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Effects Based Planning - A UK Research Perspective

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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'. 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.

Effects Based Planning - A UK Research Perspective[1]

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Abstract

This paper outlines the core Effects Based Planning (EBP) concepts, constructs, products and tools developed within the UK MOD Applied Research Programme 13 Command Control and Information Infrastructure project RE214 Operational Command and Battlespace Management.

In particular, this paper introduces the cornerstones that have emerged from the research programme. The following areas are covered:

- the relationship between nodes and effects (and therefore analysis and planning);
- the requirement to analyse all dimensions of the battlespace (political, military, economic, social, informational and infrastructural;
- the requirement to plan for effects across all battlespace actors. This would involve the generation of a Course of Effect (CoE) for own (blue) forces and perceived CoE for non-aligned (green) forces and enemy (red) forces. It would also involve an assessment of the cause-and-effect relationships across all actors' CoEs;
- the requirement to plan for actions using military, diplomatic and economic means;
- the requirement to synchronise effects and actions over time.

A sister paper, 'lessons identified from the first UK Effects Based Planning Experiment', provides an overview of an experiment to investigate said EBP concepts, constructs, products and tools.

Introduction

Operations are becoming increasingly joint, multinational and integrated across military and non-military dimensions; they are also becoming increasingly multi-phased and of a shorter duration. The military planning process must necessarily reflect these changes in the operational landscape. The UK Joint Vision "seeks to release the full potential of the manoeuvrist approach through an Effects Based philosophy emphasising deep operations which exploit Knowledge Superiority and Information Operations in order to shatter the enemy's will to fight and, if necessary, to destroy his combat power." [1]

The **Effects Based Approach** (or 'philosophy' as described in the UK Joint Vision) concerns all stages of operations, from planning (**Effects Based Planning**) to execution (**Effects Based Operations**) and will be realised by Network Enabled Capability (NEC). Fundamental to the Effects Based Approach (EBA) are:

1. A thorough analysis[2] of the Battlespace across all seven dimensions of the Strategic Environment - military; economic; legal, moral and ethical; technological, political, physical; and social (MELTPPS[3]);
2. Planning for Effects against the will and/ or capability of specific Battlespace Nodes, rather than simply for Actions;
3. The conduct of Effects Based Operations through the employment of Agile Mission Groups.

The research reported here concerned the investigation of the first two of these concepts, which essentially cover Effects Based Planning (EBP).

Specifically, the main aim of the research was to identify and assess candidate EBP process at the operational level of command and identify equipment capability requirements and issues for short- to medium-term exploitation. An abstract EBP concept had been developed by JDCC[4]. QinetiQ added to this concept, developed constructs to support the aspirations of this concept and designed a candidate process[5]. The constructs and process were supported by a set of prototype EBP tools, also developed by QinetiQ.

An overview of key Effects Based Planning concepts is provided in the next section. A sister paper, 'Lessons Identified from the first UK Effects Based Planning Experiment, [4] details the lessons identified from an experiment to investigate the concepts, constructs, processes and tools introduced in this paper.

Effects Based Planning Concepts and Constructs

A number of concepts and constructs have been developed to support the generation and assessment of an Effects Based Plan. Three major constructs are introduced here: Network Analysis; Course of Effect; and the Effects-Actions Synchronisation Plan. Definitions of individual EBP concepts are provided against each of these headings.

Network Analysis

A **Node** is defined as an individual or organisation that either has an influence on a campaign/ operation or is influenced by it. Under the Effects Based Approach such Nodes may be described on any of the **Seven Dimensions of the Strategic Environment** (MELTPPS). **Network Analysis** is the product of Network Assessment - the process by which Nodes are identified and assessed for critical capabilities, critical vulnerabilities and the **semantic relationships** they have with each other, including ownership and influence. It may be depicted graphically in terms of Nodes and semantic links. An **Actor** is defined as a group of Nodes with a common purpose and unity of effort. Network Analysis is not limited to non-aligned and enemy Actors – it views the Battlespace in a holistic manner.

[2] This is referred to as System of Systems Analysis (SOSA) by the wider MNE community
[3] The equivalent US acronym is PMESII: political, military; economic; social; informational; and infrastructural. Note that this acronym was used in the experiment.
[4] Joint Doctrine & Concepts Centre
[5] This shaping activity was conducted, in part, with reference to JFHQ best practice.

