' reality at any given point in time. Imagine making changes to expression of intent in the ideal self-synchronizing situation, the analyst changes direction and collection, within the confines of the relative C2 functions. If the conflict situation is changed from Afghanistan to Haiti, the C2 functions themselves will change, immediately influencing sense-making environment.

Fig.2 Intersubjective C2 Environment for the MI Analyst



William Mitchell, Royal Danish Defence College (2009)

Part 3 – The Skills for the Edge

The intersubjective approach to C2 model development in Denmark, like many of her allies, currently lies within a military context defined by a NATO in transition, and a high profile mission in Afghanistan. Currently, much time is being spent on applying the effects based philosophy, establishing corresponding principles, practices, and procedures through customized counter insurgency (COIN) proposals for respective National area of responsibilities (AoRs). The development of the concepts in this paper are not immune to this context, and has been heavily influenced by what the effects based approach to operations (EBAO) represents as a meeting place between the social sciences and the long dominate (but not exclusive) natural/physical sciences.[20] It is not a chance encounter; the development of EBAO is a rational reaction to complexity – it is an attempt to reduce the complexity produced by the non-linear strategic interaction in modern conflicts. However, as it doctrinally stands now this paper acknowledges EBAO more as a philosophy of warfare with some principles, while having much less to offer in terms of practices and procedures as to qualify it as a complete doctrine. This might not – and maybe should not - change as the nature of EBAO requires dynamism and therefore possibly functions best when left as a guiding philosophy. For the purposes at hand here, EBAO is understood as involving the comprehensive, integrated application of all instruments of Alliance power, both military and non-military, to desired outcomes.[21]

When assessing the EBAO process with regards to intelligence analysis and planning, there are four key aspects that frame the evaluation that impact our analysis and planning capacities: the end state; the effects; the action; and the knowledge base. The mechanics that drive the EBAO process there must be a desired *end state* for denoting the end of both military and non-military operations determined by the political leadership. In order to move towards that end-state, a series of desired effects and sub-effects have to been determined**.**

Though the process sounds relatively simple, as noted by Smith, carrying it out challenges our ability to manage complexity in three areas; first is orchestrating the right actions to create the behavioural effects we desire in the battlespace; second is determining which direct and indirect effects (desirable and undesirable) are likely to stem from our actions; and, third is determining the effects we actually created (defining the measures of effectiveness for example).[22]

To do that properly requires a great deal of knowledge about the reality in which the actions will take place and as argued theoretically that reality consists of both a physical and cognitive domain. To provide that knowledge, the military has its own supporting MI organisation. This will be discussed in more detail shortly; however, the most important aspect for the application of knowledge in relation to the implementation of EBAO is to ensure that the "logical" relationship between end-state, objectives, effects, and actions,[23] reflects due consideration of the intersubjective reality.

[20] Phister et al. (2004):1-2;Czerwinski (1996):121-132;Owens (1995):35-39.
[21] Nato Bi-SC Strategic Vision
[22] Edward A. Smith (2005) Ch.6
[23] Bi-Strategic Command Pre-Doctrinal Handbook (2007): 5-8 to 5-9.

Our attempts to engage this complex environment, are reflected well in *Tom Czerwinskis*' '*billiard*' metaphor and the concept of *tagging*.[24] NATO's PMESII[25] guidelines attempts to do just that with the complexities of an asymmetric battlespace by dividing it up into different dimensions for strategic reference when decision-making or planning. Instead of there being just a *military* dimension, they must now consider PMESII dimensions of their battlespace. [26] By doing so it hopes to make the predictions of the non-linear interactions more manageable.

The *effects* themselves are the physical and/or behavioural state of a PMESII system within the conflict environment that results from military or non-military actions or sets of actions within the PMESII defined battlespace.[27] *Actions* resulting from the EBAO process and then executed within the battlespace represent both military and non-military activity directed towards the achievement of a specific effect or effects. Therefore the analytical exploitation of PMESII is best served near the actions.

There should be no surprise that the traditional role of MI will be affected in much the same way their civilian counterparts have been concerning the post-cold war environment where it concerns a complexity.[28] Intelligence cycles[29] and supporting collection platforms are extremely important to the policy planning process – they drive it –and in turn- are driven by it. This dynamic relationship is mirrored in the military by the MI role within the planning process. Therefore failure to prepare MI to exploit the principles of PMESII will mean that those principles will not come to drive the planning process, for example if 'taskings' (direction) are not generated by the planners to support the development of non-military dimensional intelligence – the planning will not be able to properly integrate the non-military dimensions.[30] Please note here, that reference to a specific command level for the analyst, has been left out.

Expanding the Scope of MI Collection

Most intelligence cycles in the military reflect four stages or steps, *direction, collection, processing, and dissemination*, in some way or form. The purpose of the intelligence cycle is to deal with all the available information, decide relevance, search for the missing information, process it into something even more relevant, and make it ready for distribution. As stated earlier, before the recognition of the asymmetric battlespace, it was suffice for MI to focus primarily on the military dimension that was more attuned to the descriptive analysis in general.

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[24] Czerwinski (2003):114-115. Imagine using a cue-ball to break a full set of cue-balls, in order to plan for the next shot, you must manage an extremely complex situation as the balls themselves are indistinguishable from each other. Your only option would be to keep track of distances and trajectories of every ball relative to a fixed point on the table. However, if you were able to give some balls a red stripe, others a blue stripe, and yet others a yellow, and the rest green stripes, you would significantly reduce the complexity of the situation for planning your next shot. This technique to help manage complex situations is called *tagging.*

[25] PMESII – Political, Military, Economic, Social, Information, Infrastructure domains of a battlespace.

