

Network Centric Operations Today Between the Promise and the Practice

by *Richard E. Hayes*

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Purpose and Focus

Network Centric Operations (NCO), an umbrella term that encompasses the concepts of Network Centric Warfare (US)¹, Network Enabled Capabilities (UK)², Network Based Defense (Sweden)³, NATO Network Enabled Capabilities (NATO)⁴, and similar terms used around the world, are becoming increasingly important to the modern militaries of the world. This is occurring, in no small part, because the changing technological environment (computing power, computer literacy, nanotechnology, digital communication capacity, etc.) provides the promise of improved military applications across the key functional area of intelligence, operations and logistics. While these changes are largely within the information domain, they have profound impacts in the physical (force elements, terrain, weather), social (organisational, social), and the cognitive domains. They permit military forces, in all types of operations, to substitute knowledge for mass and speed for force. The increased importance of information arises partly from these technological changes, but also includes major changes in the operating environment, which is becoming more complex (involves more factors), more tightly interconnected (as a result of globalisation), and more dynamic (changes more quickly).

One major reflection of these changes is a shift from predominately Industrial Age to Information Age organisations. Industrial Age organisations represent the ideal outcome of a series of processes

designed to achieve goals and objectives – decomposition, specialisation, hierarchies, optimisation, deconfliction, centralised planning and decentralised execution.⁵ However, this approach fails to provide an adequate response to the increasingly complex, interconnected, and dynamic operating environment of the 21st Century. Hence, Information Age organisations are needed to provide the agility⁶ (robustness, resilience, flexibility, innovation, responsiveness, and adaptability) required. These organisations rely on generating and assembling more and higher quality information, sharing that information (which improves it), collaboration (working together toward common purposes), making decisions in an interdependent context and taking synergistic actions.

Moving from Industrial to Information Age operations allows recognition of the fact that decomposition and deconfliction are no longer necessary to gain control over a situation and often prevent synergy. Indeed, the Network Centric (Information Age) approach includes moving beyond Joint operations that cut across the traditional warfare domains of space, air, land and maritime to 'Meta-Joint' operations⁷ involving coalition forces, interagency co-operation, and non-state actors such as international organisations, sub-national groups, and non-governmental organizations. While a small number of pure warfare domains can still be identified where Industrial Age approaches are necessary (for example, defence against diesel submarines), most warfare is increasingly dependent on blending tools from a range of organisations and institutions. US Joint Forces Command (JFCOM) has increasingly come to refer to the need for 'coherent Joint effects'.

The network becomes the mechanism that enables Information Age organisations and processes. In 'ideal' NCO the full suite of intelligence, surveillance, and reconnaissance (ISR) assets are merged with rich sources of information about friendly forces to generate a cohesive understanding of the situation. Effective NCO depends on creating shared awareness of the battlespace at the level of 'actionable knowledge'. This is created not only by an active process of collaboration that deals with what the available information means, including shared awareness, but also extending to knowledge of cause and effect relationships, temporal dynamics, extant uncertainties, pattern interpretation, and some level of predictive battlespace awareness. This focuses both on what is known and what is unknown.

The purpose of this paper is to compare the theory of Network Centric Operations (the Promise), including controlled environments such as exercises and experiments, with the experience (the Practice) in a variety of operational contexts.

The Promise (Theory, Experiments and Exercises)

While the literature on NCO has continued to build, both in the US and abroad,⁸ the most comprehensive recent work is contained in the Network Centric Operations Conceptual Framework (NCO CF) under development by the US Office of Force Transformation (OFT).⁹ This document seeks to capture the concepts underlying NCO, describe the attributes necessary to understand those concepts (for example, the concept of better decision making is seen as made up of two primary dimensions – higher quality decisions and faster decisions), and

specific metrics that can be applied to measure performance on those attributes (for example, faster decisions are assessed in terms of the speed of the command process in reacting to some new development in the battlespace as well as the timeliness of those decisions or the likelihood they can be made in time to exploit an opportunity or avoid a threat).

Only a part of the NCO CF is directly relevant to this paper – the part that focuses on information processing and exploitation. Those elements focus on specific relationships hypothesized to be important. They include:

- Stress on information sharing and collaboration.
- Stress on the quality of interactions.
- Stress on shared sensemaking.

Information sharing is hypothesized to improve the quality of information both because it makes it possible for more individuals to have more information and because those individuals are expected to represent different points of view and types of expertise, thus making it more likely that bad bits of information and analysis, as well as meaningful uncertainties, will be identified. Moreover, collaboration (defined as working together toward a common purpose) is hypothesized to have these same effects because it provides the forum for explicit discussion of the quality of information and what it means.

