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“Collective C2 in Multinational Civil-Military Operations”

The employment of structures and work patterns in organizations involved in modern, complex, multi-national operations

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Abstract

The exercise of command and control in the context of modern, complex conflicts involving multiple nations and both military and non-military (including other governmental) organizations requires particular attention to be paid to individual and collective involvement in situational appreciation and decision-making. The technical artefacts (e.g. plans, orders, R3, assessments and pictures) by which purely military organizations might seek to maintain coherence in conventional and bounded operations need to be reinforced by constructs and principles which better exploit human and social capacities to cope with uncertainty, to adapt and to maintain agility. These constructs include:

- dynamic creation of, and affiliation to, communities and collaborations;
- the use of work patterns in situational appreciation and planning which are designed specifically to control the rate of convergence on central or preferred models, and the breadth of alternatives under consideration;
- the trajectories of individuals through the above (c.f. conventional ideas about 'the commander going forward').

Using examples developed in the course of work performed for military customers, this paper seeks to explore the challenges and opportunities that novel command management and senior leadership engagement might offer to the successful resolution of modern, complex multi-national crises.

The challenges of the modern operating environment

Modern, complex conflicts are likely to involve multiple nations and both military and non-military (including other governmental) organizations. There is a need to cope with two (related) forms of complexity:

- complexity in the operating environment, as characterised by greater uncertainty, unpredictability, ambiguity, dynamics and emergence than would be encountered in traditional ‘adversary on adversary’ (or ‘physical and kinetic’) conflict; and
- complexity within the ‘virtual organization’ (of military and non-military organizations) which is seeking to operate in this environment; this is exemplified by the need to embrace social diversity (e.g. reflected in different ways of interpreting the environment and the repertoire of possible actions).

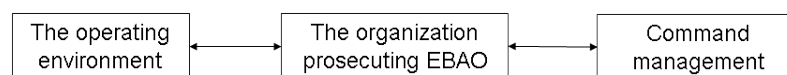
Whilst complexity does not remove the need for some form of coherence of interpretation and action, the mechanisms through which this coherence is achieved in the conventional military setting need to be supplemented. This has a particular impact on *Command Management*, through which the Commander establishes and maintains his headquarters structures, collaborations and processes with a view to maintaining operational agility and performance.

The objective and content of this paper

The objective of this paper is to offer an improved appreciation of Command Management, through which the Commander configures and adjusts the workings of the ‘virtual organization’ of military and non-military organizations.

The paper begins with an overview of the characteristics of the operating environment and the organizational elements through which an Effects-based Approach to Operations¹ (EBAO) is prosecuted.

The paper then looks at some of the specific organizational constructs, methods and principles whose potential is currently being evaluated. The aim here is not to commend these particular approaches *per se*, but to identify some of the pervasive characteristics of such organizational elements. It is these characteristics which will take us to our final objective, by illuminating the requirements for Command Management, which is effectively the ‘controller’ of the organization.



The paper concludes by drawing these issues together in a more general characterization of Command Management. The picture which emerges is of an active style of management, constantly monitoring and adjusting organizational arrangements to maintain a dynamic equilibrium in respect of the demands of the situation and the operational objectives. There are no ‘best ways of working’, only contingent balances between competing tensions, as the

¹ Whilst there has been recent criticism of ‘Effects-based Operations’ (EBO) the adoption of an Effects-based (or outcome based) approach to military operations remains a clear aspiration.

Commander seeks to exploit the available human and social capacities to cope with complexity in the operating environment.

The paper draws lessons from work conducted in support of the development, by the Swedish Armed Forces (SwAF), of an Effects-based Approach to Operations (EBAO) concept, given context and interpretation by the organizational and informatic models developed in the conduct of the research programme funded by UK MOD from 2007 to the present.

Overview

Effects-based Principles

Conflicts are always seen in the context of confrontations, and hence there is a requirement to adopt a long-term, broad perspective when dealing with conflicts, confrontations and crises, recognising political and public constraints upon the military instrument. As many nations strive to achieve a more 'Comprehensive Approach' (CA) to crisis resolution (an outcome-focused approach which employs the capabilities of multiple Instruments of Power), the military contribution to this effort is articulated within the concept of an Effects-based Approach to Operations (EBAO). This encourages an emphasis on understanding the underlying causes, rather than simply the symptoms, and the potential consequences of military actions, rather than simply the immediate actions themselves.

Within an EBAO, the terms 'cohere' and 'harmonize' are used to express collaborative activities that serve to relate all the different actions² in the environment. The tightest forms of relation are co-ordination (related in space) and synchronization (related in time); more generally, interventions in complex environments (and involving a broad range of military and non-military actors) rarely involve such tightly-related actions. Hence for complex interventions we use the terms coherence and harmonization to suggest relations in understanding and purpose³.

Learning

In complex and dynamic operational environments, challenges and problems may be difficult to characterise, may only reveal their true character once a solution (i.e. a set of intervention actions) is attempted and have the potential to change in unpredictable ways. These are characteristics which Conklin [1] ascribes to wicked problems, and a key feature of the approaches which Conklin identifies as appropriate is *learning*.

In this paper we pick out, in particular, three aspects of learning-related behaviour, all of which relate to feedback loops:

- monitoring the results of our actions and adjusting plans so as to 'steer' towards an objective (an aspect of control), i.e. desired effects;

² Here the term 'action' denotes any form of intervention in the environment, such as the employment of military force, the exercising of diplomatic relations or stabilisation and reconstruction efforts. (The term 'activity' is also used, within this concept, to distinguish organizational business, such as the conduct of planning processes, or engagement in collaborations, from forms of intervention.)

³ Cohered actions are more tightly-related than harmonized actions. Thus, whilst harmonization is ongoing, coherence may only be pursued at specific points in the Comprehensive intervention, and reflects planning agreements made by different Departments. It is noted that complex Comprehensive interventions cannot be cohered throughout their duration, since this may build too many inflexibilities into the overall Comprehensive intervention.

- monitoring the environment and adjusting our perceptions so as to bring the two into better alignment (part of *sensemaking* - see below);
- evaluating our success in the above and modifying our understanding of the repertoire of actions and potential frames.

The first and third of these aspects correlate respectively with 'single loop learning' and 'double-loop' learning, in the terminology of [3].

But there is more to learning than feedback. Learning in the sense of acquiring experience, which then conditions subsequent interpretation and action, may well incorporate feedback but also involve institutional norms, identity issues and narratives. This gets further complicated when there are multiple institutions involved: other people's world-views and interpretations could either accelerate or disrupt learning, depending on how they are exercised. These are important dimensions for organizations who wish to engage in effects-based thinking, but their proper investigation lies outside the scope of this paper.

Planning and learning

In the traditional headquarters' approach to Campaigning, the constituent activities of Analysis, Planning, Execution and Assessment tend to be organized in a 'planning-centric' fashion. Analysis tends to focus upon the interpretation of environmental phenomena (e.g. events, behaviours, intentions) within established frames [3] [4] and seeks to characterize the 'correct' operational problem. Further, a large amount of effort is expended in seeking to impose control upon the operating environment through the development of a detailed (and often tightly coupled) plan. Thus in a 'plan-centric' approach to 'complex' problems, planners attempt to break down the problem into manageable 'bite sized' issues to be dealt with. The selected plan is then pursued with military vigour. There are a number of deficiencies in this account in respect of the conduct of complex operations, but one key omission here is the ability of a headquarters to learn from these planned interactions and be prepared to re-plan as a direct consequence of this learning, rather than continuing to pursue the original plan for its own sake.