[26] Bi-Strategic Command Pre-Doctrinal Handbook (2007):5-3.

[27] See Appendix 1 – PMESII Table.

[28] See Alan E. Goodman (2003):3-12 for a good discussion on the affects of the Post-Cold war period on civilian intelligence. Also Herman (2004): 125-126

[29] Clark (2004):Ch.1; Herman, (2004): 293-296; Mitchell (2002):486

[30] The same principle would be in effect if the paper focused on the Diplomatic, Information, Military, and Economic (DIME) analytical framework. It could also be interesting to compare the necessary skill sets assessed for the different analytical frameworks to see how different they actually are.

When assessing the MI requirements for the incorporation of non-military information in the intelligence cycle to support the analysis of the multidimensional battlespace depicted by PMESII, the knowledge base has to be substantially expanded from the traditional focus on the military dimension, to focus on a variety of non-military dimensions as well. In terms of a generic MI cycle this means that *direction, collection, processing, and dissemination* will be affected.

Current MI structures have to begin 'gearing up' to provide non-military intelligence to support the kinetic planning process. Specifically there has to be more to focus on, other than Order of Battle styled reports (ORBATS.) [31] ORBATS are one of the traditional products of military intelligence output in terms of basic intelligence – or constitutes the intelligence that is used for baseline referencing to support planning, as well as, grounds for initiating new taskings (*direction*.) It usually covers tracking such aspects of the opponent's equipment, capabilities, performance,[32] as well as some relatively light socio-political matters relative to leadership or logistical support.[33] It goes without saying that for the implementation of EBAO to be effective - it must be supported by relevant intelligence *collection* and *processing* that focuses on understanding context, and it is only now we are beginning to produce templates for first line collectors that reflect that requirement for non-military (or non -ORBAT) information.

Changing Nature of MI Analysis: Description to Prediction

EBAO and PMESII are responses to the complexity produced by the asymmetric battlespace. The nature of EBAO itself calls for predictive analysis. To do all this properly requires a great deal of knowledge concerning the reality in which the actions will take place and a methodologically sound approach to predictive analysis to avoid polemics. Traditionally, the nature of MI analysis has been descriptive in terms of the time and space dimensions.[34] However EBAO requires a great deal more predictive battlespace awareness (PBA)[35] for the commander and it is here the challenges lie in terms of adjusting the MI organization and method. In short, applying PMESII to meet the challenges of the asymmetric battlespace will require a shift from a focus on descriptive analysis to predictive analysis.[36]This has direct methodological implications for the production of estimates and analysis or the processing stage of the MI cycle.

As far as integrating and exploiting the non-military dimensions of PMESII, the cognitive skills developed in applied social science method are paramount. Specifically, the ability to systematically produce relevant mental models to increase the overall effectiveness of MI output is paramount. *EBAO inherently places the weight of modeling application on prediction in terms of qualifying desired and undesired effects.* The most common type of modeling for dealing with prediction, and one of the easiest to work with is iterative modeling based on hypotheses defined relationships. Essentially establishing a baseline

[31] UK MOD Doc (1999):1A-2
[32] Libicki & Johnson (1995): 48-49 (Good example of the comparative tech focus)
[33] Military intelligence output is divided generically into basic and current intelligence – current intelligence is situational and not referential in character.
[34] Phsiter (2004):2. Known as Intelligence Preparation of the Battlespace (IPB), its purpose is to keep the commander aware of recent, current, and near term events in the battlespace.
[35] SAB-TR-02-01 (2002)
[36] Mitchell (2002):481-485

hypotheses based on the existing situations, then adding new information to assess how the baseline hypothesis is affected to produce predictions. It is the essential methodological minimum to integrating the non-military dimensions into the MI cycle.

Managing PMESII inherently places the weight of analysis and estimates on hypotheses defined relationships, primarily between PMESII domains. Therefore the hypotheses generation and evaluation skills are paramount for successful exploitation of more diverse types of non-military information being collected. It is not a solution to expand the scope of collection if it cannot be properly processed and exploited operationally.

Al-Nur Exercise

In a Staff exercise called AL-NUR conducted at the Royal Danish Defense College (RDDC) Staff College in Copenhagen, Denmark, coming Staff Officers ran an OPP exercise to a scenario that was built upon planning for a possible intervention into Somalia based on given intelligence and political objectives to eliminate the regionally destabilizing affect of Islamic Fundamentalist militias. Here PMESII was introduced and applied without social science method training, or formal training in the new guidance from NATO itself. The final plan was to be reviewed by non-Staff Officer analysts with social science backgrounds in the non-military dimensions, as well as PMESII experts with experience from the NATO regime.

Al-NUR- Planning Richness and PMESII.

In the first OPLAN presented in Fig. 3 Proposed OPLAN, there was a weak exploitation of the PMESII toolbox, as a military presence in Somaliland was missing while all kinetic activity was concentrated on Southern Somalia. This action was not fully evaluated for any negative political effects – if done it would have warned of a serious risk that Somaliland might use the opportunity to declare independence from Somalia (the provided intelligence indicated this) – a much undesired effect with regards to the strategic objectives. If the PMESII was applied in systematical manner, that is, committing all kinetic planning to multi-dimensional analysis, this important fact would likely have been considered.

With regards to the use of hypotheses and iterative modeling: ideally, a standing model based on PMESII and illustrating the dimensional relationships of the Somaliland independence would not only identified the undesired effects from planned kinetic actions, it would also have helped to develop strategies to *mitigate* undesired effects vis-à-vis preferred courses of action. For example, the use of model testing for a smaller military presence (military dimension) in Somaliland with focused economic assistance (economic & infrastructure dimensions) to the identified clans that want independence. Particularly those along their provincial border (political & social dimensions) and backed up by information operations (INFOPs) promoting the benefits of unity (information domain).

