A Comparison of Approaches to Assessing Network-Centric Warfare (NCW) Concept Implementation

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ABSTRACT

Implementation of Network-Centric Warfare (NCW) concepts in militaries around the World will consume considerable resources over the coming decade. Consequently, being able to measure the progress, or otherwise, of NCW implementation is of significant importance for future systems engineering, testing and evaluation of Australian NCW. As part of the Defence Science and Technology Organisation's (DSTO) development of an updated NCW readiness assessment method, also known as 'NCW Prioritisation and Implementation', a wide-ranging literature review of NCW and related assessment methods has recently been completed. This review covered the assessment methods used by a number of countries as well as methods used to assess analogous activities such as eCommerce. This review shows Australia's current efforts to develop and apply an assessment framework for NCW compare favourably with those of other countries.

Introduction

Overview

This review of literature associated with assessment of Network-Centric Warfare (NCW) has been prepared in support of the development of DSTO's NCW Prioritisation and Implementation (NPI) assessment method. As part of efforts to support the integration of Land force combat capabilities under the LAND 5000 (now retitled JP 5000) initiative, in late 2003 and early 2004, DSTO undertook an assessment of the 'NCW readiness' of key Land major capability projects and selected legacy systems.

The objective of this assessment was to assist in determining the readiness of Army (and Joint land-related) capability systems to integrate with, and contribute to, the future NCW-capable force. The assessment identified key issues and capability gaps between what is planned to be delivered and what is needed to enable NCW. In addition, the assessment process identified some of the major NCW-related issues and risks in delivering the assessed capability projects. The outcomes of the 'Land NCW readiness assessment' were reported within Defence (Unewisse *et al* 2004, Sands *et al* 2004) and publicly (Unewisse 2004).

Although the NPI Phase 1 assessment produced useful outcomes and was well-received by senior Defence decision-makers, the assessment method (Unewisse & Wilson 2003) was limited in scope, having been developed specifically for the Land environment, and subject to some criticism (Scholz 2005). One of these criticisms was an apparent lack of reference to relevant published literature. As a consequence of the identified limitations and deficiencies, the NPI method is being redeveloped to support the whole-of-ADF NPI Phase 2 assessment.

Scope

In determining an appropriate scope for this literature review, it became clear that how to assess NCW is (not surprisingly) a topic of significant interest in several countries and that there is, as yet, no single, dominant approach. Known work to date has encompassed the following methods:

- Readiness assessment of major capability system to support a move to NCW operating concepts – Australian JP 5000 NCW readiness assessment as described and applied by Sands *et al* (2004), Unewisse & Wilson (2003), Unewisse (2004), Smeaton (2004), Unewisse *et al* (2003), and Balmaks *et al* (2004).
- Performance through compliance assessment against a standard or architecture – United States Net-Ready Key Performance Parameter (NR-KPP) (US DoD 2004a).
- Benefits chain analysis to understand the relationships between NCW-related investment and force effectiveness – United Kingdom Network-Enabled Capability (NEC) benefit analysis (MoD 2003a).

These national methods generally involve a set of detailed assessments that are 'rolled-up' in some way to provide a holistic assessment. In this way, these NCW-specific assessment methods are similar to business process and quality audits based on project or policy documentation. Often the assessments take the form of guidelines rather than defined assessment processes.

Several other countries are involved in similar network-based improvements to conventional defence forces, in particular the Swedish concept of Network-Based Defence. Further research will be undertaken on other national implementation and assessment methods for the application of network technologies and operations to defence activities.

Australian JP 5000 Land NCW Readiness

Background

The JP 5000 (originally LAND 5000) initiative saw the development of a suite of readiness assessments that have used various techniques to determine the state of NCW readiness in the Land force. This area of assessment is documented in several papers (Balmaks et al 2004, Sands *et al* 2004, Smeaton 2004, Unewisse 2004, Unewisse *et al* 2003, and Unewisse & Wilson 2003).

Balmaks et al (2004) sets the agenda to this analysis work by describing the overarching requirements of JP 5000 to the Army and the ADF capability development community. The paper outlines the conceptual basis of JP 5000 in the context of Army's concept-led and capability-based approach to modernisation. It describes Army's expectation of the networked Land force and the implementation plan for achieving JP 5000.

However the applicability of this paper to readiness assessment, relates to the discussion of key NCW implementation risks. The key risks outlined in this paper also form the basis of the formal NCW readiness assessments as discussed later. In summary these risks relate mainly to network attack, corruption or latencies; interoperability: information overload and mismanagement; and unsuitability of the capability development system.

The processes used to undertake this readiness assessment can be best summarised by examining the assessment methodologies, data and assumptions as reported by Unewisse and Wilson (2003), and Smeaton (2004). In both cases the overall objectives of these assessments was to assist in the determination of the readiness of Army (and Joint land-related) capability systems to integrate with, and contribute to the future NCW-capable Land force.

Foundation – Australian NCW premises

Australian NCW is based on five premises (Directorate of Future Warfighting, 2004) as shown in Figure 1:

- Professional mastery is essential to NCW.
- Mission command will remain an effective command philosophy.
- Information and intelligence will be shared if a network is built by connecting engagement systems, sensor systems and C2 systems.
- Robust networks will allow the ADF and supporting agencies to collaborate more effectively and achieve shared situational awareness.
- Shared situational awareness will enable self-synchronisation, which helps warfighters to adapt to changing circumstances and allows them to apply multidimensional manoeuvre.