Execution focuses on the adjustment of actions *within the plan* and corresponding Assessment activities focus upon the efficacy of these actions *against the plan*, and any adjustments are made *in the context of the plan*. Whilst this approach does permit learning, this is equivalent to 'single loop learning' [2] and is constrained by the planning context.

In contrast, whilst the EBAO headquarters plans and executes actions, it mandates a continual effort to learn, not just about the efficacy of these actions⁴, but also about the appropriateness of the frames within which the plan itself has been conceived (the Campaign Design) and the frames of interpretation that have guided the design itself⁵. This learning activity is further reflected in the continual and iterative adjustments in headquarters activities, collaborations and structures, with a persistent goal of maintaining an appropriate repertoire of intervention actions – both those military actions that are to be undertaken by the military instrument and non-military actions to be undertaken by the broader set of intervention partners.

⁴ Single-loop learning [2].

⁵ This is equivalent to 'double loop learning' [2].

Sensemaking

In a learning-centric approach, there is (compared with a planning-centric approach) a more explicit recognition of the role of *sensemaking* in managing effectively, and over time, the requisite uncertainties associated with hypotheses. Sensemaking - essentially, 'making sense of the world' – is broader than the pursuit of situational awareness in two respects:

- there is an acknowledgement of the significance (to sensemaking) of *taking action in the world* (e.g. to elicit information, or even to induce a degree of order in the world which is not initially present), as well as the conduct of passive monitoring;
- there is a recognition that there may be alternative frames of reference through which what is monitored is then interpreted, and that these frames have to be utilised, and potentially modified, over time.

Sensemaking serves to retain a rich set of interpretations even when only some of those interpretations have been selected as the basis for Planning – for example, constructing alternative characterizations of operational problems as new knowledge becomes available, different intervention partners or SMEs engage in collaborations, or different ways of thinking about the environment are developed through critical thinking.

Sensemaking further requires open-mindedness⁶ with respect to different frames for interpretation (i.e. different ways of thinking, or 'worldviews') and critical thinking about constructed interpretations. Since the environment is complex, and these experts are likely to disagree on the character of operational problems, there is potentially a richer set of interpretations available to the Commander and, by the first assumption above, a richer repertoire of actions that he might potentially employ.

There are two senses in which sensemaking and learning intersect. Of primary interest in this paper are the processes of applying what the knowledge and experience of the various participants to the situation in hand (which involves considering alternatives, evaluating, getting feedback, refining, adjusting, etc.).

But there is also the way in which sensemaking activities are drawn on to modify the participants' knowledge and experience, so as to inform subsequent applications. This is definitely not achieved by 'feedback' processes, although feedback may stimulate it. This 'institutional learning' (and indeed 'cross-institutional learning') is important but is, again, outside the scope of the current paper.

Operational objectives and Command Management

In a conventional *military* operation, organizational arrangements will be put in place, at the Commander's instigation, as a result of his Mission Analysis and a clear identification of the operation's objectives, form and constraints, all expressed as part of the Commander's Intent. However, an EBAO recognises that in complex crises, the organization may have to be put into action without (at this stage) such a definitive view being possible. Hence establishing and maintaining an organization capable of effective sensemaking and learning may represent the Commander's first and most important way of getting some traction on the conflict situation. The military commander will also need to maintain an awareness of the 'intent' of the non-military actors engaged in the crisis over whom he will have no direct 'control' but with whom he will be

⁶ We will argue that this is not just a matter of personal cognitive open-ness but also of the character of the organizational arrangements in which cognition is contextualised.

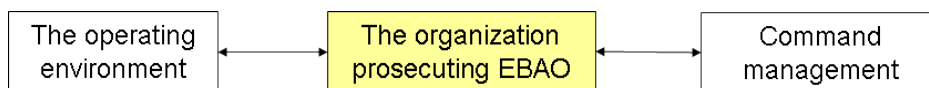
striving to ‘co-ordinate’ (or sometimes merely to harmonise) his military actions. The corollary of this is that there is a constant need for the Commander to be asking himself whether the organizational arrangements are serving him well in both enacting and conditioning his appreciation of the situation.

Social diversity across the ‘virtual organization’ is both necessary and valuable. However, it means that the Commander cannot operate in exactly the same way as he would for a conventional, purely military operation. For instance, he is likely to have to exercise his skills of persuasion and influence with non-military collaborators, over whom he has neither formal command nor effective positional authority. Nevertheless the Commander remains pivotal to the ‘virtual organization’ through his vision, direction, leadership and expertise, which will be exercised:

- through engagement in Effects-based activities and collaborations in an effective and agile⁷ manner; and
- through his organization of the ‘business of EBAO’ through the function of Command Management which allows him to direct a set of interacting headquarters activities, each of which has a clear purpose and is concerned with the transformation of inputs into outputs.

A selection of organizational Enablers

In the following sections of the paper, we consider a series of *Enablers*, which are prescriptions for organizational facets through which the organization seeking to prosecute an EBAO can function. These facets include mechanisms, processes, services, competences, activities and structures.



Our primary interest here is in the identification of generic characteristics which pertain to the successful implementation and employment of each of the selected Enablers.

Enabler 1: A ‘Breathing-In, Breathing-Out’ Model

‘Breathing-In, Breathing-Out’ is a pattern of headquarters behaviour through which a degree of explicit control is maintained over open-mindedness and the maintenance of a sufficient number and range of alternative hypotheses about an operational situation. It is about establishing a rhythm within a headquarters.

‘Breathing-In, Breathing-Out’ is described in greater detail than subsequent Enablers because (a) it is fundamental to the whole model of organization and (b) it exhibits many of the features of interest to this paper.

⁷ Definitions of military ‘agility’ abound but, in the context of this paper, it is more important (as, for example, is asserted by Anthony H. Dekker of DSTO Canberra) to understand that the concept of agility is defined in many different ways. Flexibility, speed, and adaptability are some of the characteristics often associated with agility, which can take many forms including tactical/operational agility, organizational agility, deployment agility, sustainment agility, acquisition agility, and conceptual agility. Of these, this paper is primarily concerned with organizational agility.

Exposition

Figure 1 shows a 'plan-centric' 'breathing-in' process. Here, 'breathing in' serves to refine commander's intent, thereby reinforcing the purpose and focus of military activities, whilst making increasing commitments to certain options for actions whilst discarding ('closing down') others. It results in the commitment to a specific Course of Action, represented by an 'operational framework for tactical activity' that is to be taken forward into Execution.