These multi-dimensional efforts might mitigate the risk of a unilateral Somaliland declaration of independence while, allowing the majority of military forces in the south to conduct combat operations after the OPLAN. (Multi-dimensional exploitation represented by different coloured arrows in Fig.4)

Fig.3 Proposed OPLAN
(Weak PMESII analysis)

• Establish presence in Mogadishu and expand with main effort in Southern Somalia.
• Target extremist and encourage negotiation with all other parties.
• Humanitarian relief and CIMIC coordinated with targeting.
• When SASE is established in Southern Somalia - expand success and SASE northwards.
• Deliberate approach to DDR-process.

CIMIC – Civil-Military Cooperation
SASE – Safe and Secure Encvironemt
DDR – Demobilise, Disorganise, Reintegrate

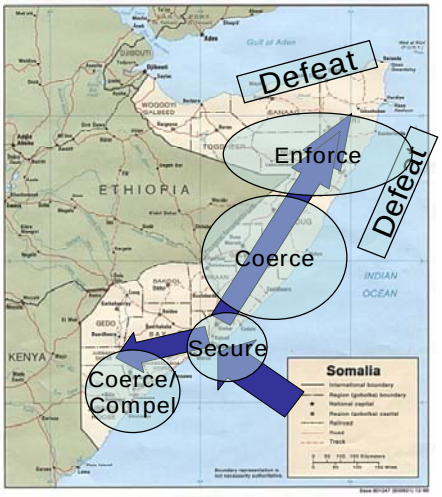
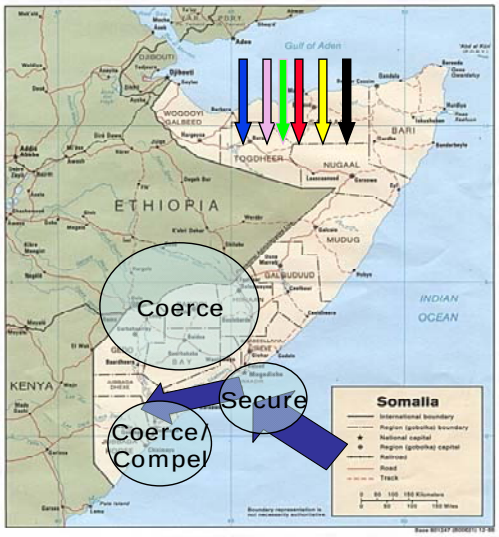


Fig.4 PMESII Mitigation of Somaliland UDI[37] threat
(Strong PMESII Analysis)

•MD1- Establish presence in Mogadishu and expand with main effort in Southern Somalia.
•MD2- Establish small military presence in Somaliland.
• P/SD1-ID Clan Structure Key Leaders in Somaliland.
• ED1- economic incentives to key leaders
•INFOD-Somaliland
•Southern Somalia - expand success and SASE northwards.

MD 1,2 – Military Dimension 1,2
P/SD1- ID- Political/Social Dimension 1 – Identification
ED1 – Economic Dimension 1
INFOD – Information Dimension
SASE – Safe and Secure Environment



15

[37] Unilateral Declaration of Independence

AL NUR- ***Planning Accuracy, Completeness, and Consistency & PMESII***

The OPLAN accuracy was continuously reduced by the dominance of military considerations. One example concerned the issue of pirates. At one point the OPLAN called for the destruction of pirate home bases; however, the basic understanding of the pirate issue suggested that pirating itself was an economic supplement for local urban centers along the coast. Therefore, issues within the political, economic, social, and military became much more significant in terms of operational impact. For example, do those towns support the Islamic insurgents? What will the economic impact be on those towns? Does destroying the 'home-bases' require occupation and military forces? Will such an action create more support for insurgents behind our lines of communication? What will be the effect on info operations in Southern Somalia? How can we mitigate (multi-dimensionally) the risks associated with the desired action?

C2 Functions and the Integration of MI into the OPP

The MI regime has to operate within an established doctrine that has to manage a variety of time vs. space challenges not normally faced by civilian intelligence. The challenge with regards to fully implementing the principles of PMESII within the military intelligence cycle in terms of the non-military dimensions of the battlespace will be the key to ensuring equal dimensional representation in the planning process – and an effective implementation of EBAO. (*It is important to note here that equal representation in the assessment process – does not necessarily mean there must be an equal representation in the final plans.)*

Timeliness is affected by the kinetic C2 requirements of the battlespace as well as synchronisation between the planning process and the supporting MI regime. If there is no synchronisation, proper MI analysis is not completed to support the planning process, and specifically where it concerns EBAO, effects related analysis quickly becomes a question of how *polemic* a Commander's decision will be - without any method or research to support it. The resulting choice is to base effects analysis on these Staff polemics, or artificially slow down the planning process at the cost of kinetic realities. Both situations from a warfighting stand point are unacceptable. Integrating PMESII is essentially adding more to collect and process, and therefore creating new challenges to analysts to do so in a timely manner. It is here the traditional hierarchical flow of processed information works against maintaining timeliness and represents a strong argument for flat lining intelligence processing at the edge. The existing MI structures represent a hierarchical detour that moves power from the edge.

