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"Using Target Network Modelling to Increase Battlespace Agility"

ID 055

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ABSTRACT

Battlespace agility is a warfighting concept defined as *the speed at which the warfighting organisation is able to transform knowledge into actions for desired effects in a battlespace.* If the Commander, the intelligence shop, and the operations people cannot draw a common picture of their battlespace – it is unlikely that the ensuing military operations will produce the desired effects. Ideally, the Commander, the intelligence silo, and the operations planning silo should have a common understanding of the battlespace in which they are fighting. The objective of this paper is to highlight one emerging communicative approach that has proven effective in facilitating shared situational awareness and understanding, called ***target network modelling (TNM)*****.** The paper will introduce readers to TNM as a communications methodology for making the military organization more agile in the battlespace by improving its ability to share situational awareness and understanding. It aspires to convince a unit's Commander, intelligence officers, and operational planners to strive for a structured set of common mental models defining the battlespace, before engaging in operational planning.

Introduction

The character of warfighting has become more complicated, fluid, and volatile in the information age; therefore our capacities to provide situational awareness and understanding must be improved in terms of speed and precision accordingly. The 19th-20th century notions of quantity and strength of arms to determine success in a battlefield with a formal treaty of surrender are no longer the norm; but rather John Arquillas' notions of the 'many and small' beat the 'few and large,' and 'finding matters more than flanking' are an undeniable requirement of todays' conflicts.[1] And this entails speed and precision of actions (*agile actions*) to constantly maintain a set of desirable conditions, as achieving a static end-state is not as clear cut as it used to be, and conflicts turn often into a long drawn out political affair. Emerging from this discourse is a distinct understanding of war that accepts that modern militaries have to fight in the complexities of a *post-modernist*[2] battlespace, a philosophical stance that sees all situational understandings for determining military actions as being socially constructed realities and constantly subjected to change. How effective one is at warfighting is essentially the result of how effective one is at managing the *intersubjective* relationship between oneself and one's battlespace. *Intersubjectivity* refers to the interaction between knowledge[3] and the material world, neither of which are fixed.[4] And though the physical boundaries of a battlespace are still largely determined by the technical assets for physical actions, *how* meaning is attached to those actions has no clearly defined physical boundaries.[5] Even to the point to where today, it may not be acceptable to decimate a legitimate enemy force. If the method of destruction or the extent of the destruction is too violent for world opinion, the net result of the successful military action could very well be negative.[6]

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[1] Arquilla (2010)

[2] Postmodernism postulates that many, if not all, apparent realities are only social constructs and are therefore subject to change. It claims that there is no absolute truth and that the way people perceive the world is subjective and emphasizes the role of language, power relations, and motivations in the formation of ideas and beliefs. (See *An Overview of Premodernism, Modernism, & Postmodernism. Postmodern Psychology*. N.p., n.d. Web. 22 Feb 2012. (http://www.postmodernpsychology.com/); For an example in military sociology see Henrotin (2004).

[3] *Knowledge* here is understood from the conventional constructivist perspective that accepts a subjective context for the pragmatic extraction of knowledge gained from the deconstruction of an intersubjective relationship. In short, radical constructivists (Frankfurter school) do not accept that knowledge exists as intersubjectivity cannot be stopped. See Ted Hoff (1998) & Mitchell (2004).

[4] Epistemology, see Adler 1997, 322; Adler 2002, 104-109. Checkel 1998, 324-348; Reus-Smit 2001, 218. See conventional constructivism in Ted Hopf's "Promise of Constructivism in International Relations Theory" presented in International Security in 1998; and Adler 1998.

[5] Look to Barnett's narrative explanation of Egypt's decision to go to war with Israel Barnett, 1998 for one of first uses; Nissen 2012a, 2012b, 2011; NATO AJP 2.0 Draft 2011; Mitchell 2012a, 2012b, 2012c, 2010a, 2010b, 2004.NATO (2007).

[6] For example, A-10 Warthog pilots refusing to fly more sorties on retreating Iraqi forces along the "highway of death" out of Kuwait in 1991 because it was too easy to kill the fleeing Iraqi forces.

From the perspective of a constructivist,[7] network thinking, as described in the late 1990s by John Arquilla, can be seen as a method for managing and communicating a representation of the intersubjective system of systems relationships in a battlespace. One certainly can find a nexus between militancy, criminality, and terrorism, as described by Arquilla in *Netwars*, in many of our current battlespaces. Furthermore the relationship between technical and social networking has become more interdependent with cybernetic developments driving social changes in how we communicate and organize. On certainly inspires developments and changes in the other. In the military doctrinal context, the technological aspect of network centric warfare [NCW] is no longer the main challenge,[8] it is the human and social networks[9] that we are now grappling with to improve our sense-making in the battlespace.[10] Again, we have been quick to provide 21st century real time video and 21st century information sharing technology, but provide slow to change military social organization, still accurately described as Napoleonic.

Transposing the language of the philosopher onto that of the war fighter, the principle can be restated as "he who manages 'intersubjectivity' best – wins". Though definitely not as sexy sounding as some of the others out there, it goes to the heart of modern warfare. The reality of warfighting today is that the *net value* of any particular action, in any given battlespace, at any given time, will be determined by the interaction between the physical and cognitive domains. Be warned, it is not a zero-sum calculation between the two domains.

Furthermore, the net resulting effect no matter how desirable is likely a perishable good is the high speed age of information. OODA loops are collapsed beyond all reasonable timeline measurements due to advances in technology, and the idea of the static 'end state' typically defined by territorial occupation, is quickly becoming synonymous with 'end condition' defined by suffice situational management. The warfighting organization in the 21st must be able manage the affect-effect relationship in both the physical and the cognitive domains of the battlespace to the best of their ability (see Fig. 1.0).

