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Metrics for Command in an NEC Era

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This paper is the 12th in a set of 13 presented to the 9th ICCRTS by staff of the Defence Scientific and Technical Laboratory (Dstl) and QinetiQ plc, relating to 'command in the network enabled era'. The papers are based on research undertaken for the United Kingdom Ministry of Defence's 'Network Enabled Capability' programme and, unless otherwise stated, are covered in whole or in part by Crown Copyright.

Operational analysis of Way of Command in the era of Network Enabled Capability[1]

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This paper is the 2nd in a set of 13 presented to the 9th ICCRTS by staff of the Defence Scientific and Technical Laboratory (Dstl) and QinetiQ plc, relating to 'command in the network enabled era', based on research undertaken for the United Kingdom Ministry of Defence's 'Network Enabled Capability' programme.

Abstract

This paper considers the need for methods and metrics for analysing the Command-related factors involved in delivering military operational benefits through better exploitation of information. It does this by considering where Command fits within the UK Network Enabled Capability (NEC) concept and where NEC impacts upon the Way (or style) of Command.

There are a number of interdependent aspects of Command which have been discussed in various treatments of network-enabled military capability. This paper considers the key characteristics of, and relationships between, these factors and proposes a causal map which brings them together. The Command-related factors which have been considered are: de-centralisation, organisational culture, the impact of digitisation and agility.

Metrics and analysis methods have been identified to support analysis of the various entities and relationships which make up the 'Way of Command' causal map. The result is an analysis framework which can support methodical consideration of Way of Command in the era of NEC and which highlights a number of fundamental issues for study. This provides a starting point for an experimental campaign which weaves Command issues into the medium and long-term NEC roadmap.

Introduction

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This paper considers the need for methods and metrics for analysing the Command-related factors involved in delivering military operational benefits through better exploitation of information. The focus on Command means that the approach takes greater account of the cultural and social domains than the information-centred analyses which are more typical of the C3I field.

There are a number of interdependent aspects of Command which have been addressed in various treatments of network-enabled military capability. This paper considers some key characteristics and relationships of these factors and brings them together in a causal map of Way of Command. The aspects of Command which have been considered are:

- De-centralisation of Command (Mission Command)
- Culture and Command
- Digitisation and Command
- Agility and Command

A table of the entities and relationships which make up the 'Way of Command' causal map is used as a framework within which to identify suitable metrics and analysis methods. The result is an analysis framework which can support methodical consideration of Way of Command in the era of Network Enabled Capability (NEC) and which highlights a number of fundamental issues for study. The paper then discusses in more detail some of the key drivers of, and constraints upon, Way of Command and draws some brief conclusions.

Background

Many highly experienced military and technical thinkers have, over recent years, been applying their energies to developing concepts for future military capability, driven by the changing nature of the potential battlespace (where, who and how we expect to fight) and by the continuing development of information technology. The result is a considerable body of published material featuring a selection of the following terms: "*network-enabled*", "*network-centric*", "*effects-based*", "*agile*", "*shared awareness*", "*shared intent*", "*collaboration*", "*information exploitation*", "*information dominance*" and "*self-synchronisation*".

The scope and viewpoint adopted for each of these various papers and books depends on the author's background, making it extremely difficult to synthesize all of the material into a coherent whole. This paper shirks that Herculean task, but does attempt to trawl the source material (focusing on UK sources, but informed by NCW thinking) to create a logical model of Command in the NEC era, capturing the various key concepts and drivers. This model, in the form of a causal map, is used as a framework within which to identify of a suite of analysis methods and metrics for the study of Command in the context of NEC. It is recognised that this is only an initial attempt and it is presented to the wider community to prompt review and feedback.

Characteristics of military command

A number of interdependent characteristics and drivers of Way (or style) of Command appear consistently in discussions of network-enabled military capability. These factors are:

- De-centralisation of Command (Mission Command)

- Culture and Command
- Digitisation and Command
- Agility and Command

The following table takes these Command-related factors and considers the various influences and constraints which each brings to an understanding of the topic.

Aspect	Influences
De-centralisation	Operational 'complexity', responsiveness, innovation, trust, horizontal flow of information, manoeuvrist doctrine.
Culture	Common understanding, trust (in individuals, teams and systems).
Digitisation	Information accessibility, shared awareness, collaborative working.
Agility	Manoeuvrist doctrine, dealing with complex environments, the need for responsiveness, flexibility, robustness and adaptability.