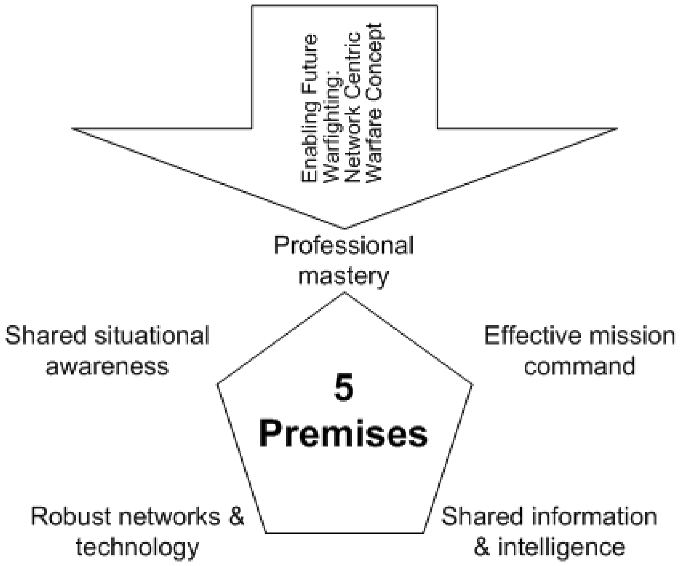

Enabling Future Warfighting: Network Centric Warfare Concept
Professional mastery
Shared situational awareness
Effective mission command
5 Premises
Robust networks & technology
Shared information & intelligence

Figure 1: Australian NCW premises

Foundation – Australian NCW characteristics

Although the five NCW premises, and associated concepts, provided some high-level insight into NCW, they did not in general provide sufficient depth to guide the development of the concepts and requirements for Land NCW or development of the JP 5000 Land NCW readiness assessment method (Unewisse 2004, Section 2.2). Consequently, ten characteristics of Australian NCW were developed to provide sufficient depth to shape the direction and implementation of NCW capability with the Land force:

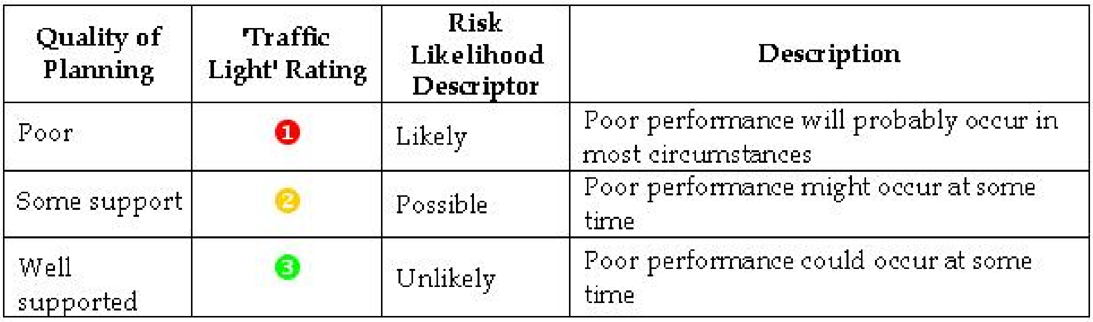
1. Application of mission command built on a foundation of professional mastery.

2. Increased ability for the commander to develop and implement options, via appropriate collaboration and combination of capabilities, to generate required effects.
3. Exchange of complementary voice and digital information across a federated and integrated network.
4. Sharing of mission intent and relevant battlespace information to enhance team formation and the effectiveness of fighting as teams – single arms, combined arms, Joint or coalition.
5. Effective information management to ensure the required information is provided to the relevant decision-makers in a timely, robust, reliable and secure manner.
6. Flexible management of time and tempo in order to facilitate quality decision-making.
7. Enhanced cooperative engagement through the networking of the engagement, sensor and C2 systems.
8. Broadening the spectrum of operational capabilities from traditional warfighting by facilitating geographically dispersed multi-faceted and concurrent operations.
9. Enhanced warfighting concepts, doctrine and TTPs to effectively utilise networked capabilities in order to increase force survivability and undertake complex operations at the same or lower levels of risk.
10. Training (both individual and collective) designed to realise and sustain the potential capabilities of a networked force.

Project selection

The selection of projects for assessment was based on importance with each being assigned a priority rating on a scale from 1 to 5. Unfortunately time constraints prevented the assessment of all projects and only those that fell within the 1 to 3 rating scale were assessed. Of those in this category, five were not assessed because of either a lack of data, or unsuitability of the project for a 'key enablers' assessment. More than 19 Land force projects were assessed for their NCW readiness. However, it was noted that some of the projects assessed were in various stages of maturity, which led to a considerable variation in the level of available documentation. Where information was available, the assessment also rated completeness for the 2010, 2015 and 2020 timeframes.