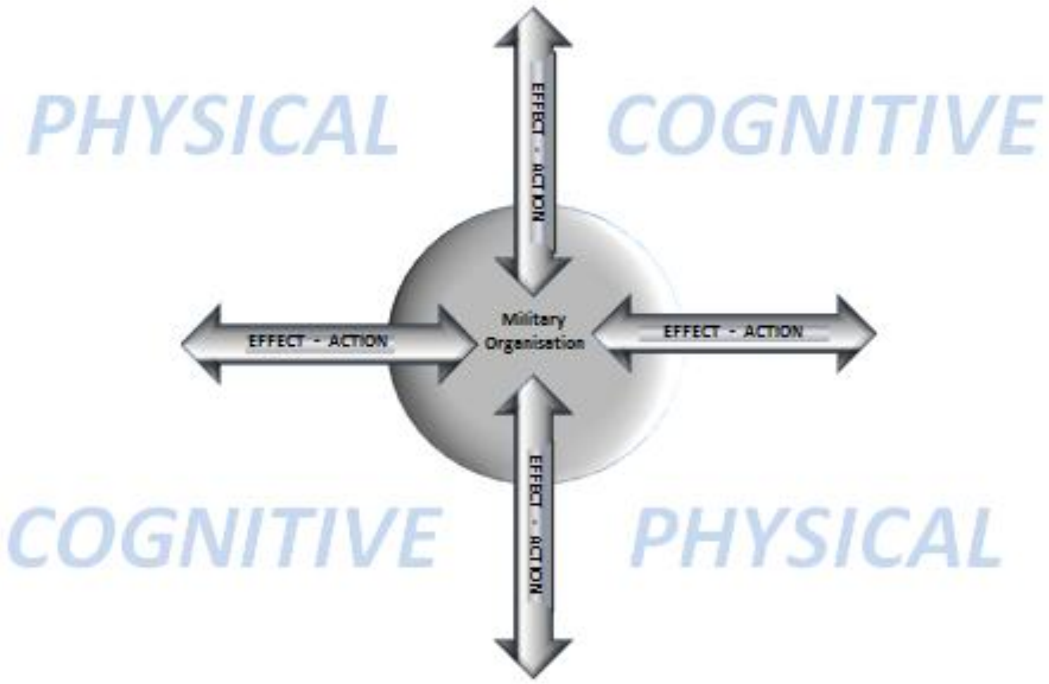
[7] Social constructivism as it is used here to explain battlespace complexity, is defined as the view that the material world shapes and is shaped by human action and interaction dependent on dynamic normative and epistemic interpretations of the material world. Constructivists consider interpretation as an intrinsic part of social science that stresses contingent generalizations, meaning that they do not freeze our understanding but open up the social[7] world. The 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. See Adler 1997, 322; Adler 2002, 104-109.Mitchell (2004). Nicholson 2006, 133-136.

[8] See the father of EBAO, Smith 2006, 195-238; Smith 2005.

[9] See Edison, Tom (2005) for integration of social network analysis into NCW.

[10] See Holmes-Eber & Kane 2009, 31-35.

Fig. 1.0 The '*Intersubjectivity'* of Warfighting



Battlespace Agility

Battlespace agility has its origins in the broader Command & Control (C2) operational agility research[11], but focuses squarely on agility in the act of warfighting within a doctrinal framework. Based on 10 years of research[12] informed by social theory, experimentation, NATO doctrinal studies and lessons learned from field experiences in Iraq, Afghanistan, Gulf of Aden, and Libya, a generic conceptualization has developed that reflects the complexities of the contemporary battlespace. It is also from this research that we have developed doctrinal approaches to manage those complexities for operational planning. *Battlespace agility* is a warfighting concept defined as "the speed at which the warfighting organisation is able to transform knowledge into actions for desired effects in a battlespace"[13] and has four key components (see Table 1.0) below.

[11] See the acknowledgement section of Alberts, D. S. and Hayes, R.E., Power to the Edge, DoD CCRP Publications Series, Washington, D.C. 2003

[12] See the Command & Control (C2) epistemology engaging *power to the edge* (Alberts & Hayes, 2005) research with a specific focus on agility. Alberts and Hayes, 2005, 27; Alberts & Hayes, 2005, 218; SAS-026 NATO 2002; SAS-050 CCRP/NATO 2006;Also see Alberts 2011, 1997; Snyder 1993; Coakly 1991; Crumley 1989;

[13] See Mitchell (2012d).

Table 1.0 Components of Battlespace Agility

Knowledge	The battlespace situational awareness and understanding of the organization used for operational planning purposes. It is determined within the given context of a battlespace and used to inform the commander's decision-making.
Speed	Refers to the time it takes for the warfighting organisation to turn situational awareness and understanding in to actions through operational planning. (Please note here that operational planning does not refer to any set timeline or process, it could be 3 months at NATO command corridors at SHAPE or 3 minutes in front of pick-up truck in the sand in theatre). Whether or not actions are timely is a function of situation specific desired effects.
Actions	Both kinetic and non-kinetic activity executed by the warfighting organisation in the battlespace.
Desired Effect	The intended change of the warfighting organization as regards the state of a battlespace system or 'system of systems' as defined by the Political, Military, Economic, Social, Infrastructure, Information (PMESII) domains, resulting from one or more deliberate actions, including deliberate in-action.

Managing Complexity in the Battlespace

Without a doubt the introduction of PMESII[14] as a "systems of systems analysis" [SoSA] tool over the last eight years has been successful at communicating the transformational changes in the post-Cold War battlespace understanding at all planning levels. Today from SHAPE's Knowledge Development Directorate down to the Company Intelligence Support Team (COIST), they can all write a report on their theatre/battlespace in PMESII format. For intelligence analysts, the challenges resolved by PMESII reflect Tom Czerwinskis' "billiard" metaphor and the solution of *tagging*[15] to simplify and communicate complex situations. NATO's PMESII guideline attempts to do just that both vertically and horizontally within the organization 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.[16] By doing so it hopes to make the predictions of the non-linear interactions and their effects more manageable. This effect based thinking [EBT] and some sort of critical factors analysis (see Fig.2) calls for an expansion and exploitation

[14] PMESII – Political, Military, Economic, Social, Information, Infrastructure domains of a battlespace and represents a system of systems approach. It can also be portrayed accurately as interacting social networks.
[15] See Czerwinski 2003, 114-115.
[16] NATO Bi-Strategic Command Pre-Doctrinal Handbook, 2007, 5-3.

of our knowledge base to support the planning, execution, and assessment of actions in a complex battlespace defined by the PMESII domains (see Fig. 3.0).