Table 1 - Command characteristics and some influencing factors

Table 1 captures some characteristics and key drivers of Way of Command but, in order to place this into context, it is necessary to consider the relationships between way of command and 'way' of operation, i.e. matching how we command to how we operate. In the NEC era, two key goals for command will be the orchestration[2] of effects-based operations and the generation and management of operational agility. The following paragraphs provide an overview of these relationships, with further detail being available in the various source papers (see References 1 - 5). A full understanding of how to exploit NEC in matching Way of Command to the operational needs is a topic which is only beginning to be studied; this paper seeks to suggest some paths for exploration.

De-centralisation of Command: De-centralisation (including self-synchronisation) is a control technique for overcoming short-comings in the control system (reaction time/processing ability), but it is not universally necessary or desirable. Some of the benefits of Mission Command (a form of de-centralisation) are efficiency, flexibility, increased 'ownership' of effects, elimination of unnecessary procedure and the freeing-up of superior Commanders to focus on operational and strategic matters. In addition, de-centralisation, supported by dynamic collaborative interworking to achieve synchronisation, will lead to dispersion of knowledge/understanding which makes the organisation more robust to the loss of a C2 node.

Culture and Command: As an entirely human activity, Command is tightly bound-up with the culture of the organisation within which it is being exercised. Successful de-centralisation of command relies on mutual trust between superior and subordinate and requires an organisational culture in which such trust can be developed, and in which initiative and creativity are actively encouraged.

Digitisation and Command: Digitisation brings improved connectivity and interoperability which can improve the exploitation of information, removing constraints on Way of Command. NEC aims to improve operational effectiveness by permitting the more efficient sharing and exploitation of information within UK armed forces and our coalition partners.

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[2] The term "orchestration" has been chosen instead of synchronisation or integration in order to emphasise the option for sequencing effects and the fact that the active 'players' can change.

Agility and Command: Reference 1 states that Mission Command attempts to meet the requirements of robustness, flexibility, efficiency, speed and shared awareness. These are all aspects of agility, which emphasises that de-centralisation (or Mission Command) is a key component of Command agility. In addition, British Army command doctrine is based on the premise that "from mission command flows the manoeuvrist approach".

Command in an NEC context

Figure 1 uses the UK NEC Core Themes to show the <u>key</u> mechanisms by which NEC can deliver increased military operational effectiveness, in the context of an effects-based approach. This causal benefits map shows where Command and Control lies within the overall NEC concept, i.e. exploiting the enabling information infrastructure to deliver increased military capability.
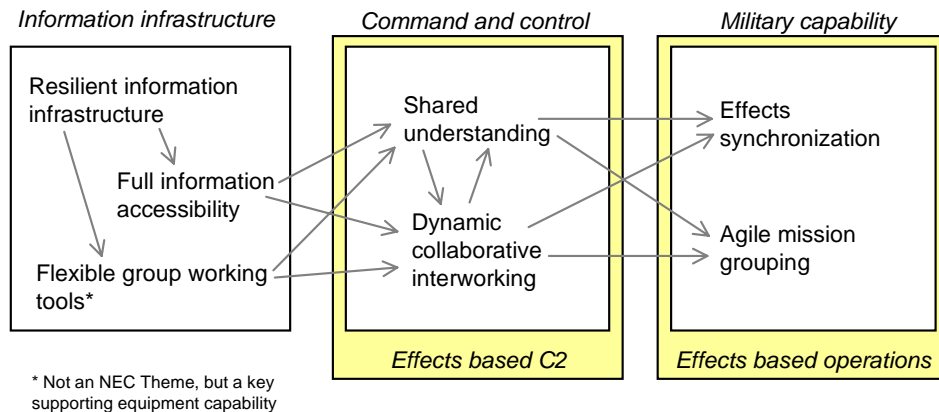
Figure 1 - Where Command fits within the NEC Core Themes