The United States Department of Defence defines Commanders Intent as the concise expression of the purpose of the operation and the desired end state that serves as the initial impetus for the planning process. Flexibility as it pertains to Commanders Intent comes from desire to ensure the Commander has just as many, if not more, courses of action available as compared to the enemy commander. The Commander with more courses of action deemed viable, has an advantage in the battlespace. Furthermore the message to subordinates must not be so methodologically precise that it limits their flexibility, or the synchronisation process so deterministic that it limits flexibility – the result will be trading assurance of self-induced action for assurance of control and a negative affect on the pursuit of self-synchronisation and agility. The intention of PMESII is to

provide guidance on integrating non-military dimensional analysis relative to the planning process through effects analysis that is completed within a framework of kinetic requirements of the battlespace – thereby in theory it should *increase* the number of courses of action available (see AL-NUR mitigation example.)

Existing MI analytical techniques do not exploit social science method, rarely are kinetic plans subjected to hypotheses based models to test for impact in the non-military dimensions. Furthermore if one is to move from description to prediction analysis, in order to avoid polemic predictions, some sort of acceptable method must be applied – and applied efficiently. However of more importance here is that we now have some guidance as to what is needed in terms of education and training. Specifically where it concerns making MI analysts more responsive and agile for any given conflict can be drawn from civilian approaches to intelligence analysis that systematically generate and evaluate hypotheses based models, including the exploitation of mental modelling for developing baseline models. The ability to develop mental models is essential to sense making and also provides a framework for the evaluation of an individual's cognitive framework for understanding the relative battlespace.[38]

A model can be a replication or representation of an idea, an object, or actual system. More importantly, it often describes how a system behaves.[39] Models can be used to describe, explain, and predict. They can be used to create baseline references and for building up databases of knowledge that can be manipulated to advantage. When applying effects approaches, contextual prediction[40] is the primary analysis objective, and this is why iterative modeling based on hypotheses becomes extremely important to both the production of useful products as well as to the management of the effects cascade in terms of applying or evaluating results.[41] When it comes to strategies for generating and evaluating hypotheses in an operational environment, focus should lie on developing analytical skills that help analysts in any warfighting situation quickly determine the right balance between situational logic and applying theory in order to maintain timeliness. Managing the inherent paradoxes such as the appropriate amount of details needed for hypotheses driven by situational logic, versus collection capabilities can be an issue. Often this may be resolved by utilizing theory driven hypotheses based iterative models to maintain timeliness or improving timeliness over extended periods.

To summarize, we must ensure that training and education of our analysts match the expectations of their mental abilities in an EBAO and PMESII context. However creating an education and training taxonomy will take some experimenting, basic social method in terms of hypotheses generation and evaluation would seem an appropriate start point. Furthermore, in the case of a PMESII framework, an intimate understanding of the effects cascade and C2 functions such as Commanders Intent would also seem appropriate.

However making the analyst more responsive does not in itself move the power to the edge – or promote self-synchronisation. It simply represents the desired skill set of the analysts that drive responsive sense-making. Where should we place this analytical capacity within the organizational context that best promotes self-synchronisation? The Al-

[38] Heuer (2006):vii-ix;15-31.
[39] Clark (004):29.
[40] Mitchell (2002):480-485.
[41] Heuer (2006):47-105.

NUR example was based on a traditional hierarchical structure, the next section will argue that this agile analytical capacity will work best, or be most responsive in supporting the implementation the commander's intent, by being dispersed out in the field. In effect, creating self-synchronizing network where properly processed information is shared in real time across a flat line rather then a cumbersome hierarchical structure for the MI regime. For those familiar with the EBAO cascading metaphor – there can only be one answer – as close to the source of the actions that cause a 'ripple' – as humanly possible.

Part 4: The Edge

To deal with the wide variety of command constructions emerging in the age of complex conflicts, military science has also been busy developing a C2 approach for evaluating military doctrinal and structural issues emerging from the necessity to better manage complexity.[42] Currently this process is hierarchal tightly managed by the development of concrete practices and procedures within the OPP to ensure what started at the strategic level in terms of desired effects, arrives in the field as desired sub-effects and action guidance. The journey of the desired effects down through the different levels characterized by prediction, planning, and actions is called the effects cascade. Just as important is the evaluative *reverse cascade* characterized by evaluation and lessons learned. When one talks of managing the EBAO process it is essentially about ensuring that the effects cascade is coherent from top to bottom.

At present, when it comes to analysis and planning both the command structure and the education and training of personnel run traditionally parallel - the further up the chain the further away from the direct action in the field – the more educated and trained are the analysts. It is the result of the historical tactical, operational, and strategic divisions of strategic reference. It is perpetually reinforcing hierarchal structure in terms of quality of analysis. As noted in the start of the paper asymmetric warfare has blurred this traditional division. If power to edge is to be successful, if self-synchronisation can be allowed to develop, than key educated and trained personnel have to go to where the local actions are planned and executed – to ensure the best chance of the desired ripple effect. If we apply this principle to our responsive sense-making capacity, our better trained and educated analysts should be at the frontlines, networked with each other.

From an intelligence perspective our information sharing should be flat lined between the points where actions can be initiated, each point of contextual interaction supported by the best human PMESII analysis. Just as importantly this should have a direct impact on our ability to provide Measures of Effectiveness (MoEs).