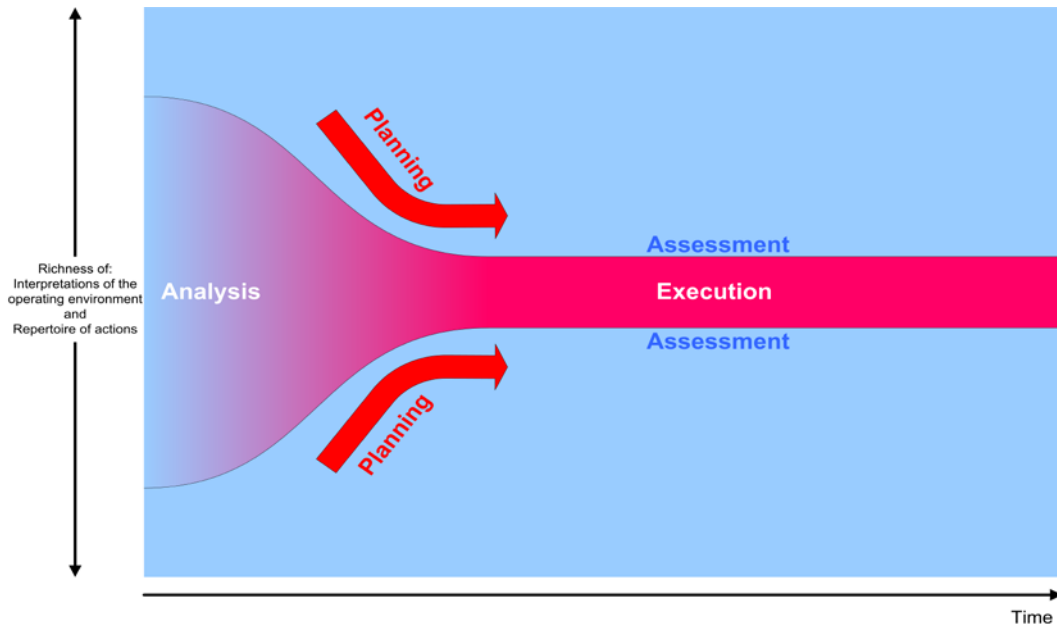


Figure 1: 'Breathing-In, Breathing-Out' Model for a Planning-Centric Headquarters

A complementary perspective on this overall process is that of handling uncertainty. Whilst fully 'breathed out' (during Analysis) the headquarters is handling a huge amount of uncertainty (e.g. concerning the truth of hypotheses); as it 'breathes in' it essentially discards some hypotheses and exchanges other hypotheses for assumptions⁸, which it attaches to the plan. Whilst this does not actually reduce uncertainty, it translates it into a more manageable, action-centric form.

In contrast, a learning-centric Headquarters possesses the ability to 'breathe out' even after it has committed to a certain set of actions (through Planning). The focus for this learning is in the 'breathing out', a willingness to reflect, reconsider, and perhaps come to a new understanding of the situation and the potential for response and intervention. This may in turn generate the need to dynamically re-plan. Hence, in addition to the ongoing iteration of Assessment and Execution, there are multiple 'breathing in, breathing out' cycles, as shown in Figure 2.

⁸ The later account of Enabler 3 will provide further explanation of hypotheses, assumptions and the relations between them.

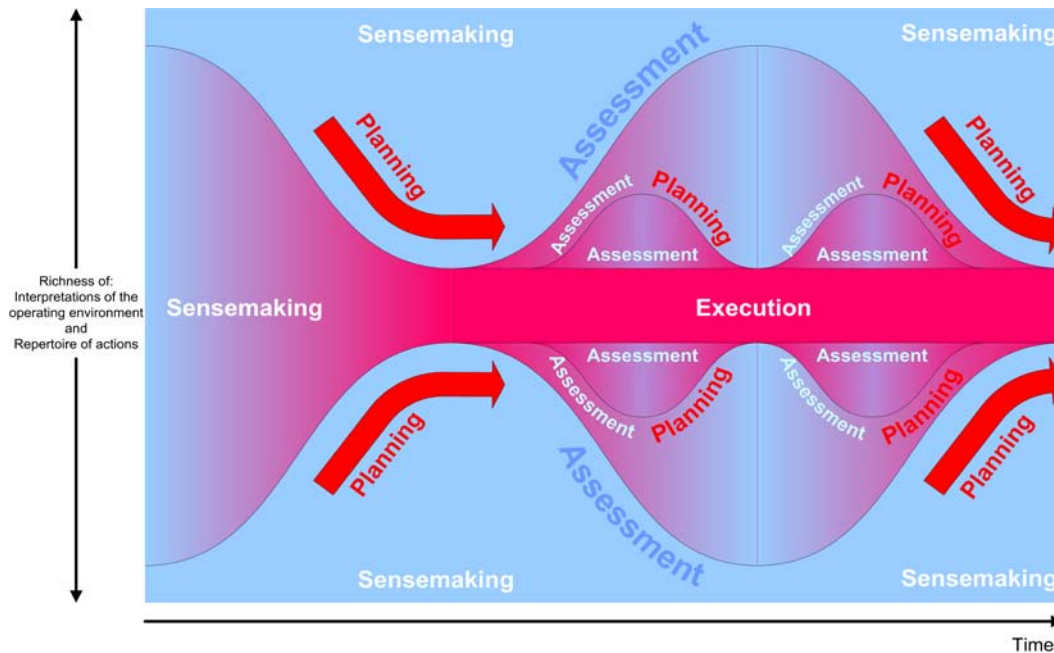


Figure 2: 'Breathing-In, Breathing-Out Model' for a Learning-Centric Headquarters

The different cycles shown in Figure 2 represent different forms of Assessment activity (all now involving 'breathing out'), iterated with relevant types of Planning activity (involving 'breathing in'). In sum, the following 'cycles' are observed:

- An 'inner cycle', iterating Assessment and Execution. This demands ongoing Assessment activity so that outputs are ready to inform frequent adjustment of tactical actions within the context of the Operational Plan.
- A 'middle cycle' iterating Assessment and Planning. This is illustrated by the narrower of the two 'breathing-in, breathing-out' patterns in Figure 2. Assessment focuses upon the outcomes of actions and interactions in the environment to learn about the appropriateness of the Operational Plan in the context of the Campaign Design. This offers the potential to modify the Plan, through a new iteration of planning activity.
- An 'outer cycle' iterating Assessment and Planning. This is illustrated by the broader of the two 'breathing-in, breathing-out' patterns in Figure 2. Assessment focuses upon the outcomes of actions and interactions in the environment to learn about the appropriateness of the Campaign Design in the context of the problem- and solution- framing that the Commander has selected as the basis for designing his campaign. This offers the potential to modify the Plan, through a new iteration of Planning activity (specifically, a new iteration of 'design'). Assessment within the outer cycle also supports learning about the suitability of these frames themselves (offering the potential for a new iteration of 'framing' activity).

Discussion

Each version (Figure 1, Figure 2) of the model describes the way in which headquarters activities continually modify the repertoire of actions⁹ that may be pursued by the military force over the course of time. It does this, not by modifying force capability, but in focusing attention on, and preparing for, a certain range of potential actions at any given point. Thus the repertoire of actions is what practically can be undertaken, not what is theoretically possible given the available capability.