NEC in a Command context

Having placed Command into the context of the NEC Core Themes, it is useful to consider how NEC relates to the key goals and constraints of Command. Figure 2 provides this view, bringing together some significant relationships which affect the way in which Command is exercised.   This causal map, which is entirely consistent with UK military doctrine publications, forms the basis for the structured analysis which forms much of the remainder of the paper.
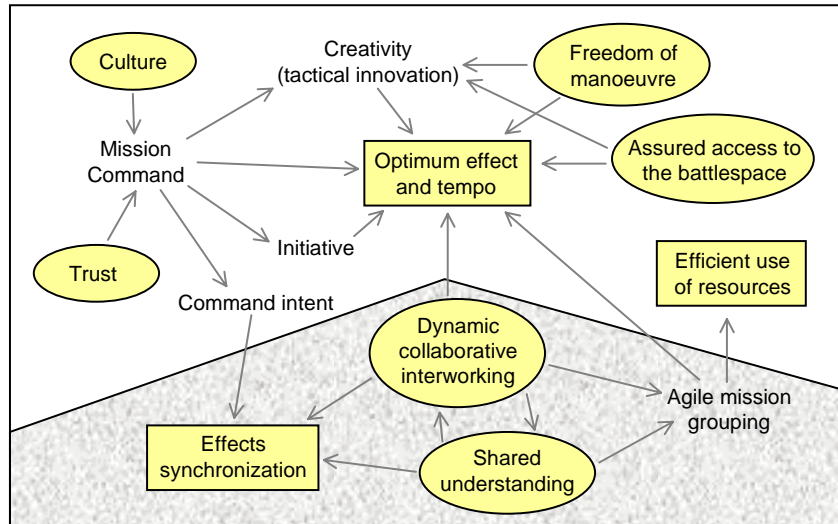
Figure 2 - How NEC relates to Way of Command

The concepts in square boxes are the goals which the Command organisation is aiming for and the concepts in ovals are the enabling interventions which the organisation may make. The arrows are causal in the positive sense, e.g. the adoption of Mission Command will allow subordinate Commanders to exercise their initiative and creativity. The shaded area indicates those NEC Core Themes which are directly linked to Command factors. This figure captures most of the fundamentals of the UK manoeuvrist approach, which are listed in Reference 3 and are:

- Unity of effort
- Main effort
- Freedom of action
- Trust
- Mutual understanding
- Timely and effective decision making

A further demonstration of the extent to which this simple causal map links NEC and Command style to UK military doctrine is provided by considering how well it reflects the manoeuvrist approach which is described in Reference 2 as:

- shattering the enemy's overall cohesion and will to fight, rather than his materiel;
- applying strength against identified vulnerabilities (asymmetry);
- momentum and tempo, leading to shock and surprise;
- doing the unexpected and seeking originality, combined with a ruthless determination to succeed;
- achieving a superior operational tempo.

Investments and benefits

It is useful at this point to provide further explanation of the sources and sinks in Figure 2 in order to better understand areas for investment (inputs/sources) and the potential benefits

(outputs/sinks). On the input side we have cultural factors, military factors and NEC, whilst on the output side we have effects synchronisation, optimum tempo and efficient use of resources.

Culture and (individual) trust: two key social characteristics which affect both the current range of Way of Command which a military organisation (or component of one) can adopt and the ease with which new Ways of Command can be introduced.

Assured access and freedom of manoeuvre: two generic aspects of military operational capability which involve shaping the battlespace in such a way as to remove constraints on the application of military force.

Shared understanding and dynamic collaborative interworking: these two nodes (which are mutually supporting) represent the impact of NEC upon the C2 process.

Optimum effect and tempo: the term tempo implies the ability to react quickly, but the adjective "optimum" has been specifically chosen to emphasise the fact that the quickest tempo may not be the most effective and that a force which can control tempo has a significant advantage. Reference 1 offers "greater lethality and survivability" as the measures of delivered value, these being appropriate to a warfighting context. A more generic expression of these is: an increased ability to exert operational effects whilst reducing the ability of others to affect own forces.

Effects synchronisation: The synchronisation of effects enables the available effort to be used to maximum effect. This enables mass to be created from dispersed force elements, potentially reducing individual and collective vulnerability.

Efficient use of resources: The efficiency with which available assets are employed can be maximised by effective deconfliction and by the optimum matching of effectors to the desired effects, within constraints over which own force have no control.

The scope and dimensionality of the causal map (Figure 2) have been limited in order to provide a manageable model, however, the map could be extended in various ways if required. The NEC Core Themes relating to information infrastructure could be added to provide high-level equipment investment variables and the other 'input' nodes could be split into sub-components. Similarly, the end measures (essentially doctrinal goals) could be translated into increased military effectiveness in the operational environment, in a context-dependent fashion.