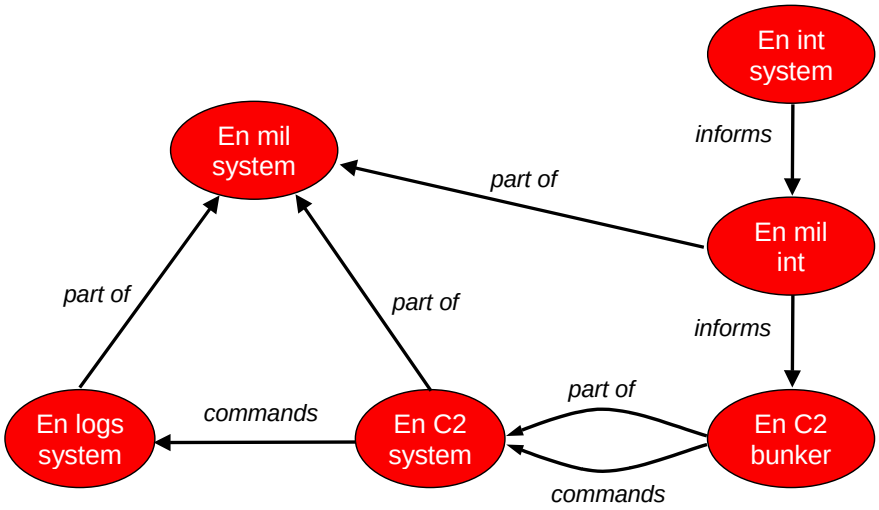


Figure 1; Network Analysis construct (network)

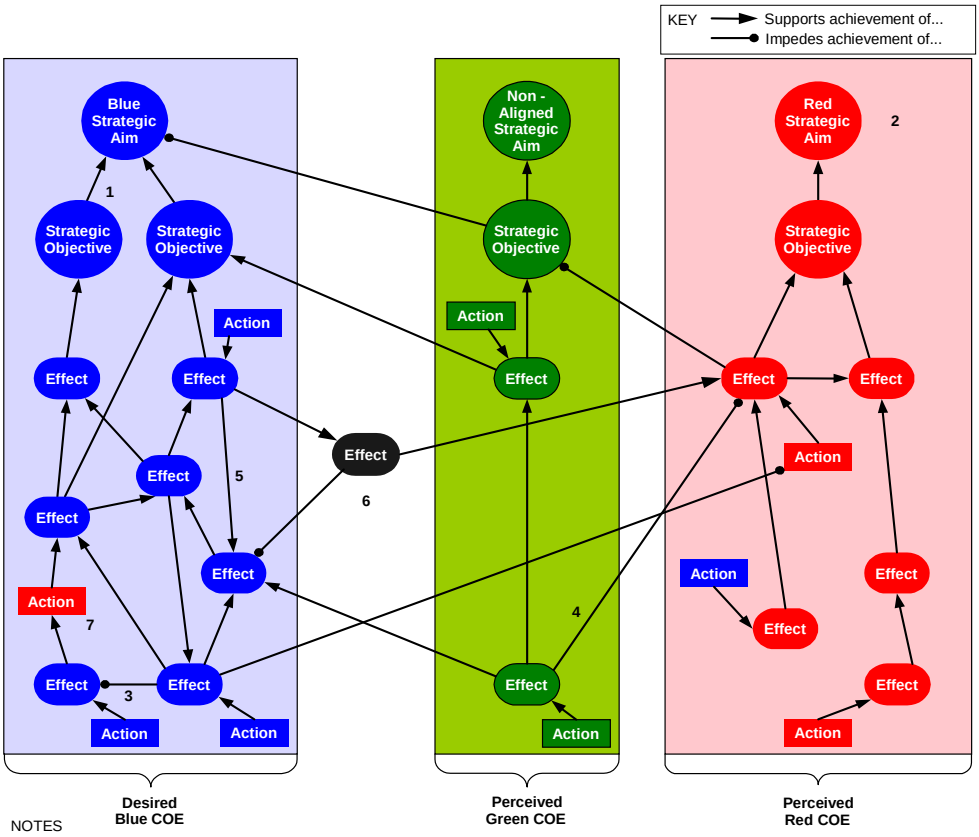
Course of Effect

An **Effect** is defined here as "the (change in) a state of a Node or influence link"[6]. The difficulty in providing a clear and unambiguous definition of an Effect is recognised, however, and in response an example Lexicon of Effects has been developed by QinetiQ, based on Smith [3] (not detailed here). Additionally, Effects:

1. Must be associated with a Node;
2. Must have an associated Measure of Effectiveness (MOE).

The central EBP construct is the **Course of Effect** (COE). This is analogous to a Course of Action and describes a collection of **Actions**, **Effects**, **Strategic Objectives** and a single **Strategic Aim**. Each Actor has a single and distinct COE, although it should be noted that since COEs will be developed by (a specific group of) friendly planners, all COEs except their own would be *perceived COEs*. An Actor's Strategic Aim is contributed to by a set of Strategic Objectives, which are similar to Effects but state desired/ perceived *outcomes* and are not strictly mapped against Nodes. Effects themselves contribute to, or impede, the achievement of Strategic Objectives/ other Effects, and Actions contribute to, or impede, the achievement of Effects. The real benefits of the Course of Effect formulation are realised through the concurrent generation and validation of all Actor's COEs. A pair of friendly and enemy Actors will invariably aim to achieve their own Effects whilst impeding the desired Effects of the other and this may be represented by cause-and-effect links *across* COEs. Further, the COE construct aids the mitigation of risk within the plan through the representation of *undesired* Effects – thus supporting the development of other Actions and Effects to reduce the likelihood of their realisation. Figure 2 shows an **Effects Rationale diagram**, illustrating the Course of Effect construct.

6 Note that the final three words of this definition were added as a result of a lesson learnt from the experiment and therefore "the (change in) the state of a Node" was the original definition.



NOTES

This Effects Rationale diagram represents the rationale for Blue's desired effects in theatre, and its current prediction of Red and Green's (non-aligned forces) desired COE. Colours represent the desirability of a given action, effect, objective or aim for an actor (i.e. the components of each actor's plan).

1. Although the arrows depicting contribution generally read bottom-up, they may be planned from the top down.

2. Representing others' supposed plans and intentions is essential in considering desirability of Blue effects/actions.

3. Blue's own actions may impede the desired effects of its other planned actions - recording this will assist in deconflicting actions and effects (a separate product is needed to support this activity).

4. One actor's effects can be designed to support or impede the achievement of another actor's desired effects/objectives.

5. Effects can be arranged to represent feedback loops (positive or negative).

6. Blue's undesired effects are recorded as effects outside Blue's COE with negative influences on Blue's planned actions/effects/objectives.

7. Any actor's plan may include actions that it believes it can force another actor to take.

Figure 2; Effects Rationale (Course of Effect) construct

The consideration of possible Actions requires an appreciation of the available *ways*. Under the Effects Based Approach, all three **Instruments of Power** (IOP)[7] may be employed, in any combination, in taking Actions to achieve Effects. This recognises both the influences that Nodes from each of these domains may exert upon each other, and the fact that modern operations are rarely purely military in nature.

Effects-Actions Synchronisation Plan

Whilst a COE provides a framework for detailed planning by setting out, in a graphical format, the rationale behind the plan, it lacks a mapping of Effects and Actions onto time and resources. The **Effects-Actions Synchronisation Plan** depicts the temporal sequencing of Effects/ Actions and explicitly represents planning artefact dependencies and time constraints.

[7] The Instruments of Power are also known as DME: diplomatic, military and economic.

The relationship between Network Analysis and Course of Effect

An effective Network Analysis is essentially a model of the battlespace that captures its dynamics and Centres of Gravity, and underpins Course of Effect development/ assessment in the following ways:

1. **Centres of Gravity** (COGs) are elements of the battlespace from which an Actor draws power or influence. These may be represented as Nodes or links. COGs may therefore be the best targets for Effects since changes in these Nodes/ links may have wider-ranging secondary Effects upon other Nodes in the battlespace.
2. Whilst not all Nodes/ links are COGs, the influential connectivity of the network indicates where an Effect may be achieved against a target Node by first achieving a different Effect against a *related* Node. This is called an *indirect* Effect.
3. The achievement of an Effect against a Node may have secondary Effects on other Nodes as patterns of cause-and-effect propagate throughout the network. Not all of these secondary Effects may be desirable. Network Analysis provides the basis for assessing these secondary Effects and, if they are desirable, may cue a new phase of planning to mitigate associated risks.