Richness of interpretation and the repertoire of actions exert an influence on each other:

- a richer set of interpretations permits, and may even stimulate, richer thinking about possible actions that would contribute to objectives;
- conversely a narrow appreciation of the ‘art of the possible’ can act as a restraint on the breadth of interpretations developed, because some are perceived as ‘apparently not useful’ (i.e. “to a hammer, everything looks like a nail”); real effort may be required to force ‘breathing out’.

Under the above assumption, the vertical axis in the model represents *both* richness of interpretations *and* richness of repertoire of actions.

A second assumption is that intervention actions can only be executed following concerted effort in Planning¹⁰ – and this requires a degree of focus, under practical constraints of time and headquarters resources (i.e. staff effort). Thus it is impossible for a Headquarters, in any practical sense, to maintain the broadest possible repertoire of actions at all times since this dilutes both planning effort and clarity of purpose.

On the other hand, the Headquarters can maintain a richer set of interpretations, and therefore repertoire of potential actions, whenever and wherever (in terms of headquarters activities) it is not focused upon execution. Hence, in both the planning-centric and learning-centric versions of the model, sensemaking (or analysis) deals with the richest set of interpretations whilst execution concerns the repertoire of actions at its most focused.

Further, planning serves to bridge sensemaking (or analysis) and execution by selecting certain interpretations, as the basis for designs and plans, and thereby constraining the repertoire of actions to those that will be available to execution. In both approaches, the context for Assessment activities is the Operational Plan, which provides the basis for adjusting those actions. In the planning-centric case, this is the limiting context; in the learning-centric case, however, Assessment is a much richer activity¹¹ since it is conducted within the context of Sensemaking.

Scales and dimensions in the learning-centric approach

The ‘Breathing-In, Breathing-Out’ approach is engaging with a number of scales and dimensions which make it internally complex. These include:

⁹ A ‘repertoire of actions’ is a range of potential options for action that is enabled through the development of appropriate concepts for Campaigns and Operations. It is dynamic and shaped directly by the creativity and insight of the Commander and his staff – and therefore is positively influenced by effective application of the Manoeuvrist Approach. It is certainly not a fixed ‘pick list’, however, and no Commander should expect EBAO, in itself, to deliver an appropriate ‘repertoire of actions’ to him.

¹⁰ This extends from the conception of a plan in a design to the practical steps a military force takes in preparing to employ capability in conducting actions (e.g. resource allocation, Tactical planning etc.)

¹¹ And therefore more ‘tightly coupled’ to Execution.

- the balance between monitoring / analysis and taking action
 - already reflected in the way in which we have used terms like Planning, Execution and Assessment to imply distinct, though coupled, activities;
- the temporal dimension (e.g. balancing shorter-term risks / opportunities and longer-term risks / opportunities);
- the balance between holistic or 'big picture' thinking and attention to specifics and detail.

Thus, within the overall management of a military campaign, a multiplicity of cycles of headquarters activity is observed¹², within which 'learning' is central:

- an 'inner cycle' that iterates short-term Assessment and Execution – in which ongoing Assessment activity informs frequent adjustment of Tactical Actions within the context of the Operational Plan;
- a 'middle cycle' that iterates medium-term Assessment and Planning – in which Assessment focuses upon the outcomes of actions and interactions in the environment to learn about the appropriateness of the Operational Plan in the context of the Campaign Design, with the potential to modify the Plan, through a new iteration of Planning activity;
- an 'outer cycle' that iterates longer-term Assessment and Planning – to support judgements about the overall success of the campaign in the context of the framing that the Commander has selected as the basis for his Campaign Design.

The outer cycle offers the potential to modify the Plan, through a new iteration of Planning activity (specifically, a new iteration of 'design'). Assessment within the outer cycle also supports learning about the suitability of these Frames themselves (offering the potential for a new iteration of 'Framing' activity¹³).

The core processes of Sensemaking, Planning, Execution and Assessment all have to cope, in some way, with the need simultaneously to consider the whole in broad terms (holistic or 'big picture' thinking) and to pay attention to specifics and detail. In a conventional military operation this is usually achieved by mission- and task- decomposition, including the use of a command hierarchy and mission command.

In a complex operating environment, such decomposition is problematic: complex problems cannot be decomposed into independent actionable sub-problems, and also delegation to subordinates can create a barrier to holistic sensemaking. A further difference might be reflected in the balance and phasing between the different cycles, with execution activities becoming (in some circumstances) more provisional and exploratory, and the 'middle' and 'outer' cycles needing continual, rather than periodic, attention.

Building the organization capable of executing the 'Breathing-In, Breathing-Out' cycles

The scales and dimensions identified above mean that the account of 'Breathing-In, Breathing-Out' reflected in Figure 2 does not (yet) constitute a basis for an effective working organization. In fact, the three nested cycles (for example) are, in themselves, a recipe for chaos unless they are resolved in some way on to practical working arrangements.

¹² And none of this would be out of place in a conventional military operation; but there are differences of emphasis, as discussed below.

¹³ As with 'Design', 'Framing' is also part of the major activity of planning.

Common to all credible approaches is some notion of *separation of concerns* together with a way of re-integrating them to recover the holistic view. Thus the three nested cycles of iterative commitment and review scheme can be implemented through the use of a large-scale pattern. This suggests that the management of a single long-term military campaign can be helpfully deconstructed into three complementary cycles of activity:

- current (day-to-day) operations monitoring
- future operations planning, and
- longer-term campaign management.

The three cycles are then pursued effectively by different teams, each of which works with a clear focus and scope. To ensure that these teams do not work in isolation, an appropriate set of integrative Enablers, including (but not limited to) the products identified below in Figure 3 (e.g. Campaign Plan, COA), and some kind of adjustment or learning scheme, are also required.