Most components in the causal map can be related to every other component in some way. The links that have been drawn can be considered to be the 'first order' effects that have been identified for consideration at this stage. Further, there are factors outwith the scope of the map which play a role in enabling many of the featured components, with training being a good example. It is possible that specific circumstances, or focusing on a particular aspect, will lead to a different understanding of the priorities and a revised causal map. This would not reflect on the 'correctness' of either treatment; they should be different, but consistent, views.

Further analysis of the Way of Command causal map

Each of the twenty-one sub-tables which make up Table 2 takes one of the 'links' from the causal map (Figure 2), suggests metrics for the cause and effect nodes and provides an explanation of the relationship captured by the link. The right-hand column presents measures/metrics for the cause and effect nodes and suggests suitable methods or models for representing the relationship in analysis.

Cause	Culture (supportive of de-centralised command)	Level of trust in subordinates. Focus on Mission Command within training.
Effect	Mission Command	Subjective view of subordinate Commander of degree of freedom. Relevant features in the issued orders.
Relationship	Mission Command can only thrive in a supportive culture. New legislation may be needed to protect junior commanders.	Cognitive mapping study of social aspects of NEC (Reference 7).

Cause	Trust (individual)	Questionnaire or interview (subjective), observation of behaviour (implied measure).
Effect	Mission Command	Subjective view of subordinate Commander of degree of freedom. Relevant features in the issued orders.
Relationship	Trust in subordinates and superiors is essential for Mission Command to flourish. Collective training and experience builds trust.	Cognitive mapping study of social aspects of NEC. (Reference 7).

Cause	Mission Command	Subjective view of subordinate Commander of degree of freedom. Relevant features in the issued orders.
Effect	Creativity	Subjective assessment by peers. Achievement of operational surprise.
Relationship	Mission Command permits the scope for creativity.	Wargaming and other HQ experiments, observation during training and exercises, ancedotal evidence from serving personnel and 'grey beards'.

Cause	Mission Command	Subjective view of subordinate Commander of degree of freedom. Relevant features in the issued orders.
Effect	Optimum tempo	Subjective assessment by peers. Effective use of forces under control. Comparison of both sides OODA loops around specific event sequences would be useful, if data available (exercise, historical analysis).
Relationship	Delegated decision making facilitates responsiveness and allows OPTEMPO to be controlled by those close to the action.	Models of communication across command hierarchies, wargaming and other HQ experiments, observation during training and exercises, agent-based simulation models, ancedotal evidence from serving Commanders and/or 'grey beards'.

Cause	Mission Command	Subjective view of subordinate Commander of degree of freedom. Relevant features in the issued orders.
Effect	Initiative	Evidence of action without direction.

Relationship	Mission Command encourages initiative.	Wargaming and other HQ experiments, observation during training and exercises, evidence from serving Commanders and/or 'grey beards' (gathered anecdotally or by interview/questionnaire.

Cause	Mission Command	Subjective view of subordinate Commander of degree of freedom. Relevant features in the issued orders.
Effect	Command by intent	Level of direction in orders. Peer review.
Relationship	Mission Command requires orders to be in the form of allocation of resources and Command Intent.	Related by definition.

Cause	Creativity	Subjective assessment by peers. Achievement of operational surprise.
Effect	Optimum tempo	Subjective assessment by peers. Effective use of forces under control. Comparison of both sides OODA loops around specific event sequences would be useful, if data available (exercise, historical analysis).
Relationship	Surprise can invalidate the enemies plans and interrupts their decision-making cycle.	Wargaming, HQ modelling (if two-sided), agent-based simulation (speculative).

Cause	Command by intent	Level of direction in orders. Peer review.
Effect	Effects synchronisation	Degree of synchronisation (time, space and impact) of effects. Analysis of information exchanges between units to identify synchronised action. Analysis of operational activity to identify synchronised effects.
Relationship	Shared (common) intent provides a common goal and facilitates effects synchronisation.	Anecdotal evidence from serving Commanders and/or 'grey beards', wargaming where several levels of command are represented.

Cause	Freedom of manoeuvre	Military analysis. Assessment of operational constraints, including threats.
Effect	Creativity	Subjective assessment by peers. Achievement of operational surprise.
Relationship	Reduction of operational constraints on action.	Wargaming, post-exercise and post-operation analysis, anecdotal evidence from serving Commanders and/or 'grey beards'.