Rating scale



Quality of Planning	'Traffic Light' Rating	Risk Likelihood Descriptor	Description
Poor	❶	Likely	Poor performance will probably occur in most circumstances
Some support	❷	Possible	Poor performance might occur at some time
Well supported	❸	Unlikely	Poor performance could occur at some time

Figure 2: Likelihood of risk measures from NCW readiness study

Qualitative ratings were applied to the data sets, which in most cases equated to three assessment states. These three assessment states generally equated to ratings of 'well supported', 'some support' and 'poor support' ratings, which in turn, equated to 'traffic light' display ratings as shown in Figure 2. The same or similar general schemes related to other rating scales within the assessment.

Method

A full description of the assessment methodology is given by Unewisse and Wilson (2003) and Smeaton (2004), with results integrated in the draft report by Sands *et al* (2004). The work by Unewisse and Wilson (2003) focused on NCW enablers, interactions and communications, while the work by Smeaton (2004) adopted a risk management approach which assessed the key enablers using a cross-impact analysis technique.

The primary analysis (Unewisse & Wilson 2003) assessed individual project NCW readiness against the characteristics of:

- Command and control (C2),
- Information management (IM), and
- Systems integration (SI).

This analysis developed an approach that broke down the key characteristics into a questionnaire, which used information derived from project desk officer interviews and a survey of related project documentation to assess NCW readiness.

Projects were rated for NCW readiness in the key enablers of C2, IM, and SI with ratings of 1 to 3, Not Applicable or Unknown. These ratings were then summarised in terms of the "traffic light" rating scale as discussed above, noting that in this process the Not Applicable and Unknown states were dropped thus reducing the confidence in some results.

In addition to the individual assessment of NCW readiness against the key enablers, an additional analysis included a review of the following:

- Interactions analysis of the capabilities that the projects will deliver,
- Cross-project risk analysis,
- Project timeline review, and
- Insights from the DSTO program.

An interaction workshop was held with the relevant project desk officers with the purpose to identify the interactions between projects in terms of significance of both the 'planned' and 'needed' interactions, and to capture any other information that could be used to provide more depth to the study. In this case ‘planned’ indicated that the project documentation includes plans for the interaction and interfaces in question. Whereas ‘needed’ was a separate independent assessment by the workshop of the interactions with other projects, which are to be supported by the project.

The interactions were characterised in terms of warfighting impact, required frequency of interactions, and required timescales for the interactions. Again, the data were derived using a three level rating scale that equated to descriptive terms of relative performance. For example, the terms used in the assessment of ‘required frequency of interactions’, equated to ‘rare/by exception’, ‘common’, and ‘nearly constant’, and hence corresponded to numeric ratings of 1, 2, and 3 respectively. A sample rating scale corresponding to the previous example is shown in Table 1. The data collection methodology also allowed values of ‘Unknown’ and ‘Not Applicable’ to be assigned to interactions.

The data collected at the interaction workshop provided complete data sets for the planned and needed requirements.

Rating	Description
1	Rare / by exception
2	Common
3	Nearly constant

Table 1: NCW readiness frequency of interaction ratings

As stated above, a risk-based assessment was undertaken by Smeaton (2004) which analysed the key enablers using a Cross-impact analysis technique. This approach involved the conduct of a Cross-impact workshop, where the focus was not on the fielded capabilities but rather on the projects that will generate those capabilities. The Cross-impact workshop was held with the relevant project desk officers with the purpose to identify key NCW enabler risk ratings.

The NCW cross-impact analysis was undertaken in two distinct steps. The first Cross-impact matrix technique was applied to a core set of 21 projects to assess the internal impact within each project of the 3 enablers of C2, IM and SI. It identified and prioritised for each project, which of the three enablers has the greatest impact. Using the same technique for a total of 41 projects, including the 21 above, the external impact of every project on all other projects was assessed.

For both the internal and external cross-impact matrix studies the method assessed which projects had an active impact on other projects (active score) and which were impacted on (passive score). The active and passive ratings were graphed, and a final value was determined which prioritised the projects into Tiers ranging from 1 to 5, as shown in Table 2. The results of the internal study for each of the 21 projects are found in Smeaton (2004).

Tier	Impact	Definition
1	**Critical**	This project has a critical impact. Careful management is required to avoid unintended cascading effects on other projects
2	**Major**	A project in this range has a major impact with the following possible range of effects on the other projects: a critical lever to be kept under control, a highly mobile, potential trouble-maker, or a project that could have a serious cascading effect on other projects if treated directly
3	**Moderate**	A project in this range has a moderate impact with the following possible range of effects on other projects: act as a stabilising influence on the other projects, or have moderate effects when carefully directed.
4	**Minor**	A project in this range has a minor impact with the following range of effects on the other projects: a strongly active, but weakly passive project that will have lasting results, a project that is moderately active, and mildly passive and will have a steering effect, a project that mildly active and weakly passive will act as a weak lever, and a project that is mildly passive and weakly active will act as a stabilising force
5	**Insignificant**	A project in this range is so reactive to the other projects in the system that action is pointless.

Table 2: NCW readiness impact tier definitions

The outcomes of these two cross-impact studies allowed the prioritisation of the 41 projects into the 5 tiers, as stated above. These tiers rated the impacts of the deficiencies in a project and also how these deficiencies impact on all other projects.