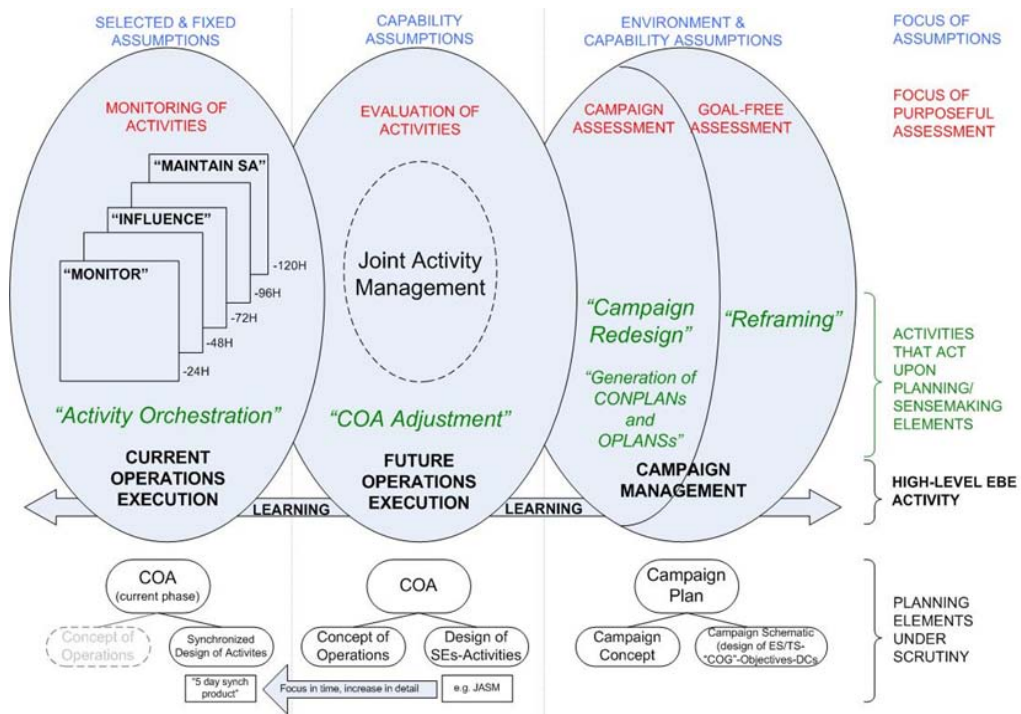


Figure 3: The three cycles of activity for the management of a military campaign

One scheme discussed by [5] for surmounting the non-decomposability of problems and solutions in the complex world is the re-cycling bin¹⁴. In this model, a number of partial problems (e.g. undesired facets of the current or projected situation) are placed on the table, and partial solutions solicited (i.e. proposed actions which could potentially address one or more of the problem-statements). Actions are selectively approved if they are judged likely to improve the situation, and not to interfere unduly with other actions (either in their effects or their consumption of resources). The result is not a coherent plan (in the conventional sense) for dealing with the problem as a whole and it cannot be proved to make optimal use of resources, but it may have other more desirable properties under complex conditions (e.g. avoidance of tight coupling [6], lower vulnerability to correlated assumptions).

¹⁴ Also appearing in the literature as the ‘garbage can’ model.

Enabler 2: The Generation of Future Scenarios

Exposition

The Generation of Future Scenarios¹⁵ (GFS) is an advanced Sensemaking activity that employs methods from scenario planning to help the commander and his planning staff develop a shared appreciation of how complex the environment is and, consequently, to develop a rich shared understanding of the opportunities, risks and uncertainties that must be addressed in planning. Such an understanding is fundamental to planning complex interventions; it is embodied in the tenet 'planning for success whilst planning against failure'.

GFS focuses upon the future, where the major uncertainties lie, and achieves its aims through the development of a framework for reasoning about the future. The objective is a rich, diverse and manageable set of plausible future scenarios within which potential planning concepts and hypotheses can be identified. Each scenario includes a storyline that explains how the current situation might evolve into a future situation.

Discussion

GFS encompasses constructive methods (e.g. storytelling) and relies upon the expression of hypotheses. Hence storytelling is a key competence for planners and hypothesis generation is a shared competence for planners. Again, these cannot be reduced to mechanical processes, either in their execution or their evaluation.

Execution

At the broadest level, GFS is scoped as four sequential stages, whose remits give some basis for exercising governance over activities which, are in themselves, non-deterministic and strongly dependent on the personalities and competencies of those involved.

- Identify Key Question. The Command Group develops the question that scenario development must answer. This question sets the timeframe and scope for the Generation of Future Scenarios.
 - It is important that the question is broad enough to encourage consideration of all aspects of the operational environment that are important to the mission.
- Identify Driving Forces. Brainstorm 'driving forces'¹⁶ for the future of the conflict region including the impact of the military intervention itself.
 - From the key driving forces identified the two most influential and uncertain driving forces are selected. These will be used in the next stage to organize scenario development.
- Develop Scenario Logics. Develop four scenarios, in outline, as they might be shaped by the Key Driving Forces. Criteria for success include

¹⁵ Generation of Future Scenarios is an advanced sensemaking activity evolved from methods of scenario planning, also called scenario thinking or scenario analysis. It is a strategic planning method that some organizations use to make flexible long-term plans. At Royal Dutch Shell, for example, scenario planning was viewed as changing mindsets about the exogenous part of the world, prior to formulating specific strategies. It is in large part an adaptation and generalization of classic methods used by military intelligence.

¹⁶ A Driving Force is a construct that represents a hypothesized fundamental characteristic of the operating environment that has a major impact upon outcomes. Driving Forces are typically represented as trends (things that can go up or down), variables (things that can increase or decrease) or simply dichotomies (things that can have one of two states, such as the occurrence of a specific event).

plausibility (not accuracy), distinction (no two scenarios look the same), identity (each scenario has a 'sticky name') and interest.

- **Develop Scenario Descriptions.** Make judgements about the 'values' of other Driving Forces in each scenario. If Driving Forces can be related to each other within a 'good' causal map, then it may be possible to make informed judgements about the 'values' of other Driving Forces – since we have a starting point of the two Key Driving Forces.
 - This is a highly creative stage and the most important factors are open-mindedness and creative storytelling ('the journalist' is a good role to play here – roles like this can be pre-defined and selected according to a check-list).
 - This is also an intense stage of information gathering, interpretation, critical thinking and reasoned argument. Some rationalisation can be promoted by having a set of standard checks, e.g. checks for plausibility and consistency, across scenarios, of good coverage of actors, dimensions of the strategic environment (PMESII), etc..

Note again the need to steer between rigid procedures and 'free-play'. In the account above, certain elements of the stage descriptions have been fixed (e.g. two driving forces, four scenarios) on the basis that (a) these have been found through experience as useful parameters and (b) it assists familiarity with the process if these parameters are always held the same.

Enabler 3: Management of Hypotheses and Assumptions (MHA)

Exposition

The need for some kind of principled approach to the management of hypotheses and assumptions was identified above in the 'Breathing-In Breathing-Out' account. Critical information, upon which plans and activities are formed, are couched as hypotheses and/or assumptions, where:

- a *hypothesis* is a proposed explanation for an observable phenomenon¹⁷, and
- an *assumption* is a hypothesis on which Campaign activity is founded.

The objectives for MHA are:

- to enable a military headquarters to balance the (potentially competing) requirements for dealing with uncertainty whilst committing to activities in support of Campaigning (establishing intent, making decisions, producing plans, executing plans, etc.);
- to help to prevent a headquarters falling into the trap of acting as if it is dealing with certainties¹⁸;
- to encourage and enable the questioning of hypotheses and assumptions;
- to support the proactive investigation of alternative hypotheses to those upon which active Campaign efforts are founded.

Hypotheses are likely to be expressed through reference to Driving Forces, the entities developed during Sensemaking that are used to express root causes for a situation. It is anticipated that hypotheses will be explained and reinforced through examples, stories and observations (symptoms).

¹⁷ Thus hypotheses are assertions or propositions, and have associated with them a level of uncertainty; they cannot be handled as if unequivocally true.

¹⁸ By providing the means to maintain and manage as yet unproven hypotheses for planners to exploit when additional evidence is unearthed or comes to light.

Execution

It should be clear from the foregoing that a coherent and effective scheme for MHA cannot be considered in isolation from broader headquarters activity (e.g. the 'Breathing-In, Breathing-Out' model). There is no objectively-defined uncertainty calculus, applicable regardless of the operational and organizational context, from which a notion of the value of a hypothesis, or an objective threshold of certainty for rejecting or discarding hypotheses, can be derived.