The MoE dilemma is essentially about choosing what indicators are most representative in a conflict environment that requires both kinetic and non-kinetic actions to move towards such objectives as security and development. However, if we are to hold true to the intersubjective reality where nothing is fixed, if we are to hold true to the EBAO philosophy that the battlespace is multi-dimensional, and if we are to hold true to our attempts to manage the complex reality through tagging and PMESII, then we do not need to focus on choosing between indicators. Instead we should focus on understanding the contextual fabric at any one point of interaction at the edge in theatre (a district for example) and simply assume (basis of the effects cascade philosophy) that the sum of these contextual

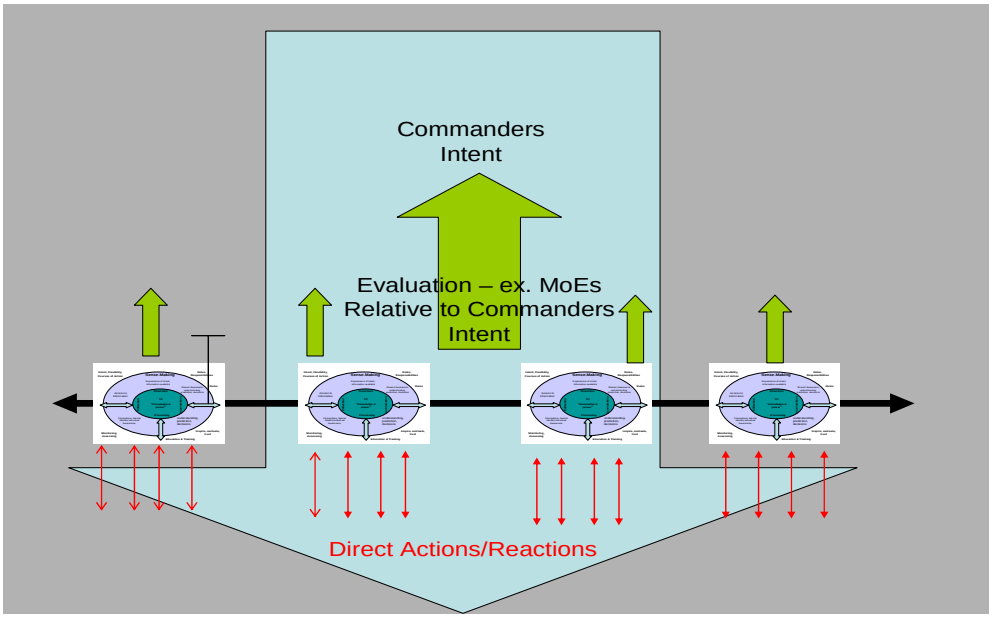
[42]David S. Alberts & Thomas J. Czerwinski (1997): 2-62; Also see Stuart E. Johnson & Alexander H. Levis (eds.) (1989) (1988); Nicholson (2006):139-146.

understandings (many districts) represent the MoE for the Theatre OPP. If this is the case, then there is no better argument for power to the edge in the form of analysts that can systematically employ PMESII to produce a contextual snapshot of their AoR. Imagine a PMESII trained analyst who can generate and assess hypotheses based models for their AoR that inform local actions on desired and undesired (multi-dimensional) effects, as well as provide multi-dimensional advice in order to mitigate undesired effects due to desired actions. Then imagine this occurring in 40 districts across Theatre. The complexity of the asymmetric battlespace already reduced through tagging (PMESII) is further reduced by sub-dividing the battlespace into manageable contextual AoRs.

Context is not about any one indicator but understanding the relationship between a variety of indicators in an AoR to understand the local reality and this aspect requires that the analysts be sufficiently trained to exploit baseline measurements and hypotheses based models within a PMESII framework. Furthermore building a contextual interpretation is not dependent on a single indicator, but instead slows the interpretation of specific indicators by forcing them into relationships with other indicators. In this way one could argue that the local intersubjective battlespace - is being managed to some degree.

For example, if in district Alpha the analyst notes that after 1 month of operations; the local reports of improvised explosive devices (IEDs) are up, the IED strikes are down (Military dimension); signals intelligence (SIGINT) insurgent background noise is down – which requires a baseline measure to begin with (Military dimension); human intelligence (HUMINT) reports on insurgent movement is down (Military dimension); market activity is up (Economic dimension); insurgent night letters are down (Information domain); development projects advance (infrastructure dimension); law and order is up (Social dimension); the analyst can say with confidence that in his district there has been progress towards the overall objectives of security and development. (After a series of periods – the analyst should be able to establish an informed opinion on the rate of progress versus previous periods.) As the other districts report, the MoE responsibility at the higher levels (regional for example) simply becomes to sum the contextual reports of the districts in their AoR, while at Theatre level they sum the contextual reports of the regions to represent the Theatre ‘ripple’ effect and identify troubled districts – or targets of strategic importance. The key to MoEs is moving the ability to manage intersubjectivity – or the ability to assess context to an AoR sufficiently small - that a well-trained analyst can manage efficiently. (See Fig. 5).

Fig. 5 Analytical Power to the Edge



William Mitchell, Royal Danish Defence College (2009)

Part 5: Campaigns of Experimentation

The ultimate goal of the current campaigns of experimentation described below is to gain insights and further develop the requirements for training and education of personnel involved in intelligence driven operational planning for asymmetric conflict environments. However current objectives are to identify actual structural points of interest for evaluation in this regard, focusing on the intelligence cycle and its integration into operational planning: What types of non-military information should be collected (templates[43])? How do we process this information (skill sets for analysts)? How do we use it in the OPP (skill sets for analysts and planners as well as relative organisational issues)?

Campaign I - Defining the Edge from an Intelligence Perspective

The first campaign of experimentation focuses on the collection and processing of non-military information in the field (traditionally recognized as the tactical and operational levels of organization) and its subsequent exploitation within the OPP at a Battlegroup (reinforced battalion) level. It specifically calls for a test of 'power to the edge' personnel placed at the battalion level and down, hopefully in Afghanistan in the fall of 2009. The first line of collectors are being trained under the designation of 'cultural effects officers', while at the battalion level, analysts will be integrated into the OPP under the designation 'cultural effects analysts'. While the collectors will essentially collect after a template at company level, it is an essential part of the experimentation to assess the usefulness of the various types of information collected for OPP exploitation at their respective levels. Furthermore, how it is managed, and how it is shared at various levels is also of interest.