With EBT as a foundation, we have seen operational planning processes adoption of critical factors analysis (physical and cognitive) as well as centre of gravity (CoG) analysis conducted within a PMESII battlespace understanding from operations in Afghanistan to Libya. The speed and precision of this type of analysis will ultimately determine the agility of the warfighting organization to adapt to its given situation.

Fig. 2.0 EBT & SoSA

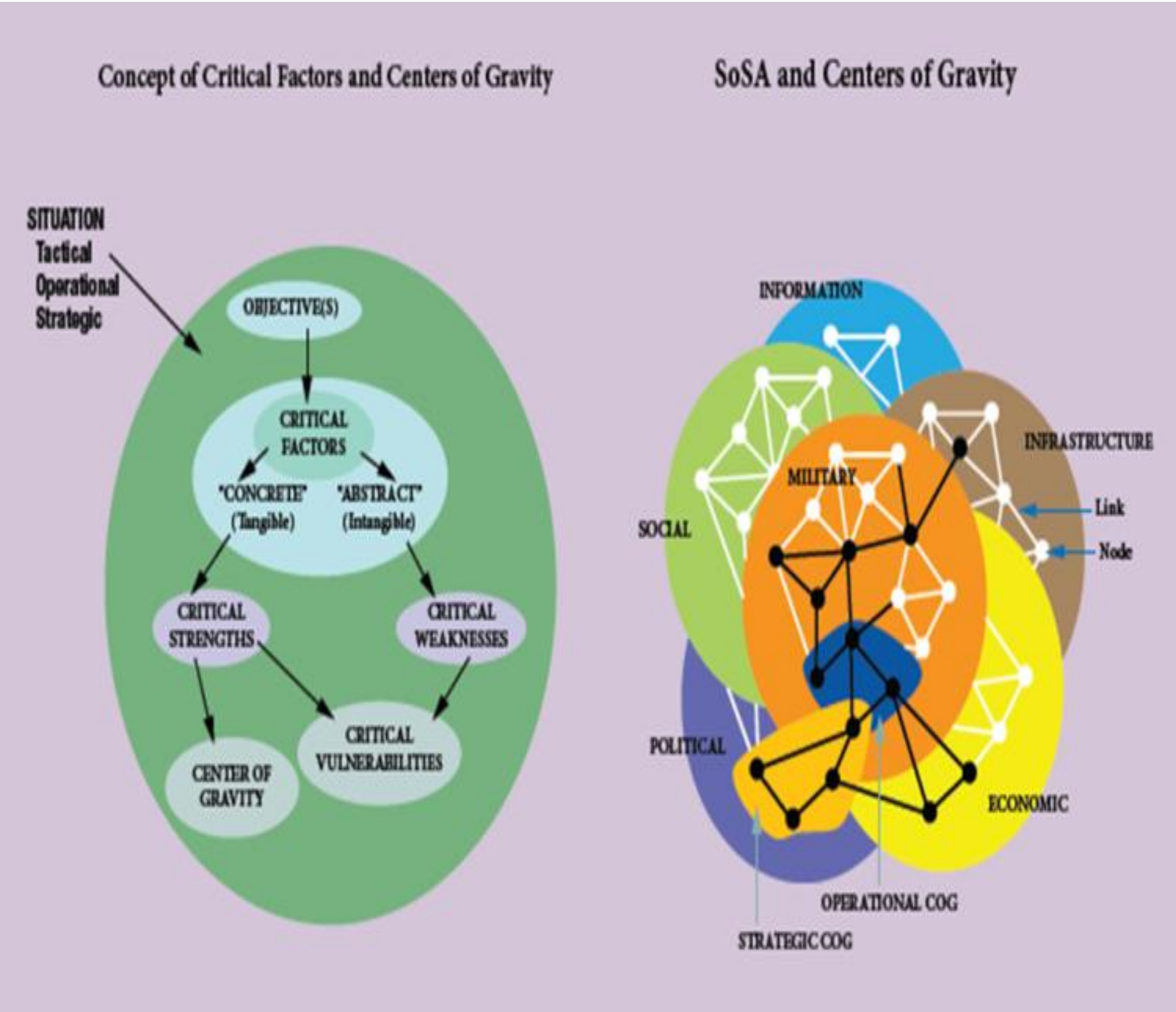
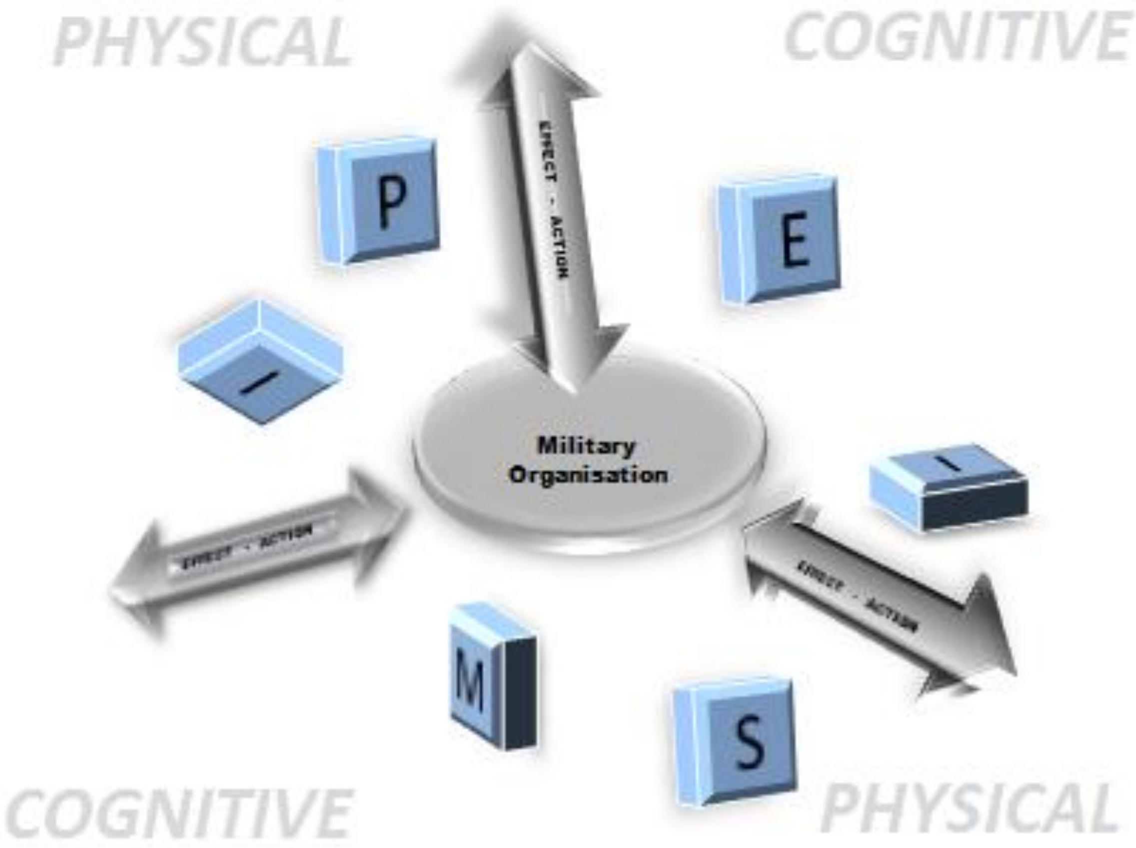