Hence the two principal constraints on any MHA scheme are the following:

- Context must be preserved, in that the circumstances of generation of a hypothesis or assumption (and of its potential or actual employment) need to be retained either as explicit attributes of the information or as associations with other structures, events or processes (e.g. "This hypothesis arose in the context of activity a_1 .") We take this to be a requirement on information management and exploitation (IM/IX) as applied to hypotheses and assumptions¹⁹.
- MHA needs to be driven by, and responsive to, the organizational patterns (e.g. 'Breathing-In Breathing-Out', GFS) which are employing or exploiting it. This means that:
 - operations on hypotheses and assumptions (e.g. create, assign certainty value, disseminate, suppress, archive) should be performed according to life-cycles defined by the other Enablers rather than according to some generic, or abstract, life-cycle;
 - the exercise of subjective assessment by individuals engaged in these other Enabler-patterns should not be undermined by a lack of transparency in the operation of MHA machinery (e.g. the presence of relations between objects which the user might be unaware of).

Again there is the need to avoid both:

- rigid procedures (a totally pre-determined way of managing uncertainty values and relations between objects), and
- 'free-play' (the ability both to manipulate individual hypotheses / assumptions and to execute broader actions on the sets thereof (e.g. promoting a wider search)) without recourse to some broader rationale deriving from other Enabler-patterns.

Enabler 4: Re-connecting with Reality (RwR)

Exposition

This is a Commander-centric assessment of progress towards campaign success which focuses on making sense of the consequences of Actions being undertaken in the environment and developing an understanding of the manner in which this environment is changing over time.

Central to RwR is the taking of advice from Subject Matter Experts (SMEs) (many of whom will be non-military) who have not been tarnished by either a detailed knowledge of the plan or biases concerning the progress of day-to-day decision making. Hence the Commander must put in place suitable

¹⁹ See also the 'Information design' paper in Track 4 of 16th ICCRTS [8].

collaborations through which he can be assisted to 're-connect with reality' to further aid his personal 'sensemaking' of the emerging situation.

In this way, RwR provides an independent, alternative assessment for the Commander of how well the external environment is moving towards the desired End or Transition State. It should provide a broad range of assessments; some objective, others very personal and subjective. As a consequence of this analysis the Commander should be better prepared to generate a fresh, unbiased opinion about the progress of his campaign and a richer understanding of how to direct future campaign efforts.

Execution

This draws heavily upon the Commander's personal knowledge, experience and interpretive skills, and also his capacity to relate to external SMEs.

For RwR to be effective, it is imperative that these SMEs should not have been tarnished by either a detailed knowledge of the plan or biases concerning the progress of day-to-day decision making. Clearly this is in the spirit of 'getting another view'; but how 'independent' should this view be, and how will it then be exploited? A process which generates all manner of 'alternative views' which are then dutifully ignored will have achieved little. The Commander has not only to hear the alternative view but also to be prepared to 'take it in', and he will still be intrinsically conditioned by his own perception of his repertoire of actions.

Again we see the need for some kind of disciplined framework to prevent this sliding into the much-loved pattern of consulting widely in order to confirm pre-conceptions. Expressing such discipline as a personal competence of the Commander is necessary but not sufficient.

So what have we learnt from these Enablers?

Two key themes

Emerging from the analysis above, there are two key themes for coping with complexity which can be summarised as follows:

- Dynamic monitoring and adjustment. Many of the possible mechanisms that might support an EBAO may, at first sight, appear to take the form of 'simple virtues' (e.g. 'open-mindedness'). However, their fulfilment presents the Commander with a number of challenges. There are no 'correct answers' to questions like "How open-minded should we be in our interpretation?" and "How rich a set of hypotheses need to be maintained?" Therefore such parameters have to be set and maintained through a mechanism of dynamic monitoring and adjustment. This is part of a Command Management function whose effective prosecution is a key concern of the commander.
- Neither purely mechanical, nor 'free-play'. Enablers do not resolve on to mechanical procedures which can be defined in advance and then executed repeatedly without significant variation. Conversely, making them 'totally free-play' makes them vulnerable to the adverse impact of personalities, cultural preferences and external or institutional influences²⁰. Nor can facilitation itself be left purely in the hands of a 'strong individual': it is not sufficient for 'great man' leadership to evolve

²⁰ An everyday analogy might be the way in which a brainstorming session, if not properly facilitated, can be completely ruined by the exercise of positional power or personal agendas.

into 'great chairman-ship'. There is a need also for rules, models and templates, and also (in some cases) a degree of *ritualization* or *role-playing* to decouple behaviour from personalities.

These characteristics also align with those of the complex domain in the Cynefin framework [7]. However, under conditions where there is no time to investigate change, the situation is tipped into what Cynefin terms the *chaotic* domain. Here the focus must be on acting, quickly and decisively, in order to change the characteristics of the situation and to reduce what [7] describes as the *turbulence* of the situation. In this situation, the 'great man' commander may come into his own. But the consequences (both environmental and organizational) are unpredictable, and behaviours appropriate to the 'chaotic' cannot be sustained. In EBAO, this means getting back, as soon as possible, into the complex domain.

Choreographed patterns

Choreographed patterns provide a generic approach to the construction of the organization which can execute these Enablers. We use this term to describe the rules, models and templates through which the execution of Enablers is enacted, with a view to protecting them from the adverse impact of personalities, cultural preferences and external or institutional influences whilst exploiting the social diversity present in the 'virtual organization' pursuing the Comprehensive Approach or other forms of Civil-Military Co-operation.

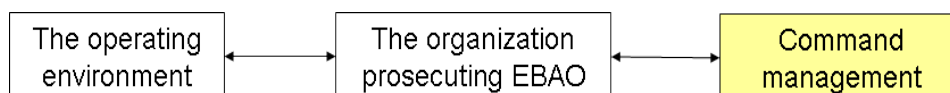
Choreography provides safeguards (in some degree) against the Enablers collapsing into 'free play'. For example, they encourage role-playing (e.g. ritualized challenges to a proposed position).

Patterns can be scaled and/or adapted in their instantiations and do not impose the rigidity of fixed procedures. Nevertheless they should be stable enough to be used as the basis for training. They should also be used as the input to design-time processes for the specification of IT support, although clearly one of the key features of such support is that it should be adaptable and tailorable to the specific circumstances.

Choreographed patterns also need to be understood (and characterised) *informatically* (c.f. [8])²¹.

Command management

In the remainder of the paper, we turn to the final element, that of Command Management.



²¹ Conversely [8] argues that informatics requires an appreciation of organization. Thus a scenario developed under the control of the 'Generation of Future Scenarios' pattern should only be accessed and interpreted by someone who understands that pattern and knows the difference between this and (for example) conventional Contingency Planning.

The requirement

An EBAO suggests the need for the role of the Commander to be brigaded into two distinct but highly inter-related roles:

- Campaign Management – in which the Commander is ‘looking outwards’ to the operating environment and actually managing the progress of the campaign itself;
- Command Management – in which the Commander reviews, prioritises and selects the most appropriate mechanisms to help him monitor and adjust the internal arrangements of his own headquarters, building and reconfiguring them²² according to the changing demands of the external environment. This means that, whilst Effects-based activities should themselves be flexible and configurable, it is the Commander who must continually assess the need for an internal reconfiguration and direct his organization accordingly.