Cause	Freedom of manoeuvre	Extent and nature of operational constraints (including threats) upon manoeuvre.
Effect	Optimum tempo	Subjective assessment by peers. Effective use of forces under control. Comparison of both sides OODA loops around specific event sequences would be useful, if data available (exercise, historical analysis).
Relationship	Reduction of operational constraints on where and when to act in achieving tempo.	Wargaming, post-exercise and post-operation analysis, anecdotal evidence from serving Commanders and/or 'grey beards'.

Cause	Assured access	Extent and nature of operational constraints (including threats) upon access to area(s) of operation.
Effect	Optimum tempo	Subjective assessment by peers. Effective use of forces under control. Comparison of both sides OODA loops around specific event sequences would be useful, if data available (exercise, historical analysis).
Relationship	Reduction of operational constraints on where and when to act in achieving tempo.	Wargaming, post-exercise and post-operation analysis, anecdotal evidence from serving Commanders and/or 'grey beards'.

Cause	Initiative	Evidence of action without direction.
Effect	Optimum tempo	Subjective assessment by peers. Effective use of forces under control. Comparison of both sides OODA loops around specific event sequences would be useful, if data available (exercise, historical analysis).
Relationship	The ability to respond to events without recourse to superior command will allow a rapid response.	Wargaming, models of communication across command hierarchies, conflict simulation modelling.

Cause	Dynamic collaborative interworking	Instrumenting the work processes could measure its degree of agility and the extent of collaboration.
Effect	Optimum tempo	Subjective assessment by peers. Effective use of forces under control. Comparison of both sides OODA loops around specific event sequences would be useful, if data available (exercise, historical analysis).
Relationship	Dynamic collaboration can rapidly bring expertise to bear and optimise response, in timing and choice of effect.	Experimentation (e.g. MNE[3] series), HQ modelling, wargaming and conflict simulation modelling.

Cause	Dynamic collaborative interworking	Instrumenting the work processes could measure its degree of agility and the extent of collaboration.
Effect	Agile mission grouping	Time to define and generate mission group. Extent and ease of subsequent changes. The survivability of the individual assets provides another indicator of agility.
Relationship	The planning and direction of agile mission groups will require teams to be collaborating in a dynamic fashion.	HQ modelling, wargaming, experimentation in tactical team-working.

Cause	Dynamic collaborative interworking	Instrumenting the work processes could measure its degree of agility and the extent of collaboration.
Effect	Effects synchronisation	Degree of synchronisation (time, space and impact) of effects. Analysis of information exchanges between units to identify synchronised action. Analysis of operational activity to identify synchronised effects.
Relationship	Collaboration is essential for synchronisation of effects in a dynamic, complex environment.	HQ modelling, wargaming, conflict simulation modelling, experimentation in tactical team-working.

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[3] A series of annual Multi-National Experiments involving NATO, USA, Canada, UK, Germany, Australia and exploring collaboration across Coalition headquarters.

Cause	Dynamic collaborative interworking	Instrumenting the work processes could measure its degree of agility and the extent of collaboration.
Effect	Shared understanding	Individual and shared understanding can be assessed by questionnaire or interview (or real-time probes in exercises). Could also be tested for by ability to collaboratively plan or direct missions.
Relationship	Close collaboration will involve exchanges of information and team discussions which will increase shared understanding.	HQ modelling, wargaming, experimentation in team-working within HQs (e.g. MNE series).

Cause	Shared understanding	Individual and shared understanding can be assessed by questionnaire or interview (or real-time probes in exercises). Could also be tested for by ability to collaboratively plan or direct missions.
Effect	Agile mission grouping	Time to define and generate mission group. Extent and ease of subsequent changes. The survivability of the individual assets provides another indicator of agility.
Relationship	The ability to dynamically form a team to undertake a common mission will be enhanced by shared situational understanding.	HQ modelling, wargaming, experimentation (including within digitised exercises).

Cause	Shared understanding	Individual and shared understanding can be assessed by questionnaire or interview (or real-time probes in exercises). Could also be tested for by ability to collaboratively plan or direct missions.
Effect	Effects synchronisation	Degree of synchronisation (time, space and impact) of effects. Analysis of information exchanges between units to identify synchronised action. Analysis of operational activity to identify synchronised effects.
Relationship	A common understanding of the situation, together with shared intent, will enable force elements to synchronise effects.	Wargaming if effects are adequately represented, experimentation (including within digitised exercises).