Fig 3.0 Actions & Effects in PMESII Defined Battlesapce



The Role of Military Intelligence in Operational Planning

Providing the bulk of knowledge in operational planning process for warfighting is the military organization's intelligence cycles.[17] They are iterative processes that reflect four stages: *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. They are responsible for disseminating a large part of situational awareness, and almost all of situational understanding. For most familiar with operational planning, s*ituational awareness and understanding* refers to the

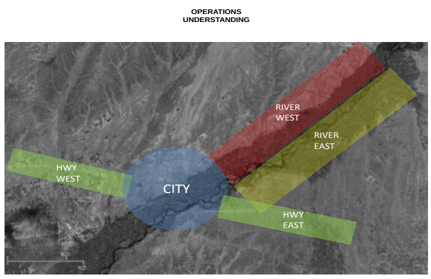
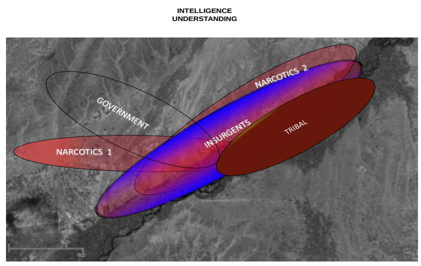
[17] For a generic understanding see Clark (2004), Ch.1; Herman, (2004), 293-296; Mitchell (2002), 486.

knowledge base for description, explanation, and prediction relative to the battlespace to be used for determining the actions for the desired effects. A more technical definition would be the perceptions of the elements in the environment within a volume of time and space, the comprehension of their meaning, and the projection of their status in the near future.[18]

The importance of having shared situational awareness and understanding between operational elements of a unit cannot be understated. If the Commander, the intelligence shop, and the operations people do not have a common understanding of their battlespace, or a divergent understanding, it is unlikely they will agree on the scope, type, and tempo, of the actions necessary to achieve the desired effects. Moreover, there will likely be disagreement on the measurements of effectiveness (MoEs) and measurements of performance (MoP). In short, without shared situational awareness and understanding, the unit will likely start off in the wrong direction, and the likely result will be military actions that do not produce the desired effects effectively enough, not at all, or make things worse. The example from Afghanistan presented in Fig. 4.0 below illustrates how divergent situational understandings between the operational planners and the intelligence, one group seeing a conventional battlespace divided up in physical areas to control; the other seeing a battlespace divided into different networked narcotics cartels.

Fig. 4.0

Helmand Example of Divergent Situational Understanding

<table>
<tr><td></td><td>S3
(Operations)</td><td>S2
(Intelligence)</td></tr>
<tr><td>Helmand 1
Area of
Responsibility
(AoR)
Understanding</td><td>
</td><td>
</td></tr>
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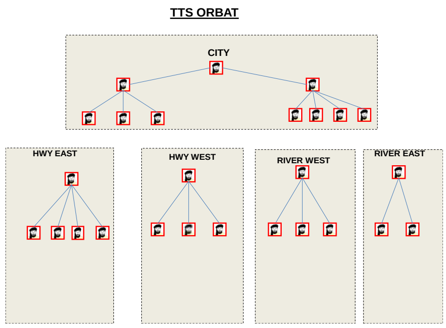
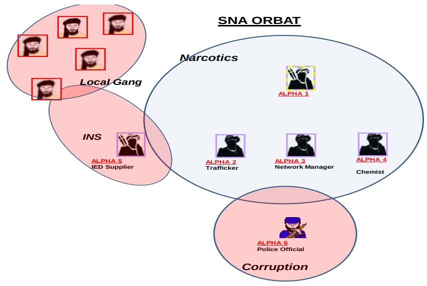
[18] Endsley (1998):97-101.