US Net-Ready Key Performance Parameter (NR-KPP)

Compliance assessments

The US Net-Ready Key Performance Parameter is part of the US Department of Defense (DoD) acquisition strategy and incorporates compliance assessments against:

- Net-Centric Operations and Warfare Reference Model (NCOW RM),
- Global Information Grid (GIG) Key Interface Profiles (KIPs),
- DoD Information Assurance (IA) requirements, and
- Supporting applications or products.

Net-Centric Operations & Warfare Reference Model (NCOW RM)

Four key features of NCW are identified by the US Net-Centric Operations and Warfare Reference Model (NCOW RM) (US DoD 2004b):

- **Reach** – Space-time where 'distance is not a factor', but recognizing that the integration of spatially disconnected capabilities costs time (i.e., there is a minimum delivery time). Time is the dominant limitation in success!
- **Richness** – Total set of expertise, information, and/or capabilities that can be brought to bear, within a unit of time, to effect a decision or an action subsequent to a decision. Richness contributes to driving the margin of uncertainty in a decision or action downward.
- **Agility** – Number of effective adaptations that can be accomplished per unit of time. Thus, highly agile capabilities are those that can anticipate or react and successfully adapt to changes in the environment faster than less agile capabilities.
- **Assurance** – Achieving expected levels of operational and systems performance within a specified context, including an adversarial force in a specified timeframe. Adversarial force (i.e., counters to assurance) is measured in terms of work-factors (time to accomplish a condition or effect) and probabilities (likelihood of occurrence).

Compliance against the NCOW RM, as shown in Figure 3, is verified through an audit on project or program documentation to ensure that definitions, vocabulary, operational views, technical views and standards are incorporated accurately. Compliance is measured against specific criteria, grouped into net-centric concepts, processes, services, standards, and taxonomy.

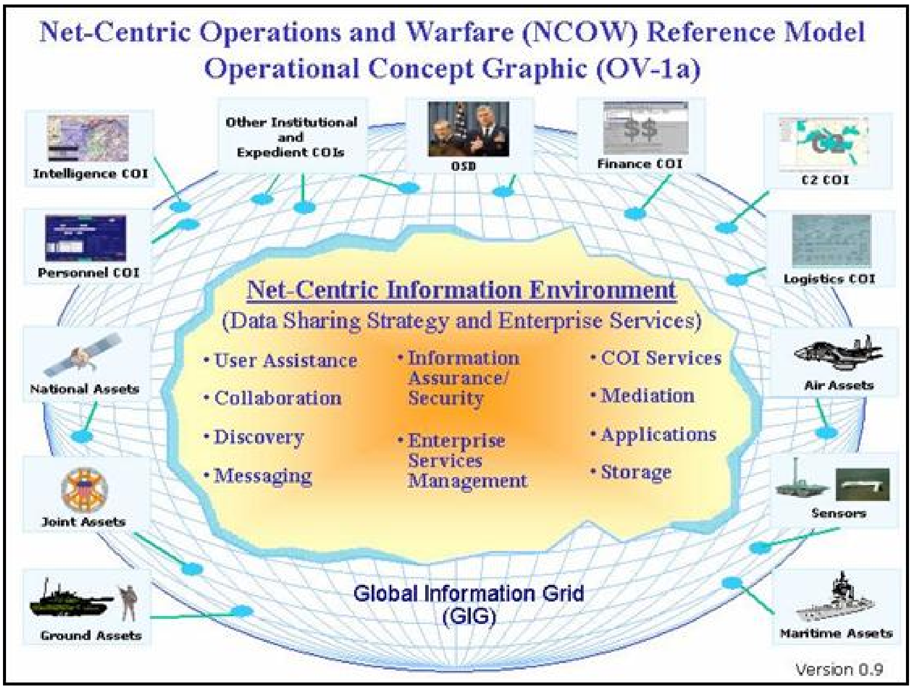
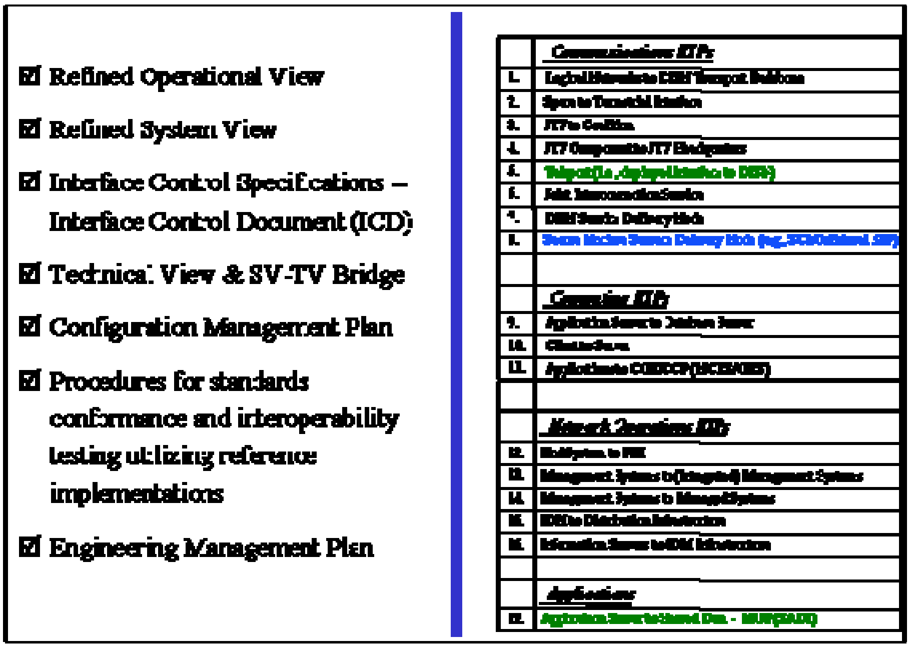