Effects Based Planning Process, Products and Tools

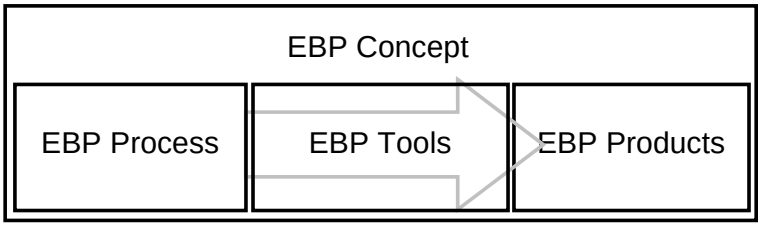


Figure 3; relationship between EBP concept, process, products and tools

Figure 3, above, illustrates the relationship between EBP process, products and tools within the EBP concept. The aim of EBP is to generate planning products (including, ultimately, orders) against which Effects Based Operations may be conducted. The EBP process provides the framework for the generation of these products, supported by the use of EBP tools. The EBP concept introduced in the previous section underpins process, capability and products. The following software tools were developed to support the EBP process and their general purpose is described in Figure 4, below:

- Network Analysis Table/ View (NAT/V);
- Effects Rationale Table (ERT)[8];
- Nodes-Effects Table (NET);
- Effects and Actions Synchronisation Plan (EASP).

[8] Another tool, the Effects Rationale View (ERV) was not used within the experiment. An ERV capability was provided, however, by a separate analyst using Microsoft Visio.

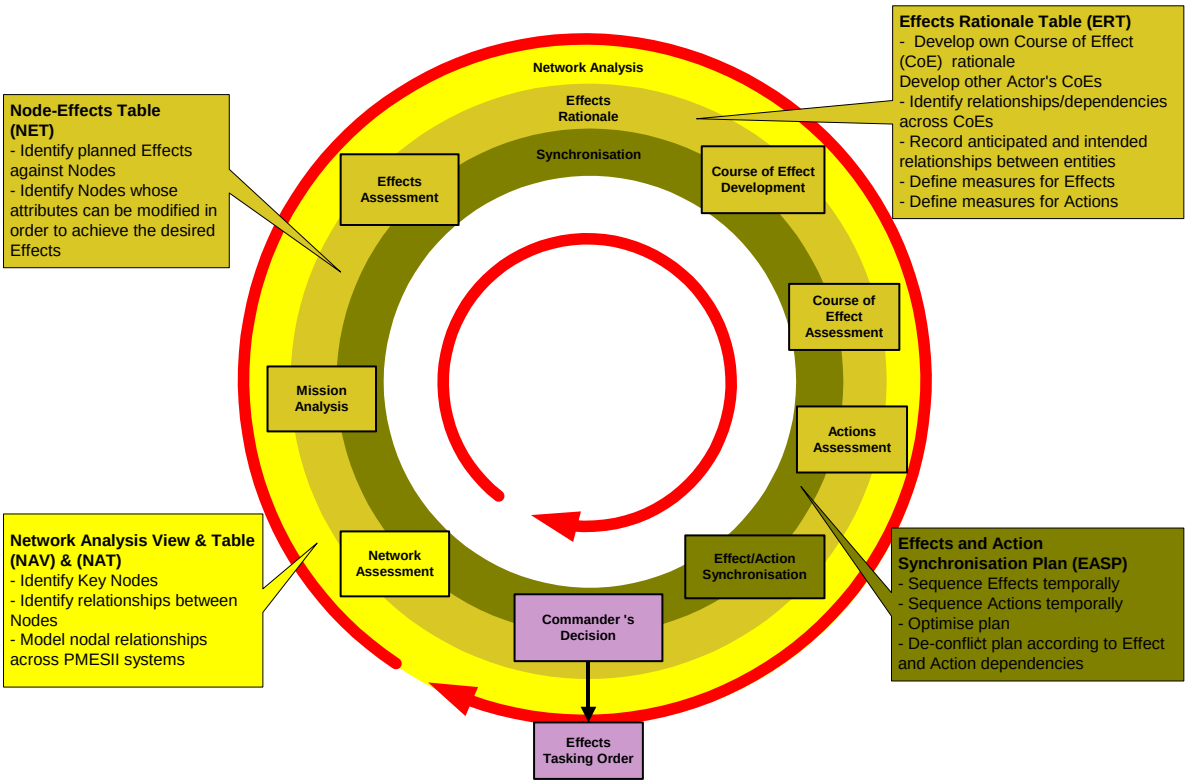


Figure 4; EBP process[9]

Figure 4 depicts a number of sub-processes (in the boxes) and the generic products that they serve to generate and refine (in the concentric rings). These sub-processes and products are described below. Note that the sub-processes map onto the generic products through the EBP tools in the manner described in Figure 3; this is shown by the colour mapping in Figure 4 (e.g. Effects Assessment is supported by the ERT and the NET in producing Effects Rationale). Note also that the products map onto the three EBP constructs introduced in the previous section, namely Network Analysis, Courses of Effect and the Effects-Actions Synchronisation Plan. It should be noted that the EBP process, and refinement of each generic product, is iterative.