Helmand 2 Order of Battle (ORDBAT) Understanding		

The requirement for military intelligence to provide the Commander and the operations silo with accurate and timely situational awareness and understanding has not changed, and is definitely not new to warfighting. However the environment in which militaries fight has changed. Complexity in modern warfare requires more than Order of Battle styled reports [ORBATS].[19] ORBATS are one of the traditional products of basic military intelligence output. It usually covers tracking primarily material/efficiency concerns from the military dimension such aspects of the opponent's equipment, capabilities, performance,[20] and some relatively light socio-political matters relative to leadership or logistical support.[21] If EBT operations are to be effective they must be supported by relevant[22] intelligence collection from non-military dimensions and an expansion of the knowledge base primarily through non -ORBAT information.[23] The nature of analysis has traditionally been descriptive in terms of the time and space dimensions.[24] However EBT requires a great deal more predictive battlespace awareness [PBA][25] for the commander and it is here the challenges lie in terms of adjusting the training of our analysts. In short, applying SoSA in the form of PMESII to meet the challenges of the complex battlespace within an EBT context will require a focus on predictive analysis[26] (Mitchell 2002). It is here the adoption of TNM can contribute greatly to battlespace agility at the point of dissemination and direction, where situational awareness and understanding is shared with the Commander and operations silo.

Ideally, the Commander, the Commanders' intelligence silo, and the Commanders' operational planning silo should have a common picture of the battlespace in which they are fighting. Finding methods to simplify the communication of that common picture, will

[19] Using UK MOD Doc (1999):1A-2 definition.

[20] For a good example of the comparative tech focus see Libicki & Johnson (1995), 48-49

[21] Military intelligence output is divided generically into basic and current intelligence – current intelligence is situational and not referential in character.

[22] See Schoffner 1993, 31-35.

[23] For example ASCOPE in US Army Manual 2009.

[24] See 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.

[25] Using SAB-TR-02-01 (2002) definition.

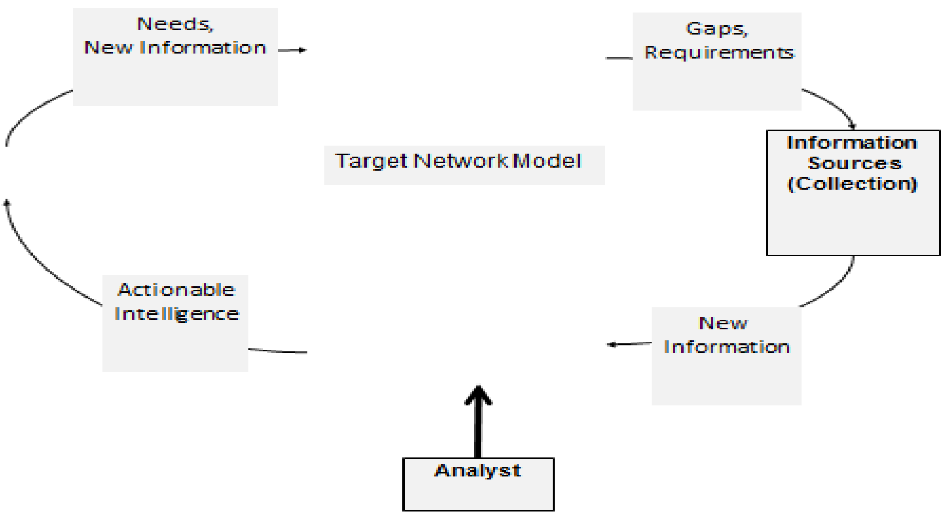
[26] Mitchell 2002, 481-485.

also contribute to more agility in the battlespace. One technique that has proven[27] effective in facilitating shared situational awareness and understanding; the technique is called ***target network modelling*** [TNM]. The brief will introduce readers to TNM as a methodology for making the military organization more agile in the battlespace by improving its ability to share situational awareness and understanding. It aspires to convince a unit's Commander, intelligence officers, and operational planners to strive for a simplified common model of the battlespace, before engaging the battlespace.

Target Network Modeling (TNM)

Robert M. Clark was the first to really isolate target network modeling as a tool for intelligence analysis, in his book *Intelligence Analysis: A Target Centric Approach* in 2004. TNM is based on a splicing of two analytical techniques, the first is *modeling*, and the second is *network analysis* via link or SoSA . In Fig 5.0, the intelligence process visualized by Clark defines the target as a network and places it at the center of the knowledge development process. This represents a movement away from the linear and stove piped knowledge development processes to networked and collaborative knowledge development process where all contributing elements are constantly in the learning curve, not dependent on a linear phase or stage.

Fig 5.0 Robert M. Clark - *A Target Centric Approach*



[27] TNM was tested in Helmand, Afghanistan by the Danish Battlegroup Team 10 in conjunction with target generation processes related to both SOF and conventional forces. Under 16th Air Assault Brigade target networks models were used to generate, track, and prioritise target sets between different units. The technique is an operationalization of Robert M. Clark's

A model is a replica, or representation, of an idea, an object, or an actual system. For the purposes of battlespace definition, it should describe how the system behaves. In this regard it should identify the key structures, functions, and processes related to the system in focus.[28] Network analysis has its origins in network theory and essentially is intended as a methodology for managing non-linear or asymmetric relationships. Where it concerns intelligence it is primarily link and social network analysis techniques that have become a pillar of intelligence analytical techniques in general. However John Aquila's *Netwars* (first printed in 1997) set the stage for an integration of network analysis into military intelligence and operational planning.[29] The merging of both techniques within doctrinal circles has recently been reflected in the US Joint Warfighing Centers' *Commanders Handbook for Attack the Network*[30] that deals in more details with issues raised in this brief. When combined with modeling, we have a common methodology for discussing and determining common situational understandings that are easily communicated between interested parties. All battlespace component commands refer to the same TNM structure that consists of the Master TNM and secondary TNMs, essentially all component commands and their battlespaces will be populating secondary TNMs for their own operational planning. Master TNMs represent the totality of a battlespace for a unit, while secondary TNMs are a further network model breakdown of specific elements of the Master TNM. For example if there are two insurgent clans visualised on a master TNM, two secondary TNMs representing the two clans, could be visualised, produced, and populated.