Net-Centric Operations and Warfare (NCOW) Reference Model
Operational Concept Graphic (OV-1a)
Intelligence COI
Other Institutional and Expedient COIs
OSD
Finance COI
C2 COI
Personnel COI
Logistics COI
Net-Centric Information Environment
(Data Sharing Strategy and Enterprise Services)
• User Assistance
• Collaboration
• Discovery
• Messaging
• Information Assurance/ Security
• Enterprise Services Management
• COI Services
• Mediation
• Applications
• Storage
National Assets
Air Assets
Joint Assets
Sensors
Ground Assets
Maritime Assets
Global Information Grid (GIG)
Version 0.9

Figure 3: Net-Centric Operations and Warfare (NCOW) Reference Model

Global Information Grid (GIG) Key Interface Profiles (KIPs)

Compliance against the GIG KIPs, shown in Figure 4, manages interoperability through the configuration control of key interfaces. The verification of interoperability compliance is undertaken through an audit on integration and development documentation, test plans, and interoperability certification testing.



☑ Refined Operational View

☑ Refined System View

☑ Interface Control Specifications – Interface Control Document (ICD)

☑ Technical View & SV-TV Bridge

☑ Configuration Management Plan

☑ Procedures for standards conformance and interoperability testing utilizing reference implementations

☑ Engineering Management Plan

	Communications KIPs
1.	Logical Networks to DISN Transport Backbone
2.	Space to Terrestrial Interface
3.	JTF to Coalition
4.	JTF Component to JTF Headquarters
5.	Teleport (i.e., deployed interface to DISN)
6.	Joint Interconnection Service
7.	DISN Service Delivery Node
8.	Secure Mission Service Delivery Node (e.g., [illegible])
	Computing KIPs
9.	Application Server to Database Server
10.	Client to Server
11.	Application to COE/CCP (NCES/GES)
	Network Operations KIPs
12.	Node/System to PKI
13.	Management Systems to (Integrated) Management Systems
14.	Management Systems to Managed Systems
15.	KMI to Distribution Infrastructure
16.	Information Servers to IDM Infrastructure
	Applications
17.	Application Server to Shared Data - [illegible]

Figure 4: GIG Key Interface Profile (KIP) example

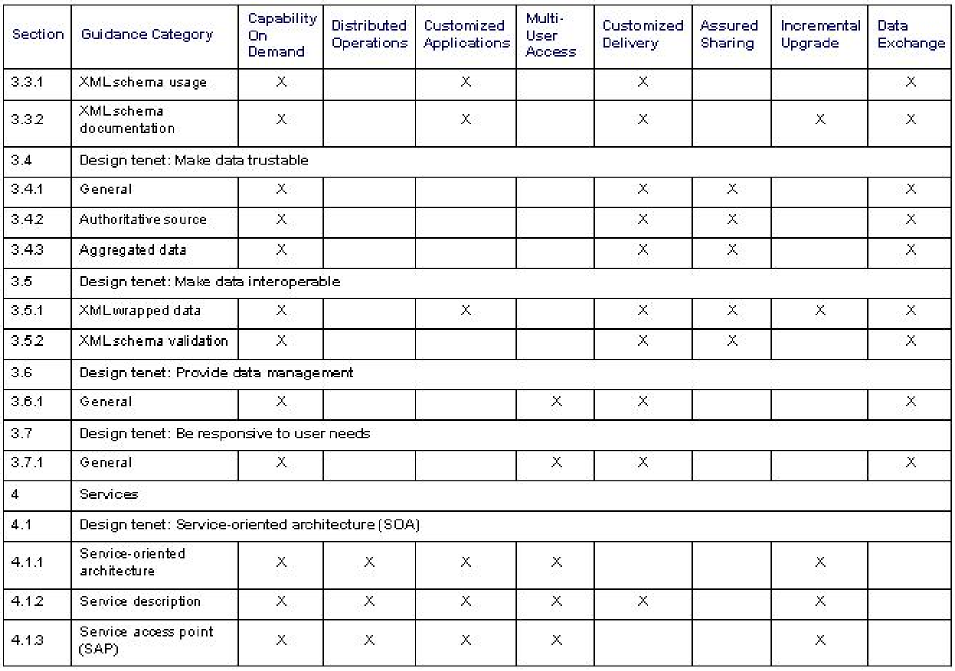
DoD Information Architecture

Compliance against DoD Information Assurance is also undertaken through a variety of audits on documentation focused on the areas of availability, integrity, authentication, confidentiality, and non-repudiation and incorporating protection, detection, and reaction capabilities. These audits target specific areas of technology, such as weapon systems, C4ISR systems, and any information system that depends on external information sources.