[43] See the latest US Army manual, FMI 3-24.2, Tactics in Counter Insurgency, March 2009, Headquarters, Dept. of the Army, page 20, ASCOPE template and supporting details in Appendix A.

At the battalion level, experimentation focuses on the 'cultural effects analyst' and how the non-military information is processed, exploited, and integrated into the OPP. Specifically, relationships between, MI, operations, and CIMIC (S2, S5, and S9 at lowest level) in the OPP synchronisation process with respect to the intelligence cycle are of interest. The MI analysts will be trained or provided a basic understanding of the EBAO philosophy, the functions of C2 (particularly commanders intent and timeliness), applying PMESII awareness at the local level, method (establishing baseline models, and iterative modeling), and using link analysis software for common flat lining of information sharing down and up the command structure. The purpose is to evaluate the new skill sets of personnel involved in the intelligence organization at the edge; the contribution (if any) to the pursuit of self-synchronisation; to provide insights as to its effectiveness at the various sub-theatre command levels; and to assess how it develops and manages MoEs. The initial range of C2 variables to be used for both campaigns is presented in Appendix II, and is not exhaustive, but are the assessed likely candidates to assist evaluation at this early stage.

Campaign II -Training & Education (PMESII Context) Vs. Plan Richness and MI Cycle Direction

The Al-Nur exercise at the RDDC Staff Courses provided a controlled environment for testing proposed training or education modules related to PMESII and social science method *vs.* impact on plan richness and the initial direction phases of the MI cycle. It does so at a strategic level (traditional understanding) of a Joint Command environment. This experimental platform will be systematically exploited to establish taxonomy of education and skill requirements for PMESII in terms of method skill related to hypotheses generation and evaluation as well as mental modeling with focus on iterative modeling. In this regard special attention will be given to the role of MI, operations, and CIMIC (J2, J5, and J9) in establishing a new 'tasking' culture of requests for processed non-military information. Secondly, this platform would provide a framework for establishing taxonomy of situational asymmetry where general principles for a variety of scenarios could be tested vs. non-kinetic mixes. Thirdly, such a platform would contribute directly to Staff preparation for EBAO implementation within NATO via the application of PMESII in a controlled environment. Fourthly, a systematically controlled environment could help for research and development of new techniques by isolating weaknesses within skill sets of the edge personnel. Finally, a standardized platform across NATO member Staff Colleges, and a common lessons learned would speed up development and identify elements in training that are not culturally specific to individual member states. The RDDC is a present in the initial phases of establishing the foundation for this experimental platform. It is hopeful that it will be up and running systematically by the spring of 2010.

Conclusion

A constructivist understanding of the asymmetric environment offers a theoretical explanation as to why complexity develops based on the role of intersubjectivity. It is from this understanding placed within the context of military intelligence and planning, that three challenges were identified: the need for sense-making agility; the expansion of the scope of intelligence to be collected and processed in order to manage the cognitive (ideational) domain of the battlespace; and finally managing the fluidity of dividing lines between our traditional understanding of what makes the tactical, the operational, and the strategic levels distinct. The experimentation described here, and to be carried out within the next year, is intended to provide some insight into how we can best meet those challenges.

APPENDIX 1 PMESII

Category	Review of Background	Review of Current Crisis
Political	History of political system. Political processes and culture. Central / Local government. Political interest groups. Regional / Int'l conditions. Influential individuals. Political security. International Organisations.	What aspects of the political system affect the current crisis? What aspects of governance are contributing to or mitigating the current crisis? Who are the key nodes in the political system and what are their goals? What are the key relationships of political system elements?
Military	History of military system. Leadership. Armed forces/ORBATS. Internal security. Military industrial complex. Logistics and Sustainment. Opposing forces.	What are the objectives of friendly and opposing forces in the current crisis? What are the key military nodes? What are probable courses of action of friendly and opposing forces?
Economic	Natural assets. Production capabilities. Distribution systems. Consumption.	What aspects of the economic system affect the current crisis? What are the critical system elements of the economic system? Who wants to use the economic system and for what goal?
Social	Ethno-linguistic groups / Religion. IO/NGOs/DP/Refugee groups. Terrorist / Criminal Organizations. Business associations. Health care / Education.	What aspects of the social system affect the current crisis? How are social groups involved in the current crisis? Relationships between social system elements?
Infra-structure	Utilities. Transportation. Industry. Public facilities.	What aspects of the infrastructure system affect the current crisis? What are the critical infrastructure system elements and their associated relationships?
Information	Global information. National information. Defence information. Military C2.	What aspects of the information system affect the current crisis? Who is trying to use the information systems and for what goals? What are the critical system elements of military C2?