Helmand Case Study

The following TNM approach was applied within the Danish Battlegroup from September 2010 to January 2012 in the Upper Gereshk Valley area of Helmand, Afghanistan to assist in facilitating target generation (kinetic and non-kinetic) based on effects analysis. The Master TNM based on a 4 state model was used throughout Helmand from about October, 2010, support by the various component commands by secondary models that would drive intelligence collection and targeting. As part of the Danish military project Kitae, the effects of applying Clarks' techniques were qualitatively analyzed and integrated intelligence courses on the home front. The following summary tables in Fig.6 and Fig. 7 from the project are presented here to argue the case that TNM greatly improves battlespace agility, by increasing the speed and precision of shared information, shared awareness, and situational understanding. In this Master TNM example, the shared situational understanding across Helmand is reflected in 4 competing forms of governance, *Shadow* (the insurgency), *Dark* (criminal/narcotics), *Official Governance* (National Government), and *Traditional Governance* (Tribal). Fig. 7.0 illustrates a simple secondary TNM populated with details by sub-units to depict their specific battlespace within the dynamics of the master TNM with all four competing governances represented.

[28] See Clark 2004.
[29] See John Arquilla (1997).
[30] Joint Warfighting Centre, 2011.

Fig. 6 Helmand Master TNM Example

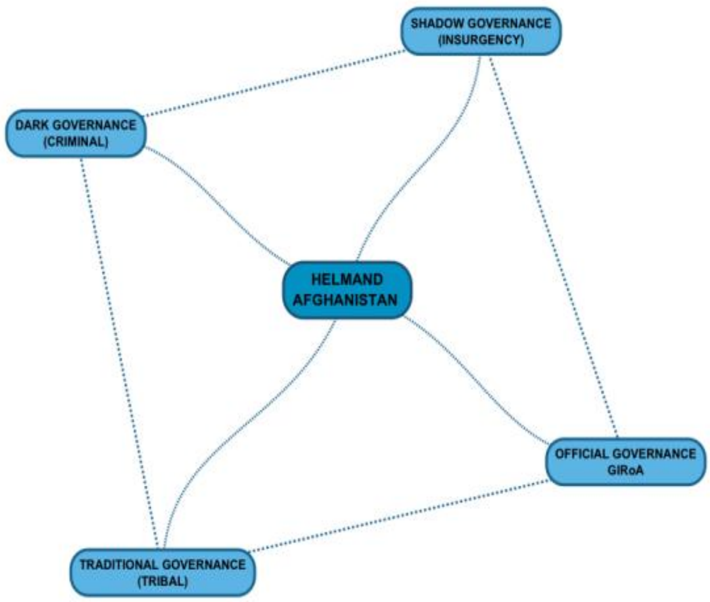
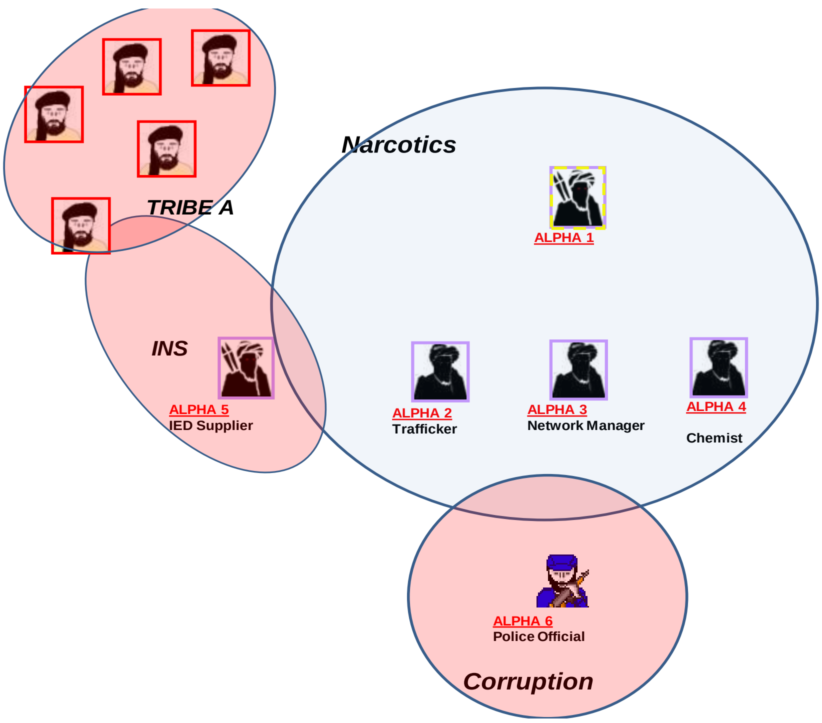


Fig. 7.0 Helmand Sub-Unit Secondary TNM Example



The targeting[31] measurements presented below in Table 2.0 are summaries from Kitae I[32] and include both the kinetic and non-kinetic targets generated for both conventional forces and Special Operations Forces (SOF) units. It is a process that facilitates the attack of the right target, with the right asset, at the right time and place, in order to achieve desired effects on target.[33] The measure provides the most concrete measure of battlespace agility as it is based completely on the principle of *actioning* intelligence (knowledge) in a timely manner. Essentially the more targets produced, the more opportunities for action towards desired effects.