So, in addition to acting as the ‘expert’ who engages in the Effects-based processes that allow him to guide the staff work itself, the Commander also proactively directs and guides the configuration of the headquarters to ensure that structures, processes, behaviours and ‘ways of working’ are in place to retain the necessary agility appropriate to the prevailing circumstances.

In pursuit of the ultimate goal of conducting a successful Campaign, the role of Command Management is therefore to orchestrate a ‘way of organizing’ the military headquarters that not only reinforces the centrality of the Commander but also optimises the effectiveness of the headquarters in helping to meet the objectives of the campaign.

The Enablers need considered and careful selection and implementation, since they will always involve choices, prioritisations and options; these need to be constantly reviewed as the prevailing circumstances change. Effective Command Management will always represent a negotiation between *tensions* or *paradoxes*, reflected in the simultaneous desire for opposites.

Appendix A provides a list of tensions (expressed as opposing pairs of goals or methods) which has been synthesised from sources such as Conklin’s account of wicked problems [1], Perrow’s quadrants [9] and an analysis for UK MOD of NEC Vulnerabilities [10]. We take these tensions, and the need to resolve them through balancing mechanisms, to be central to the development of an understanding of the role and mechanisms of Command Management.

Fulfilment

Command Management can be viewed as an ‘internal sensemaking’ process (Figure 4), which in turn can be portrayed as a control system²³:

- a series of set-points are established, including measures in respect of the tensions noted above (see Appendix A);
- Command Management is then effected through a series of mechanisms (which we term ‘Balancers’) which are acting on and/or sensing the organizational space in respect of the set-points (c.f. single-loop learning [2]);

²² Wherever possible the Commander must also strive to influence the reconfiguration of collaborators’ organizations as well.

²³ In the sense of industrial or process control, rather than the specific-to-military meaning of ‘control’. Use of the control metaphor serves usefully to illustrate some features of the relationships, but this is by no means a complete account, for which multiple metaphors would be needed.

- there is also double-loop learning [2] in the form of a supervisory control system which periodically modifies the set-points.

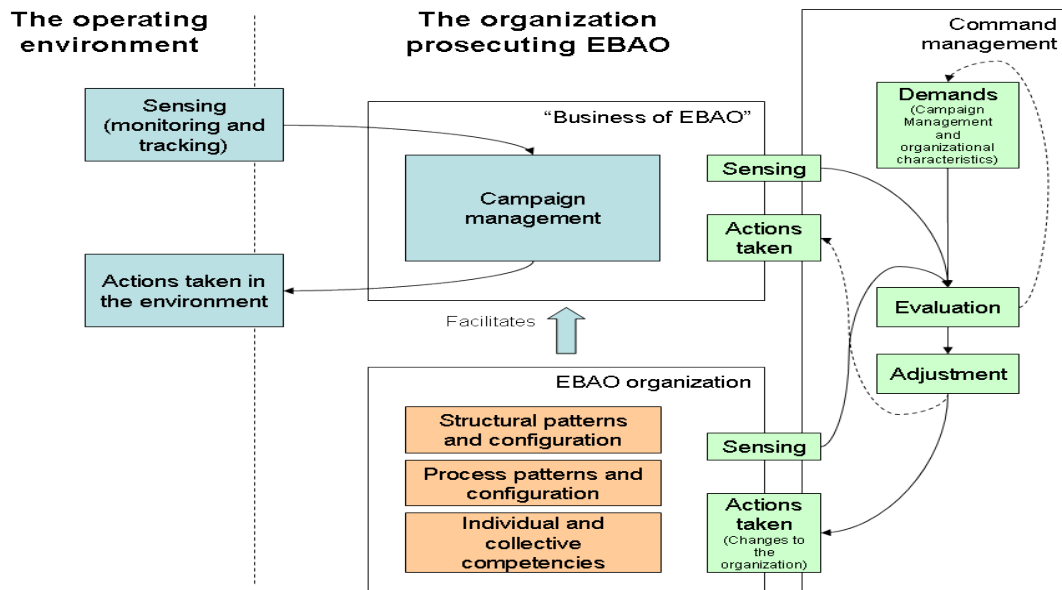


Figure 4: The role of Command Management

No commander will have the time to attend to everything that he might wish to be personally engaged in, so careful and flexible prioritisation of his effort over time will be essential. Likewise, the manner in which a commander chooses to engage with his staff is not something that can be codified or identified as 'best practice'. Every commander will bring his unique knowledge, skill and acuity, gained through years of experience and will impress his particular 'way of command' upon his staff. However, it is possible to identify some of the possible mechanisms through which he may operate.

Leadership and decision-making

It should be clear from the list of tensions that the Commander will need to supplement the traditional characteristics of the military leader, if he is to discharge his unique responsibilities in respect of leadership without potentially compromising the organization's ability to cope with environmental complexity.

A key area here is decision-making. In earlier work [5], we have developed a generalised model of decision-making under complexity. The approach is to partition the activities contributing to decision-making, analogous to the way in which Figure 3 effects a separation of concerns. These partitions represent distinctions between:

- articulation and prioritisation of 'problems' (e.g. objectives, challenges, violations);
- generation of potential 'solutions' (including partial solutions);
- evaluation of potential solutions (singly or in combination);
- allocation and brokering (e.g. matching 'problems' and 'solutions'; 'competition of ideas'; assigning resources to generative and evaluative work);
- 'Yes/No' decision-making (e.g. commitment to action);
- determining the decision-making architecture (i.e. the configuring of the above).

From this generalised model, it is clearly possible to recover militarily-familiar processes and structures as special cases (e.g. the military Estimate process, and the role of the Chief of Staff in directing and co-ordinating Planning activity). Of course we would envisage rather different instantiations of this model being employed in the pursuit of EBAO. Some instantiations have the potential for producing solutions which might not be reachable by a 'central planning' function.

The Commander may choose to participate (and to monitor closely the emerging behaviour and effectiveness) in any of the above areas. Clearly his role is central to defining the decision-making architecture, and to making 'Yes/No' commitments to action. In other areas he may choose to stand back, or to adopt a supervisory role (monitoring closely the emerging behaviour and effectiveness but not directly intervening). This is all analogous to (though not to be confused with) the principles of mission command.

The Commander's 'Trajectory'

Within an EBAO, the Commander's concern about where he should be best placed to exercise command will be less about physical location (e.g. 'going forward') and more about his involvement and oversight of the different aspects of work going on in his Headquarters (and beyond). An effective trajectory is one which enables the Commander to maintain the agility of the headquarters itself as situations change. The 'Commander's trajectory' is a sensing, monitoring and nudging process, whose main task (from a Command Management perspective) is to tell him what is happening and to put him in a position, if he deems it necessary, to pull some of the 'levers' at his disposal to make corrections.

The questions which a commander should be asking himself are "Is organizational activity remaining effective in relation to the operational environment as I understand it?" and "Should the way in which organizational sensemaking activities are unfolding be changing my appreciation of the operational environment?" Although many would argue that these questions are hardly unique to an EBAO, they become more subtle and powerful determinants of success when trying to cope with the complexity of operations that an EBAO supports.