Compliance assessments include compliance against internal acquisition policies (for example the Clinger-Cohen Act of 1996 – CCA compliance), and various certification programs, such as through the DoD Information Technology Security Certification and Accreditation Process (DITSCAP).

Net-centric Enterprise Solutions for Interoperability (NESI)

Net-centric Enterprise Solutions for Interoperability (NESI) is a joint effort between the US Navy's Program Executive Office for C4I & Space and the US Air Force's Electronic Systems Center. NESI provides the technical guidance and enterprise design patterns for building net-centric capabilities as services and components that align to the NCOW RM, specifically through a set of checklists and design guidelines. An example checklist is shown in Figure 5.



Section	Guidance Category	Capability On Demand	Distributed Operations	Customized Applications	Multi-User Access	Customized Delivery	Assured Sharing	Incremental Upgrade	Data Exchange
3.3.1	XMLschema usage	X		X		X			X
3.3.2	XMLschema documentation	X		X		X		X	X
3.4	Design tenet: Make data trustable								
3.4.1	General	X				X	X		X
3.4.2	Authoritative source	X				X	X		X
3.4.3	Aggregated data	X				X	X		X
3.5	Design tenet: Make data interoperable								
3.5.1	XMLwrapped data	X		X		X	X	X	X
3.5.2	XMLschema validation	X				X	X		X
3.6	Design tenet: Provide data management								
3.6.1	General	X			X	X			X
3.7	Design tenet: Be responsive to user needs								
3.7.1	General	X			X	X			X
4	Services								
4.1	Design tenet: Service-oriented architecture (SOA)								
4.1.1	Service-oriented architecture	X	X	X	X			X	
4.1.2	Service description	X	X	X	X	X		X	
4.1.3	Service access point (SAP)	X	X	X	X			X	

Figure 5: Example NESI checklist

The areas NESI focuses on design tenets for data, services, information assurance/security, and transport. Enterprise technology objectives, such as capability on demand and distributed operation, were mapped from net-centric attributes to provide technology objectives to assess NESI guidance. (NESI 2005a, 2005b, 2005c)

UK Network Enabled Capability Benefit Analysis

NCW versus NEC

The literature (Borgu 2003, Borgu 2004, MoD 2003b) suggests significant differences between the US-originated concepts of NCW versus the UK adaptation of NCW as Network Enabled Capability (NEC) or Network Enabled Operations (NEO):

- NCW is considered to be resource driven, while NEC is resource limited.
- NCW considers the network to be the primary driver, while NEC views the network as an enabler only.
- NCW is considered a doctrine, while NEC is considered part of a gradual improvement in force effectiveness.
- NCW is a planned and structured development of technology roll-out, while NEC is expected to evolve through networking battlefield entities.
- NCW is limited, by definition, to warfare, while NEC is expected to be applied more widely to Operations Other Than War (OOTW).

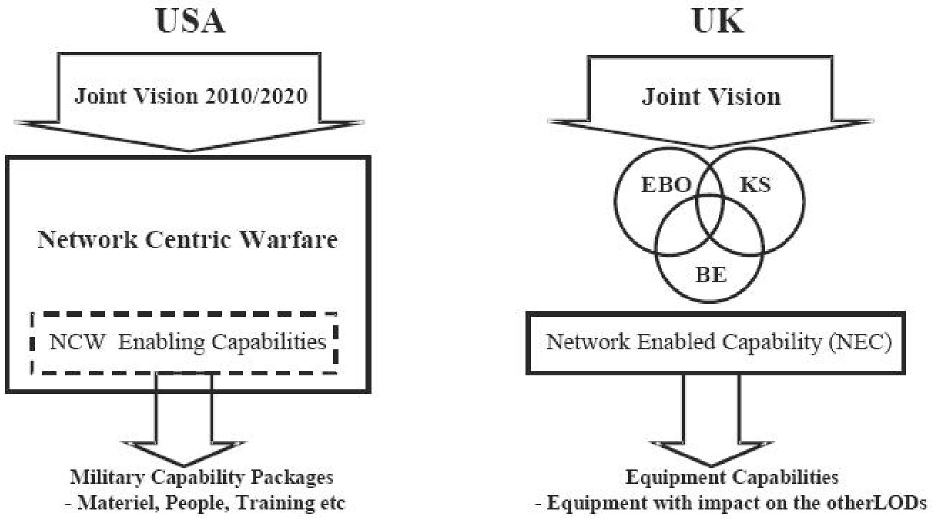

USA
UK
Joint Vision 2010/2020
Joint Vision
Network Centric Warfare
NCW Enabling Capabilities
EBO
KS
BE
Network Enabled Capability (NEC)
Military Capability Packages
- Materiel, People, Training etc
Equipment Capabilities
- Equipment with impact on the otherLODs

Figure 6: US NCW versus UK NEC

This difference plays a role in the assessment mechanisms of the two approaches. NCW-based assessments tend toward more technical and interoperability assessments, while NEC-based assessments tend toward cognitive factors and incremental technical improvements in capability. This manifests in the metrics the two concepts use for assessment.