APPENDIX II
Range of C2 Variables for Proposed Campaigns of Experimentation

Achievement Orientation: Culture	A cultural dimension, characterized by the degree to which values such as assertiveness, the acquisition of money and material goods, and competition prevail in a society [derived from the original concept .
Achievement Orientation: Personal Values	An individual attitude, characterized by the degree to which an individual values assertiveness, the acquisition of money and material goods, and competition [derived from the original concept 'Masculinity'].
Action Accuracy	Extent to which actions executed are directed to the intended purpose.
Action Appropriateness	Extent to which actions executed are the appropriate ones to achieve the intended purpose.
Action Completeness	Extent to which actions executed encompass the full scope of the plan or order.
Action Consistency	Extent to which actions executed are consistent with actions in an earlier timeframe.
Action Correctness	Extent to which actions executed without error.
Action Efficiency	Extent to which actions executed are efficient in the use of resources.
Action Precision	Extent to which actions executed are precisely related to the intended purpose.
Action Synchronization	Purposeful arrangement of actions in time, space and purpose. JCS Dictionary of Military and Associated Terms
Action Timeliness	Extent to which actions are executed at the time required by the plan or order (in the case of self-synchronising forces the plan could be an ad hoc arrangement between peers).
Adaptive Behaviour	Any process whereby behaviour or subjective experience alters to fit in with a changed environment or circumstances or in response to social pressure (Colman, A.M. (2003). A Dictionary of Psychology. Oxford, NY: Oxford University Press).
Adaptiveness	The ability to change work processes and the ability to change the organization. (Power to the Edge, 2003)
Agreeableness	Personality trait characterized by being pleasant, characterized by kindness, generosity, warmth, unselfishness and trust (Colman, A.M. (2001). A Dictionary of Psychology. Oxford, NY: Oxford University Press).
Alertness	State characterized by the preparedness to recognize and to react to stimuli. "Continuous Alertness": Selective recognition of and reaction to continuously or frequently occurring stimuli. "Vigilance": Recognition of and reaction to irregularly and infrequently occurring events.
Allocation of Decision Rights	The distribution of choices related to a particular topic under a set of circumstances or conditions disseminated to the international community, a society, an enterprise, or an organization.
Ambiguity of Situation	Extent to which information does not lend itself to interpretation.
Ambiguity Tolerance	The degree to which one is able to tolerate lack of clarity in a situation or in a stimulus.
Anxiety	The affective state characterized by apprehension,dread, distress, uneasiness (Reber, A.S. (1995). The Penguin Dictionary of Psychology. 2nd ed. London: Penguin Books).
Authentication	A security measure designed to protect a communications system against acceptance of a fraudulent transmission or simulation by establishing the validity of a transmission, message, or originator. JCS Dictionary of Military and Associated Terms
Awareness Accuracy	Appropriateness of precision of awareness for a particular use NCO CF
Awareness Completeness	Extent to which awareness necessary form understanding is obtained. NCO CF Awareness completeness includes awareness about capabilities, environment, forces, intentions, and mission.
Awareness Consistency	Extent to which awareness is consistent with relevant awareness at an earlier time period NCO CF
Awareness Correctness	Extent to which awareness is consistent with ground truth NCO CF
Awareness Currency	Time lag of awareness NCO CF
Awareness Precision	Level of granularity of awareness NCO CF
Awareness Relevance	Extent to which awareness obtained is related to task at hand NCO CF
Awareness Timeliness	Extent to which currency of awareness is suitable to its use NCO CF
Awareness Uncertainty	Subjective assessment of awareness uncertainty NCO CF
Cognitive Capacity	The amount of information the human brain can hold and process within a given time (Oxford Dictionary of Economics. Original reference: H. A. Simon, Models of bounded rationality, Volume 2, Cambridge, Massachusetts (MIT Press, 1982).
Cognitive Complexity	The degree to which a person is able to differentiate cognitive elements, and the degree to which these elements can be integrated or related to each other (e.g., Fransella & Bannister,