Cause	Shared understanding	Individual and shared understanding can be assessed by questionnaire or interview (or real-time probes in exercises). Could also be tested for by ability to collaboratively plan or direct missions.
Effect	Dynamic collaborative interworking	Instrumenting the work processes could measure its degree of agility and the extent of collaboration.
Relationship	A degree of shared understanding is a necessary basis for collaborative teamwork.	Experimentation into team working.

Cause	Agile mission grouping	Time to define and generate mission group. Extent and ease of subsequent changes. The survivability of the individual assets provides another indicator of agility.
Effect	Optimum tempo	Subjective assessment by peers. Effective use of forces under control. Comparison of both sides OODA loops around specific event sequences would be useful, if data available (exercise, historical analysis).
Relationship	The ability to dynamically form mission groups will enable delivery of effects at the optimum time.	Wargaming, digitised exercises, agent-based simulation, conflict simulation modelling.

Cause	Agile mission grouping	Time to define and generate mission group. Extent and ease of subsequent changes. The survivability of the individual assets provides another indicator of agility.
Effect	Efficient use of resources	Appropriate of allocation to tasks, could be assessed subjectively or by analysing actual and alternative events (using appropriate methods). After-the-event assessment of 'overkill' or 'underkill' could be combined with review of total available force assets.
Relationship	Agile creation of mission groups will enable the most appropriate assets to be allocated to tasks. Any spare capability may be exploited by other groups.	Wargaming, digitised exercises, agent-based simulation, conflict simulation modelling.

Table 2 - structured analysis of Way of Command causal map

Way of Command and decision making style

One of the goals of choosing the way in which a force is commanded is to facilitate effective decision making in order to achieve the desired levels of tempo, synchronisation and efficiency. There is a considerable body of literature on different styles of decision making and much recent discussion has centred around the balance between rational choice decision making and naturalistic (recognition-primed) decision making. A number of factors, such as experience, time pressure, information accessibility, personal style and HQ culture affect the decision making style, or mix of styles, which is adopted.

The effects assessment[4] approach which is being developed for effects-based planning appears to be closer to rational decision making than the naturalistic process which is considered characteristic of expert decision makers. That said, any attempt to specify such a process will inevitably take this detailed form and is the only way it can be taught to novices. Practice and experience should lead to intuitive selection of effects, although this can only emerge if the assessment and planning processes are not rigidly enforced by doctrine or by the socio-technical systems. This paper takes the view that the style of decision making should be considered independently of the Way of Command, in a first order analysis at least.

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[4] This effects assessment process is termed "Operational Net Assessment" by US Joint Force Command.

Way of Command and synchronisation of actions/effects

One of the essential roles of military C2 is to ensure that the various elements which make up the force support one another to a greater or lesser extent, or at least do not interfere with one another. This orchestration to achieve synergy, synchronisation or de-confliction can be achieved in a number of ways, such as: geographic areas of responsibility; allocation to tasks; detailed event sequencing; dynamic collaboration. Clearly, there is a close relationship between Way of Command, the degree of co-ordination required and mechanisms which can be employed.

The US concept of Network Centric Warfare introduced the concept of self-synchronisation, resulting from shared understanding and common intent. This requires that there is no detailed plan of action or specific allocation of tasks at the level which is synchronising, these being features of Mission Command. Care will have to be taken before adopting this most extreme form of de-centralisation, although it appears to have utility at the lowest tactical level.

During a recent workshop on Way of Command, a retired British Army general voiced the opinion that Mission Command has its place, but that certain evolutions (such as breaching an obstacle or an amphibious landing) need strong, centralised control. An analogy is provided by considering the difference in the methods for controlling an orchestra and a jazz quartet: imagine a jazz quartet being led by a conductor; or a symphony orchestra improvising. These groups of musicians produce very different results, have very different social dynamics and have evolved very different styles of control. The lesson for the military domain is that Mission Command is appropriate for smaller, less complicated, formations which are required to be dynamic and creative but that centralised co-ordination may be more appropriate for large formations which are undertaking tasks which require tight co-ordination.