NEC benefit analysis process

The UK NEC benefit analysis aims to develop a method to apply a number of NEC analysis tools to understand the relationship between investment and force effectiveness. (MoD, 2003a)

The process, shown in Figure 7, assumes that there are benefits chains where investment provides benefits, either directly or through Lines of Development (LOD) that contribute to each link in the benefits chain.

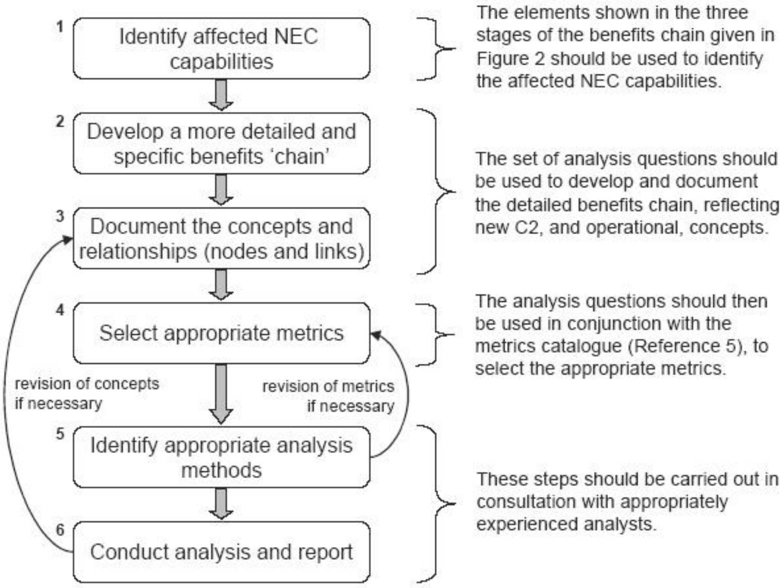

1
Identify affected NEC capabilities
2
Develop a more detailed and specific benefits 'chain'
3
Document the concepts and relationships (nodes and links)
4
Select appropriate metrics
revision of concepts if necessary
revision of metrics if necessary
5
Identify appropriate analysis methods
6
Conduct analysis and report
The elements shown in the three stages of the benefits chain given in Figure 2 should be used to identify the affected NEC capabilities.
The set of analysis questions should be used to develop and document the detailed benefits chain, reflecting new C2, and operational, concepts.
The analysis questions should then be used in conjunction with the metrics catalogue (Reference 5), to select the appropriate metrics.
These steps should be carried out in consultation with appropriately experienced analysts.

Figure 7: NEC Benefit Analysis process

Benefits chain

Each benefits chain is decomposed into more detail to identify relationships across the benefits areas, including all core NEC capabilities:

- Information infrastructure – Including resilient information infrastructure, full information availability and flexible groupware tools.
- Command and control – Including shared awareness, distributed, collaborative planning, and flexible working.
- Military capability (effects) – Including agile mission groups, synchronised effects, and fully networked support.

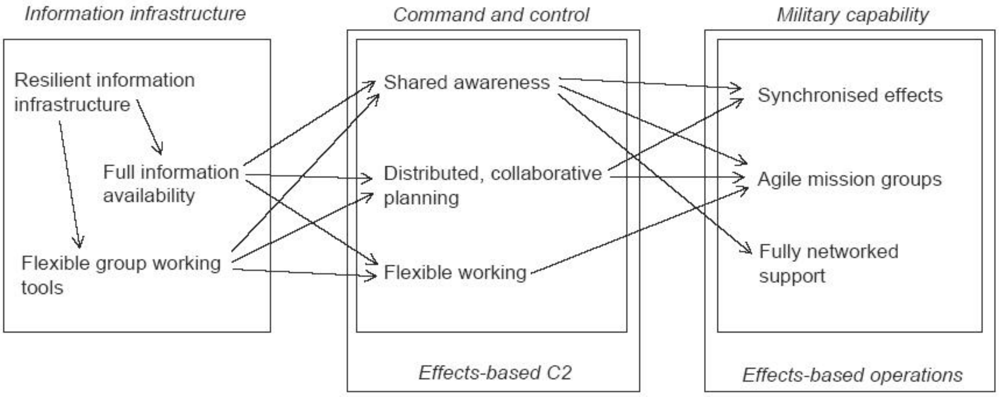


Figure 8: Detailed NEC benefits chain

Figure 8 shows the mechanisms that NEC will impact operational effectiveness, recognising that NEC is an enabler of effects-based operations which will be delivered mostly through policy and doctrinal changes (including training).

Metrics for Questionnaires

After these relationships have been identified, questionnaires are established that are tailored for the specific project or system to provide an initial NEC analysis, for example, information systems, project, or platform investment, or a scenario or capability chain. A three-dimensional grid, as shown in Figure 9, provides guidance for the selection of metrics, including the evolution of the system or architecture from the current to future (epoch), layers of networking, and the core NEC capabilities. A metric catalogue is also provided to guide selection of metrics.