Table 2.0 Effect Generation Summary
Helmand Case Study

	Targets Generated	Targets Exploitations
AUG 2010	**77**	**21**
SEPT 2010	**89**	**54**
NOV 2010	**426**	**79**
JAN 2011	**317**	**49**

Table 2.0 also illustrates an increased efficacy in the targeting processes that was driven by the TNMs illustrated in Fig. 6 and Fig.7 implemented in Sept/Oct 2010. The implementation of TNMs to managing target generation and exploitation facilitated the targeting across the board with the different component commands so much so that communication of prospective targets between different units and commands could be accomplished with a single TNM on a Power Point slide emailed to the necessary unit. It is not the intention to suggest that TNM was the singular instigator of the increase in efficacy, but as the managing framework for target generation it certainly played a key role. The onus was on activating a targeting organisation that could learn and adapt fast through *situational understanding*[34], identifying the desired effects in that situation, and executing the right actions to achieve them. The targeting organisation had to adapt to the situation in order to understand and generate the desired effect; not adapt the situation to the targeting organisation and hope for the best. This requires specific tools and approaches to ensure a common framework for communicating situational awareness and

[31] Targeting is the process of selecting targets and matching the appropriate system (kinetic and non-kinetic) to them based on operational requirements and capabilities.
[32] Mitchell (2012)
[33] See Decide, Detect, Deliver, Assess (D3A) – Army doctrinal targeting process/ Find, Fix, Finish, Exploit, Assess (F3EA) – Joint doctrinal targeting process/Find, Fix, Track, target, Exploit, Assess (F2T2EA) – Joint doctrinal targeting process for Time Sensitive Targets
[34] Dostal, 2007. Situational understanding differs from awareness in that it is the result of assessing situational awareness, or an easy way to frame it is situational awareness deals with identifying the "*who, what, where, and how"* while understanding focuses on the "*why"*.

understanding between elements of the warfighting organisation. The greater the shared understanding within the organization, the more likely the **speed** and **precision** of actions will produce desired effects, producing greater battlespace agility. TNM provided a relatively simple method of communicating situational understanding with regards to populating secondary models, and greatly increased the overall agility in the battlespace.

The following tables represent the majority of the qualitative indicators originally defined by NATO SAS-50, used to assess the impact on the battlespace agility components. By using simple TNMs, the large majority of measurement variables indicated an improvement in battlespace agility. Furthermore, it contributed to facilitating a shared situational understanding amongst units in such a fundamental way that resilience was improved in periods where there was a degraded environment.

Table 3 AFG TNM Analysis Shared Information Matrix

Measurement Variables		Definition	Primary Battlespace Agility Component	HELMAND, AFGHANISTAN (2010-2011)	Projected in Degraded Environment
1	**Shared Information Accuracy**	Degree to which shared information quality matches what was is needed	Precision	TNM reduced the collection of frivolous information.	**If initial context established then information accuracy still improves**
2	**Shared Information Completeness**	Extent to which shared information relevant to ground truth is collected.	Precision	TNM ensured contextual flexibility with individual parts of the overall problem. (ex. Role of poppy farming)	**If initial context established then information completeness still improves**
3	**Shared Information Consistency**	Extent to which shared information is consistent with prior shared information and consistent across sources.	Precision	TNM improved the generic framework for collection that improved consistency especially on handovers.	**If initial context established then information consistency still improves.**
4	**Shared Information Correctness**	Extent to which shared information is consistent with ground truth.	Precision	TNM greatly improved the consistency with ground truth. It essentially stopped the organization from making the situation fit the organizational doctrine, and adjust the doctrine to fit the situation.	**If initial context established then information correctness still improves.**
5	**Shared Information Currency**	Difference between the current point in time and the time the shared information was made available.	Speed	TNM combined with 'flatling' technologies greatly increases currency.	**If initial context established then information currency does not get worse.**
6	**Shared Information Precision**	Level of granularity of measurement detail of shared information item.	Precision	TNM provided a framework that restricted the communication of frivolous information. Individual components better managed their own details by 'pulling' only the needed information within the improved context.	**If initial context established then information precision improved through better management and promotion of the 'pull' principle.**
7	**Shared Information Relevance**	Extent to which shared information quality is relevant to task at hand.	Speed & Precision	TNM greatly improved shared information relevance through providing a more broadly shared context platform reducing time wasted on irrelevant information.	**If initial context established then shared information relevance still improves.**

8	**Shared Information Timeliness**	Extent to which currency of information is suitable to its use.	Speed	TNM greatly improved timeliness as it promoted a common framework for information, it was easier to share.	**If initial context established then shared information timeliness still improves.**
9	**Shared Information Uncertainty**	Degree of uncertainty about the battlespace. The sum of unknowns.	Precision	TNM reduced uncertainty as to component commands' responsibility in the 'big picture.'	**If initial context established then shared information uncertainty is improved.**
10	Shared Information Sharability	**The extent to which an element of information is in a form or format understandable by all nodes in the Network.**	**Speed & Precision**	**TNM greatly increased information 'shareability' as it focuses on shared context between the component commands instead of details.**	**If initial context established then shared information share ability does not worsen.**

Table 4 AFG TNM Analysis Shared Awareness Matrix

Measurement Variables		Definition	Primary Battlespace Agility Component	HELMAND, AFGHANISTAN (2010-2011)	Projected in Degraded Environment
11	**Shared Awareness Accuracy**	Appropriateness of precision of shared awareness for a particular use.	Precision	TNM increased shared awareness accuracy by reducing background noise. Focus is where it should be.	**If initial context established, shared awareness accuracy does not worsen.**
12	**Shared Awareness Completeness**	Extent to which the shared awareness necessary forms a complete shared understanding.	Precision	TNM enhanced shared awareness completeness by providing all planning levels with a common framework of reference.	**If initial context established, shared awareness completeness does not worsen.**
13	**Shared Awareness Consistency**	Extent to which shared awareness is consistent within and across collaboration.	Precision	TNM enhanced shared awareness consistency by providing all planning levels with a common framework of reference	**If initial context established, shared awareness consistency does not worsen.**
14	**Shared Awareness Correctness**	Extent to which shared awareness is consistent with ground truth.	Precision	TNM greatly increased shared awareness correctness by forcing a broader understanding of the key dynamics of the battlespace across the breadth of the military organization.	**If initial context established, shared awareness correctness does not worsen.**
15	**Shared Awareness Currency**	Time lag of shared awareness.	Speed	TNM combined with flat-lining technologies greatly reduces the time lag of shared awareness.	**If initial context established, shared awareness currency does not worsen.**
16	**Shared Awareness Precision**	Level of granularity of shared awareness.	Precision	TNM reduces the number of filters between source and end user. Reducing the 'Chinese whisper' effect.	**If initial context established, shared awareness precision does not worsen.**
17	**Shared Awareness Relevance**	Proportion of shared awareness that is related to the task at hand	Precision	TNM supports and promotes 'pull' principle with the organization and ensures a higher degree of relevance as it is the end user who takes what is needed, not intervening filters 'pushing' what might be needed.	**If initial context established, shared awareness relevance does not worsen.**