Command style and the ability to handle complexity

Ashby's Law of Requisite Variety states that the available control variety must be equal to, or greater than, the disturbance variety for control to be possible. This explains why complexity is best handled by enterprises in which control is delegated to the lowest level, the antithesis of a typical bureaucracy with rigid hierarchical, centralised control and able to respond to relatively few and slow perturbations. In a predictable environment this is an effective way of achieving unity of purpose and tight co-ordination. In a complex dynamic situation, and many aspects of modern warfare are widely accepted to be complex, the delegation of control, by Mission Command for example, is necessary for its effective management.

UK doctrine publications address the need to achieve an effective balance of delegation, with Reference 2 noting that "British Command structures have been developed on the principle of direction at the highest level necessary to achieve unity of purpose, combined with the delegation of authority for achieving objectives to the lowest level appropriate for the most effective use of forces".

It is stated in Reference 3 that "complex adaptive systems are best studied by other complex adaptive systems". It can be argued that this might be extended to state that complex adaptive

systems are best developed by other complex adaptive systems. This gives an insight into why reductionist approaches to procuring such systems tend to be problematic and suggests the sort of management processes needed to successfully deliver network enabled capability.

Cultural barriers to rapid changes in Way of Command

Reference 1 provides a thorough, although land-focused, assessment of the difficulties likely to be encountered in implementing NEC concepts in the UK Armed Forces. It lists the following changes in culture necessary to gain the full benefit from NEC:

- flexibility to task organise outwith 'normal' command relationships;

- flatter, more responsive, command structures;

- move away from the close battle;

- relinquishing ownership of indirect fire assets;

- acceptance of Command at a distance;

- move from the Physical to the Information domain.

Reference 1 also recommends a move from collective to collaborative training and practice/ experimentation rather than assessment as way of reinforcing a culture of de-centralisation of control. A slight variation on this would be to assess training on the basis of the extent of collaboration and de-centralisation rather than mission achievement, i.e. measuring success in the quality of the process rather than the outcome.

Many sources note that many, if not all, network-enabled concepts are not new, which implies that there should be valuable lessons which one function, unit, service or nation can learn from others who have already explored the territory. Although current C2 concepts have evolved over time, they have evolved differently in various services or specialisations and there may be much to gain by exchanging ideas across boundaries. An example is the extent to which command and control are separated in airborne air-defence operations, starting with RAF Fighter Command sector controllers in WWII and continuing to current NATO operations with E3-D AWACS. It is in bringing together the lessons from the different services and specialist areas that Joint doctrine development maximises the exploitation of existing knowledge and enables new best practice to be created.

Agile Command - dynamic management of Way of Command

One of the biggest challenges for those Commanding network-enabled operations will be managing the way in which such operations are commanded, i.e. creating and evolving the structure of authority and responsibility to meet changing needs. Interestingly, in adopting the NATO formal Command relationships (OPCOM, TACON etc.) the British Army has lost the flexibility it had in its previous, more subtle, terms for defining Command and Control relationships[5]. If Unity of Command and clarity of Command and Control authority and responsibilities are to be maintained in an era of agile C2, then new methods for managing structures and relationships are needed.

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[5] Prior to adopting NATO terminology the British Army used "UNDER COMMAND, IN DIRECT SUPPORT, IN SUPPORT, AT PRIORITY CALL and SUPER-IMPOSED" to specify C2 relationships.

Successfully meeting this challenge will require military thinkers, technologists and operational analysts to come together and co-evolve appropriate concepts, doctrine, training, information infrastructure and decision support tools. This challenge is made all the harder by the fact that responsibility for delivering these different aspects of capability lies with separate parts of UK MOD, although mechanisms for co-ordination are already in place.

Conclusions

This paper presents another view of how network-enabled capability will contribute to the effectiveness of military forces; its value lies in linking NEC concepts with UK military doctrine (current and future) and command culture. This provides a basis for an experimental campaign which can weave Command issues into the medium and long-term NEC roadmap.

Command is an activity within the cognitive and social domains and requires appropriate analysis metrics, together with methods which typically include people 'in the loop'. This is reflected in the frequency with which wargaming, exercise analysis and experimentation appear in the list of potentially useful analysis methods.

There is general agreement in the relevant literature that different Ways of Command are appropriate, depending on the circumstances, and varying with time and across the battlespace (in geographical, environmental and functional dimensions). What is required is a sound understanding of the drivers and constraints which dictate how Command should best be exercised, together with tools for creating/evolving the necessary structures.

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