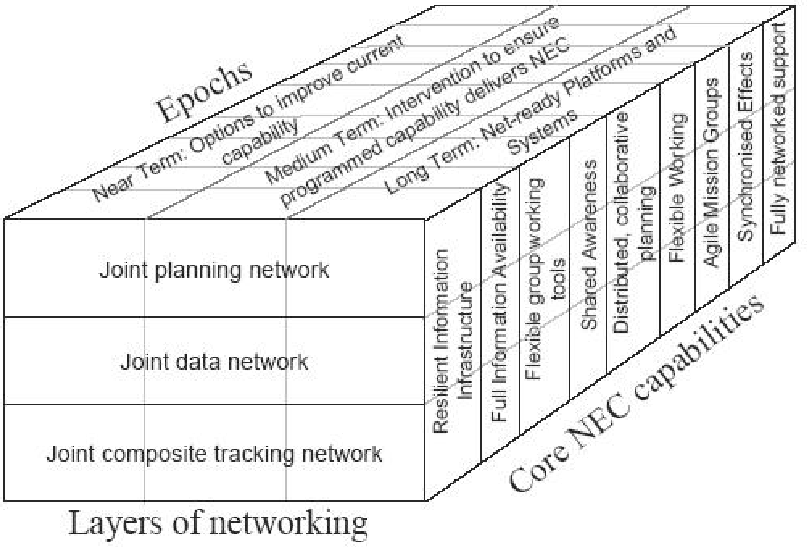

Epochs
Near Term: Options to improve current capability
Medium Term: Intervention to ensure programmed capability delivers NEC
Long Term: Net-ready Platforms and Systems
Joint planning network
Joint data network
Joint composite tracking network
Layers of networking
Resilient Information Infrastructure
Full Information Availability
Flexible group working tools
Shared Awareness
Distributed, collaborative planning
Flexible Working
Agile Mission Groups
Synchronised Effects
Fully networked support
Core NEC capabilities

Figure 9: NEC metrics for metric guidance

Projects are characterised in the dimensions of epochs, core NEC capabilities, and networking layers. Table 3 shows the characteristics of the NEC epochs and Table 4 shows the characteristics of the NEC networking layers.

Epoch	Characteristics
Near term	Improved access to, and exploitation of, information by existing platforms and systems.
Medium term	Evolving from legacy architecture towards the goal architecture.
Long term	Achievement of goal architecture and ‘net ready’ platforms.

Table 3: Characteristics of NEC epochs

It is recommended that metrics are assigned with view to both validity and reliability guidelines, as described in the *NATO Code of Best Practice for C2* (CCRP 2002).

Networking layer	Characteristics
Joint composite tracking network	Shared real-time data, weapons control.
Joint data network	Shared picture, shared awareness, force control.
Joint planning network	Shared understanding, shared intent, force co-ordination.

Table 4: Characteristics of NEC networking layers

Conclusions

Comparison of approaches

Despite the similarities between the three approaches to the assessment of NCW capabilities, it should be made clear that they each assess different areas of improvement. The Australian assessment specifically assessed the readiness of projects and technologies to provide NCW capabilities. The UK assessment specifically assessed the benefits of investment in various areas of NEC to improve force effectiveness. The US assessment specifically assessed the compliance of a project or system to the established architecture.

Having an established architecture to assess compliance against becomes a more technical exercise than the UK and Australian approaches. These approaches need to manage the human aspects as well as the technical aspects to establish the target architecture against which to assess compliance. In this way, the US compliance assessment tends to focus on the technical aspects, while the UK and Australian assessments have made a significant effort to include human dimensions in the assessment. This difference can also be accounted for by the nature of the NEC and Australian NCW concepts against the US NCW concept.

UK NEC and Australian NCW readiness assessment

The UK NEC benefits chain assessment shares several similarities with the Australian NCW readiness assessment, such as:

- NEC Epochs (near, medium, long) – where the NEC epochs are characterised by immediate improvement to capability, the transition of legacy architecture toward a goal architecture, and then the achievement of the goal architecture while the Australian NCW readiness assessment identified 2010, 2015, and 2020 as markers for improved capability.
- NEC Networking layers (joint planning, joint data, and joint composite tracking networks) – where the NEC networking layers appears to be analogous to the command support and tactical information exchange domains within the Australian Defence Information Environment (DIE).
- Core NEC capability areas (information management, interoperability, C2) – where the core NEC capability areas map directly to the Australian NCW readiness assessment characteristics of information management, systems integration, and C2.
- Core NEC capabilities within areas seem to roughly align with the Australian NCW characteristics.

US NR-KPP and Australian NCW readiness assessment

The US NR-KPP compliance assessment shares several similarities with the Australian NCW readiness assessment, such as:

- NCOW RM compliance assessment – where the questionnaire established to measure the compliance against the NCOW RM equates roughly to the questionnaire established to assess Australian NCW C2 readiness.
- GIG KIP compliance assessment – where the questionnaire established to measure the compliance against the GIG KIP equates roughly to the questionnaire established to assess Australian NCW systems integration readiness, and both include the use of the Levels of Information System Interoperability (LISI) model.
- DoD Information Assurance compliance assessment – where the questionnaire established to measure the compliance against DoD Information Assurance

requirements equates roughly to the questionnaire established to assess Australian NCW information management readiness.

- The US NR-KPP compliance assessment makes use of numerous 'Scorecard' assessment matrices, such as the LISI 'Scorecard' used within GIG KIP compliance assessment, and these scorecards are very similar to the 'traffic light' approach used for the Australian NCW readiness assessment with either 3 or 5 levels of scoring.

Acknowledgement

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