The Commander's trajectory throughout the development of the campaign changes (in organizational terms) and serves as a monitoring and/or integration mechanism for the 'business of EBAO' to ensure the necessary coherence of partial-disconnected structures and behaviours both within the headquarters itself and whenever possible, within any organizations with whom it may be collaborating. The Commander's trajectory within Command Management must balance the often-conflicting needs of the activities underway within the overall battle rhythm of the headquarters. This could range from close engagement with high tempo rapid decision making within the day-to-day management of component activity, to longer-term consideration of the manner in which a campaign is progressing determined through 'goal free' assessments.

Thus the commander's trajectory must weave a well-considered, agile route through the wide panoply of headquarters management activity, remaining ready to adapt to deal with the unexpected and to spot and exploit opportunity. This trajectory may also cross over to other organizations belonging to non-military 'leaders' engaged in a crisis and thus facilitate, through key leadership

engagement, the opportunity for military commanders to 'influence' other actors and their organizations.

Conclusions

Future military headquarters engaging in an EBAO must be able to support their Commander in the realisation and delivery of more favourable outcomes that are based upon configurable interactions between inherently flexible headquarters functions. Organizational arrangements for an EBAO are not just about changing one set of process patterns (derived from the conventional military setting) for a different set of patterns, e.g. a rigidly-defined Effects-Based Planning Process. Instead, such headquarters must employ adaptive processes rather than rigid procedures in order to generate the ways and means to both engage with, and better understand, the intent of non-military organisations within a crisis. Staff structures and practices must be able to adjust to, and reflect, both the personality and approach of the individual commander and the particular characteristics of the prevailing situation.

On the other hand, leaving Effects-based campaigning as a free-play exercise or an unstructured improvisation is rarely likely to be an option. This is not (just) because of time pressures, but because personal characteristics and institutional factors may then dominate and there is no guarantee that the social diversity within the 'virtual organization' will be properly exploited.

In avoiding these two extremes, the organization engaged in EBAO is likely to make extensive use of subtle forms of organizational choreography, role-playing (e.g. ritualization) and enactment of organizational patterns. These are features which are common to all of the organizational Enablers discussed in this paper.

The Commander retains a central role in this, not as the 'decision-maker par excellence' (although in the last resort he may have to fulfil this role) but as the creator, dynamic configurer and steward of the 'virtual organization', maintaining (through Command Management) its effectiveness in response to the unfolding situation and the evolving appreciation of it.

The picture which emerges of Command Management is that of an active style of management, constantly monitoring and adjusting organizational arrangements to maintain a dynamic equilibrium in respect of the demands of the situation and the operational objectives. There are no 'best ways of working', only contingent balances between competing tensions, as the Commander seeks to exploit the available human and social capacities to cope with uncertainty, to adapt and to maintain operational agility.

Acknowledgement

The authors wish to acknowledge the substantial contributions made to the foundations on which this paper is built by our former QinetiQ colleagues Andrew Preece and Patrick Turner, in particular the formulation of the 'Breathing-In, Breathing-Out' Model. The authors also wish to thank the anonymous reviewer of this paper in draft for highlighting some useful distinctions and subtleties with regard to learning.

References

- [1] Conklin, J., 'Wicked problems and social complexity', from 'Dialogue Mapping: building shared understanding of wicked problems', PhD thesis published by Wiley, October 2005
- [2] Argyris, C. & Schön, D., 'Theory in Practice – Increasing Professional Effectiveness', Josey-Bass, CA, 1974
- [3] Weick, K., 'Sensemaking in Organizations', Sage Publications, CA, 1995
- [4] Klein, G., Philips, J., Rall, E. and Peluso, D., 'A Data/Frame Theory of Sensemaking', in Hoffman, R. (ed.) 'Expertise Out of Context: Proceedings of the 6th International Conference on Naturalistic Decision Making', Lawrence Erlbaum Associates, 2006
- [5] Dodd, L., Turner, P.J. and Markham, G., 'Decision making and action within organizations', RE306 Working Paper 2d, QINETIQ/EMEA/TS/TWP0804653, v.0.1.9, 28th March 2008
- [6] Lloyd, M.A., Markham, G. and Dodd, L., 'Use of complexity-related ideas in understanding military operations and military capability', paper presented at 11th ICCRTS, Cambridge UK, September 2006
- [7] Kurtz, C.F. and Snowden, D.J., 'The new dynamics of strategy: sense-making in a complex and complicated world', IBM Systems Journal, 42, 3, 2003
- [8] Markham, G., 'Information design for synchronization and co-ordination of modern, complex, multi-national operations', Paper 085, Track 4, 16th ICCRTS, 2011
- [9] Perrow, C., 'Normal Accidents', Basic Books, Inc., New York, 1984
- [10] John, C. and Houghton, P., 'NEC Vulnerabilities: Necessary Preventative and Mitigation Measures', Dst/CR16160/0.96, July 2005

Appendix A: Tensions to be resolved through Command Management

Table 1 offers a list of tensions in support of the discussion of Command Management. Tensions are expressed as opposing pairs of goals or methods. The list has been synthesised from sources such as Conklin's account of wicked problems [1], Perrow's quadrants [9] and an analysis for UK MOD of NEC Vulnerabilities [10].

Opposing pairs of goals or methods		Comments
Fluidity and adaptability	Politically-defined end-state [pre-defined idea of 'success', e.g. 'war on terror']	See the first of the 'three generic issues' at the start of this paper
Mindset / groupthink [premature framing]	Lack of a compelling narrative [multiple and competing frames]	Also pertinent to the problems of independence and coherence discussed in relation to RwR and to Red and Green Teaming
Risk [failure to fulfil perceived responsibilities, accountability for outcomes] and	Opportunity [chance to make a real difference]	- ²⁴
Blank sheet of paper ['fresh minds']	Templates [contingency plans, historical experiences]	-
Goal-free assessment [listening to outsiders]	Enactment [shaking the tree for yourself];	Pertinent to RwR
Maintaining momentum [with the risk of ignoring reality]	Attending to changes in the environment [with the risk of 'over-fitting the data' / hypersensitivity]	Pertinent to the interaction between the three cycles in 'Breathing-In Breathing-Out'
Shorter-term risks / opportunities	Longer-term risks / opportunities	
Knowledge support perspective [analysis, appreciation]	Action-taking [military preference for acting, and being seen to act]	Strategies for coping with uncertainty, c.f. criteria for 'Breathing-In'
Problem-solving [anticipating, predicting, driving out risk and uncertainty, explicit enumeration of options / alternatives]	Keeping options open [keeping off constraints, satisficing, lazy evaluation, deferred commitment]	
Coherence [maximisation of synergy and co-operation]	Decoupling [avoidance of over-correlation and brittleness, maintenance of resilience and freedom of action]	Pertinent to the discussion of the re-cycling bin [5]; [6]
Conceptualisation and holistic thinking [big picture, selectivity]	Separation of concerns & decomposition [specifics, detail, exhaustive analysis]	

Table 1: Tensions expressed as a set of opposing pairs of assertions

²⁴ Blank entries do not mean that these tensions are less important; they simply reflect the fact that this paper has presented only a small selection of Enablers and that there are others to which these tensions pertain more particularly.