EBP sub-processes

Network Assessment is the process by which a Network Analysis is generated and refined. It comes first in the sequence since it should be conducted continuously, both in peacetime (**baseline Operational Network Assessment**) and during operations (**focused Operational Network Assessment**). As the emphasis shifts towards the formulation of Effects to be achieved against Actors, focused ONA may be typified by the identification and analysis of Centres of Gravity (key Nodes and links).

Mission Analysis is conducted in a similar fashion to that which is currently conducted at the operational level of command. The key differences are due to both the language of Effects and the wider considerations of cross-MELTPPS analysis and cross-IOP planning. Hence command teams may be more reliant upon non-military SMEs in conducting Mission Analysis. In a subsequent sub-process not detailed in Figure 4, the Commander writes and briefs his **Commander's Direction** to his staff,

[9] Prepared by QinetiQ based on JDCC's EBP process, documented at [2]

setting out Strategic Objectives, key Effects to be developed/ assessed, key Nodes to be analysed and other planning guidance.

Effects Assessment is the sub-process whereby Effects are conceived and then assessed against the following criteria:

- *Viability*. Is it within the bounds of possibility that the Actor could seek to achieve this Effect? (This is subtly different to *Capability* and *Willingness* – see below);
- *Capability*. Can the Actor feasibly draw on capability (i.e. ways and means) to achieve this Effect?
- *Willingness*. Does the Actor have the will to achieve this Effect and deal with the consequences?
- *Measurement*. Can the Actor feasibly measure the achievement of this Effect?

This sub-process serves to eliminate Effects that are considered to be currently unachievable. Care is required, however, in the elimination of perceived non-friendly Effects. **Actions Assessment** is the associated sub-process by which Actions are conceived and mapped onto Effects that have passed the Effects Assessment process. It is recognised that there may be a number of alternative Actions available to theoretically achieve a given Effect and therefore an associated risk assessment is required.

Course of Effect Development concerns the mapping of Effects and Actions onto Actors' individual COEs (which also contain each Actor's Strategic Aim and Strategic Objectives) and the development of cause-and-effect links between such planning artefacts, including supporting/ impeding links and links across COEs. The aim of this sub-process is to develop the rationale behind the plan. **Course of Effect Assessment** is the process whereby this rationale is assessed in detail. Strategic Objectives, Effects and Actions are assessed for their likelihood of supporting the achievement for the overall Strategic Aim whilst impeding the achievement of the enemy Strategic Aim. The likely consequences of secondary Effects must also be assessed to prime the development of new Actions/ Effects to counter them, if necessary. Both of these activities require are supported by wargaming; note also that there is only one COE for each Actor, hence wargaming concerns the assessment and refinement of each of these COEs, rather than the selection of a COE for each Actor from a set of three candidates. Finally, Effects are prioritised in terms of their importance to the achievement of the Strategic Aim and this may be captured in the **Priority Effects List** (PEL).

Effects Synchronisation is the process by which the friendly COE is mapped onto time, temporal dependencies between planning artefacts and hard time constraints are specified and any resulting conflicts are identified and dealt with[10].

Commander's Decision. At this stage the friendly COE developed by the HQ staffs is presented to the commander for his consideration, and ultimately his approval.

[10] Note that the full JDCC description of Effects Synchronisation includes the mapping of Resources onto Actions and their subsequent deconfliction. Since Resources were not considered explicitly during the experiment, however, this part of the definition is omitted here.

Summary

In order to investigate equipment capability requirements for EBP it was necessary to take the high-level concept developed by the JDCC and provide a specific instantiation for the short-to-medium term.

This paper has outlined the constructs, processes and tools proposed to meet this requirement.

A sister paper [4] outlines the lessons identified from a subsequent experiment to trial the constructs, processes and tools and investigate equipment capability requirements for Effects Based Planning.

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