18	**Shared Awareness Timeliness**	Extent to which the currency of shared awareness is suitable to its use.	Speed	TNM greatly increases shared awareness timeliness through providing easily communicable mental models.	**If initial context established, shared awareness timeliness does not worsen because of TNM.**
19	Shared Awareness Uncertainty	**Subjective assessment of confidence in shared awareness.**	**Precision**	**TNM reduced uncertainty as to the shared awareness of the 'big picture.'**	**If initial context established, shared awareness uncertainty does not worsen.**

Table 5 AFG TNM Analysis Shared Understanding Matrix

Measurement Variables		Definition	Primary Battlespace Agility Component	HELMAND, AFGHANISTAN (2010-2011)	Projected in Degraded Environment
20	**Shared Understanding Accuracy**	Appropriateness of precision of shared understanding for a particular use.	Precision	TNM increased shared understanding accuracy vertically and horizontally within the organization.	**If initial context established, shared understanding accuracy does not worsen.**
21	**Shared Understanding Completeness**	Extent to which shared understanding necessary forms a complete shared understanding.	Precision	TNM increased shared understanding completeness vertically and horizontally within the organization.	**If initial context established, shared understanding completeness does not worsen.**
22	**Shared Understanding Consistency**	Extent to which shared understanding is consistent within and across collaboration.	Precision	TNM increased shared understanding consistency vertically and horizontally within the organization.	**If initial context established, shared understanding consistency does not worsen.**
23	**Shared Understanding Correctness**	Extent to which shared understanding is consistent with ground truth.	Precision	TNM increased shared understanding correctness vertically and horizontally within the organization.	**If initial context established, shared understanding correctness does not worsen.**
24	**Shared Understanding Currency**	Time lag of shared understanding.	Speed	TNM combined with flat lining technologies greatly reduce shared understanding currency.	**If initial context established, shared understanding currency does not worsen.**
25	**Shared Understanding Precision**	Level of granularity of shared understanding.	Precision	TNM increased shared understanding precision vertically and horizontally within the organization.	**If initial context established, shared understanding precision does not worsen.**
26	**Shared Understanding Relevance**	Proportion of shared understanding that is related to the task at hand	Precision	TNM increased shared understanding relevance vertically and horizontally within the organization.	**If initial context established, shared understanding relevance does not worsen.**
27	**Shared Understanding Timeliness**	Extent to which the currency of shared understanding is suitable to its use.	Speed	TNM increased shared understanding timeliness vertically and horizontally within the organization.	**If initial context established, shared understanding timeliness does not worsen.**
28	Shared Understanding Uncertainty	**Subjective assessment of confidence in shared understanding.**	**Precision**	**TNM reduced shared understanding uncertainty vertically and horizontally within the organization.**	**If initial context established, shared understanding uncertainty does not worsen.**

Summary

Though I think most would prefer a single TNM power point slide instead of 50 traditional Intelligence Preparation of the Battlespace (IPB) slides, it is not the intention of this brief to suggest that TNM replace an IPB, but rather they supplement each other. It is suggested however that the production of a TNM by the Commander, his intelligence shop, and his operational planning silo, for their battlespace should be made standard practice – understood as one Master [35] TNM per theatre, and one secondary TNM per battlespace management.

Using TNM not only increased the shared situational understanding amongst the units, it allowed for the development of a common language for inter unit communication across the board. When it is time for the handover for example, the Master TNM acted as the start point for the relieving unit to understand the battlespace, it will also tracked what had been done by previous units, and what understandings worked or did not work that might now require attention. When it came to communicating with new actors outside of the unit, it provided a simple yet effective way of communicating the complexities of the battlespace as seen by the owners. If a Task Force had to call upon assistance from the US Federal Bureau of Investigation (FBI) for example, because of TNMs the FBI would be able to grasp quickly how the Task Force perceives its problem.

Where it concerns the use TNMs in a degraded environment, TNM is very effective with networked technologies but advantages are not technology dependent. At every start point of degraded environment, the military C2 structures that have been using TNM will have a clear advantage over those that depend on 'IPB' push pipelines for IPB updates. TNMs keep the context laterally intact through the organization as it focuses on a common sense of the general dynamics driving the battlespace and not on the details of the battlespace as a whole. As TNM promotes the contextual understanding of the battlespace in manner that is simple and efficient, units using it will have a better idea of the context they are dealing, as they go into the degraded environment.

All in all it is a simple technique that once applied generally can have tremendous usage and effect, as it is also flexible in detail therefore adaptable to various requirements of OPSEC[36] risk management. On the other hand, if the Commander, the intelligence shop, and operations silo cannot individually draw a TNM of their battlespace that resembles one another in terms of structure, functions, and processes, *it does not bode well for the assessment, planning, and execution of operations in that battlespace.* TNM is a human skill set that increases the battlespace agility of unit(s) through a faster conversion of knowledge into actions for desired effects, via improvements to shared situational understanding. It is easy to teach to all levels of planning, and efforts should be made to ensure TNM becomes a standard process, and product of battlespace management.

[35] Having 1 overall battlespace TNM depiction does not take away the option of developing more specific sub-TNM for targeting purposes.
[36] Operational Security

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