	1977; Schroder et al., 1967; Wyer, 1964; citation (p. 782) from Van Hiel, A. & Mervielde, I. (2003). The Measurement of Cognitive Complexity and Its Relationship With Political Extremism. Political Psychology, 24 (4), 781-801
Cognitive Flexibility	An individual's willingness and ability to change in their understanding of a situation when confronted with new or contradictory information. Cohesion The degree to which team members are attracted to each other and motivated to stay in the team.
Collaboration Capacity	Team members' ability to working together towards a common purpose.
Collaboration Completeness	Includes collaboration about capabilities, environment, forces, intentions, and mission.
Complexity of Situation	The degree to which the relevant information is complicated (involves many factors), and involves intricate linkages; and is therefore difficult to understand.
Cooperability	The ability to engage in co-operative behaviour in a team, e.g. by information sharing and mutual support.
Cooperative Behaviour	The practice of people or greater entities working in common with commonly agreed-upon goals and possibly methods, instead of working separately in competition. URL: http://en.wikipedia.org/wiki/Cooperation [10.03.2005]
Decision Completeness	Extent to which relevant decisions encompass the necessary: depth: range of actions and contingencies included, breadth: range of force elements included, time: range of time horizons included. NCO CF
Decision Correctness	Extent to which a decision is consistent with ground truth. NCO CF
Decision Currency	Time taken to make a decision (start time - external signal). NCO CF
Decision Relevance	Extent to which a decision is significant to the task at hand. NCO CF
Decision Type	Extent to which a decision is based on rules, algorithms or human judgment.
Decision Uncertainty	Process of generating command intent. NATO COBP for C2 Assessment.
Education	Capacity to learn, A program of instruction of a specified kind or level. The American Heritage Dictionary of the English Language, Fourth Edition. 2004
Equivocality of Situation	Extent to which information can be interpreted in different ways.
Extent of Shared Information	Proportion of understanding in common across force entities, within and across communities of interest (Communities of Interest).
Information Accuracy	Degree to which information quality matches what is needed.
Information Completeness	Extent to which information relevant to ground truth is collected
Information Consistency	Extent to which information is consistent with prior information and consistent across sources
Information Correctness	Extent to which information is consistent with ground truth
Information Currency	Difference between the current point in time and the time the information was made available
Information Pedigree	Extent to which you know where information came from.
Information Precision	Level of measurement detail of information item.
Information Relevance	Extent to which information quality is relevant to the task at hand.
Information Richness	Measures that address the quality of the information content used by actors. (Understanding Information Age Warfare)
Information Service	Describes a range of processing services support than might be Characteristics provided to the force for continuance of operations. Each alternative builds on the previous.
Information Sharability	The extent to which an element of information is in a form or format understandable by all nodes in a network.
Information Source Characteristics	The traits of tools used to develop facts, data, or instructions in any form or medium. All information sources are reporters. They have the following characteristics: False alarm rate; coverage; persistence; spectrum (sensitivity); phenomenonology DOD Dictionary of Military and Associated Terms
Information Accuracy	Degree to which information quality matches what is needed.
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Information Timeliness	Extent to which currency of information is suitable to its use.
Information Transfer Approach	Movement and distribution of information.
Information Uncertainty	A fundamental attribute of war. Uncertainty pervades the battlefield in the form of unknowns about the enemy, the surroundings, and our own forces. (Power to the Edge)
Mental Models Confidence	The degree of subjective confidence that the mental model in use is appropriate to situation and task.
Mental Models Relevance	The extent to which mental model in use is appropriate to the actual situation and task at hand.
Mental Models Richness	The breadth and depth of the range of models that can be brought to bear on the situation.
Mission Effectiveness	Mission Effectiveness is the degree to which a force accomplishes its assigned military mission. Examples of specific components are described in Maxwell, 1998.
Mobility	Extent to which a sensor is able to move from place to place while retaining its ability to fulfill its primary mission.
Plan Accuracy	Degree that the plan matches the Commander's intent.
Plan Completeness	Degree that the plan does not have missing components.
Plan Consistency	Degree of logical coherence of the plan, including elements that cut across functions or echelons.
Plan Correctness	Degree the plan is error free.
Plan Currency	The time lag of issuance of the plan .
Plan Feasibility	Degree to which the plan is practicable.
Plan Precision	Level of granularity of elements of the plan.
Plan Relevance	Degree that the plan is pertinent to the Commander's Intent.
Plan Timeliness	Extent to which the plan currency is suitable for use. A suitable length of time used to develop a plan after recognition of the need for a plan.
Plan Uncertainty	Extent to which is it not able to know or predict ground truth based on the plan.
Planning Speed	Time required to develop a plan after recognition of the need for a plan.
Policy Effectiveness	The degree of success in influencing and determining decisions, actions, and other matters as related to societal and policy outcomes.
Problem Solving Style	An individual's problem solving style may be either divergent or convergent. Convergent thinking: bringing together or synthesizing of information and knowledge focused on a solution to a problem; characterized by synthesis of information and analytical, deductive thinking; logical, consciously controlled, reality-oriented. Divergent thinking: diverging of ideas to encompass a variety of relevant aspects, fluent production of a variety of novel ideas relevant to the problem (Reber, A.S. (1995). The Penguin Dictionary of Psychology. 2nd ed. London: Penguin Books).
Shared Awareness Accuracy	Appropriateness of precision of shared awareness for a particular use.
SharedAwareness Completeness	Extent to which awareness necessary forms a complete shared understanding. NCO CF
Shared Awareness Consistency	Extent to which shared awareness is consistent within and across Col.
SharedAwareness Correctness	Extent to which shared awareness is consistent with ground truth.
Shared Awareness	Time lag of shared awareness.

Currency	
Shared Awareness Precision	Level of granularity of shared awareness.
Shared Awareness Relevance	Proportion of shared awareness that is related to the task at hand.
Shared Awareness Timeliness	Extent to which currency of shared awareness is suitable to its use.
Shared Awareness Uncertainty	Subjective assessment of confidence in shared awareness.
Shared Information Accuracy	Appropriateness of precision of shared information for a particular use
Shared Information Completeness	Extent to which relevant shared information is obtained.
Shared Information Consistency	Extent to which shared information is consistent within and across communities of Interest (CoI).
Shared Information Correctness	Extent to which shared information is consistent with ground truth
Shared Information Currency	Time lag of shared information.
Shared Information Precision	Level of granularity of shared information
Shared Information Relevance	Proportion of shared information that is related to task at hand
Shared Information Timeliness	Extent to which currency of shared information is suitable to its use.
Shared Information Uncertainty	Subjective assessment of confidence in shared information.
Shared Understanding Accuracy	Appropriateness of precision of shared understanding for a particular use.
Shared Understanding Completeness	Extent to which relevant shared understanding is obtained.
Shared Understanding Consistency	Extent to which shared understanding is consistent within and across Col.
Shared Understanding Correctness	Extent to which shared understanding is consistent with ground truth.
Shared Understanding Currency	Time lag of shared understanding
Shared Understanding	Level of granularity of shared understanding.
Shared Understanding Relevance	Proportion of shared understanding that is related to the task at hand.
Shared Understanding Timeliness	Extent to which currency of shared understanding is suitable to its use.
Shared Understanding Uncertainty	Subjective assessment of confidence in shared understanding.
Situational Familiarity	The characteristic of having encountered or seen, or having knowledge of a situation.
Understanding Accuracy	Appropriateness of precision of Understanding for a particular use NCO CF
Understanding Completeness	Extent to which Understanding necessary from understanding is obtained NCO CF. A completeness of understanding includes understanding of capabilities, environment, forces, intentions, and mission.
Understanding Consistency	Extent to which Understanding is consistent with relevant awareness at an earlier time period NCO CF
Understanding Correctness	Extent to which understanding is consistent with ground truth NCO CF
Understanding Currency	Time lag of Understanding NCO CF
Understanding Precision	Level of granularity of Understanding NCO CF
Understanding Relevance	Extent to which Understanding obtained is related to task at hand NCO CF
Understanding Timeliness	Extent to which currency of Understanding is suitable to its use NCO CF
Understanding Uncertainty	Subjective assessment of Understanding uncertainty NCO CF

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