The Conceptual Framework also stresses the importance of the quality of interactions because NCO is, at its core, about enabling people to work together. Hence NCO assumes that barriers to

interaction are removed, the participants are motivated to interact, and that those interactions are rich. This obviously means removing policy and other bureaucratic barriers, creating interoperable tools so that quality interactions are feasible, and creating a culture of respect, trust, and innovation.

Sensemaking includes not only being aware of a situation, but also using experience, judgment, and decision support tools to reflect cause and effect relationships, temporal dynamics, meaningful patterns, and relevant uncertainties.¹⁰ The NCO CF stresses shared sensemaking because that is the basis for professionals synchronising their efforts, both in military planning and in actions in the field.

Results from Experiments

Despite considerable discussion of experimentation as the way ahead in NCO, relatively few relevant experiments have been completed. However, those few do indicate that the promise in the theory can be realised. For example, the US Defense Advanced Research Projects Agency (DARPA) executed a number of experiments within its Command Post of the Future (CPOF) program.¹¹ These showed that:

- Better visualization tools increase situational awareness.
- Collaboration and shared visualizations increase understanding.
- Increased shared awareness and situational understanding increase the likelihood of mission accomplishment.

Experiments conducted at the US Naval

Postgraduate School as early as the 1980s also showed that shared command intent and situation awareness enabled force elements to operate effectively even when their communications were disrupted.¹² Similarly, experiments conducted by the US Services have increasingly reported the ability to improve the speed of command and obtain improved synergy between the elements of a force when they were on a common network. Other large events, often called experiments, but really major venues within which experiments can be embedded, such as Millennium Challenge 2002¹³ and Multi-national Experiment 3 at JFCOM,¹⁴ have also reported finding improvements in the speed of command and the capability to synchronize force elements when they shared information, provided collaboration tools, and reorganized their headquarters to take advantage of new information technologies.

Results from Exercises

Exercises are more realistic than experiments, though they fall far short of the rigours involved in real world operations. However, the findings from exercises have also added to the promise of NCO. Data taken using the Headquarters Effectiveness Assessment Tool (HEAT)¹⁵ from NATO Battle Force In-Port Training Exercises¹⁶ and US Army Warfighter Exercises¹⁷ in the 1980s and 1990s consistently showed that high-quality situation awareness was the single strongest predictor, among C2 factors, of mission accomplishment. Similarly, data taken from thousands of hours of US Air Force training demonstrate that pilots sharing digital images (Link 16) have a 2.5 to 1 advantage in air-to-air combat over pilots in the same types of aircraft relying on voice communication, even with AWACS support.¹⁸ A Joint US exercise providing a network tool was also found

to have a dramatic impact on the ability of US forces to intercept and engage adversary SOF forces attempting to infiltrate into rear areas.¹⁹ In one US Army exercise, a company commander was able to substitute information for mass and conduct successful offensive operations with a 1:1 force ratio rather than the doctrinally defined 3:1 ratio,²⁰ and in another a Joint force was able to engage and destroy an adversary armour force, during darkness, before it could launch its planned ground attack.²¹ Most recently, the US Stryker Brigade, which is equipped with increased reconnaissance, HUMINT collection, and intelligence processing capability as well as a richer set of information networks, outperformed its light infantry brigade colleagues (by a factor of 10:1 in casualty ratio while accomplishing its mission) while on the offensive against a veteran opposing force made up of well trained and equipped irregular forces.

Hence, the promise of NCO, whether assessed from a theoretical perspective, in terms of experiments, or based on exercises, remains high.

The Practice (Reality): Feedback from Peace Operations, Afghanistan and Iraq

The US Office of Force Transformation has undertaken data collection about the impact of NCO on real world operations. This has included a look at the introduction of new, network technologies in a NATO Peacekeeping Operation – AMBER FOX in Macedonia.²³ While requiring both a change in command style and some time to master the technologies involved, the richer networked systems there are reported to have greatly simplified and improved headquarters operations. Another case study looked at the impact of a richer NCO system on US Navy-led coalition operations in support of

the war in Afghanistan.²⁴ Here, again, improved headquarters performance was reported (after a period of adjustment and with strong command support for the new system), including a dramatic change in how people spent their time – shifting from briefing preparation to thinking about the substance of their jobs. Field reports from Afghanistan²⁵ also indicate that coalition forces were able to create non-doctrinal linkages to pass intelligence and control air strikes because they found ways to get on to the same networks. However, despite a great deal of press reporting about the ‘marvellous’ networks and communication systems available, most of this work was accomplished with high levels of human ingenuity with relatively modest amounts of new technology.

Reports from the major combat period in Iraq were also promising, but far short of the potential and promise of NCO. Some dramatic impacts were reported, including more than one relatively junior officer who reported a ‘battlefield conversion’ when their newly networked systems enabled them to operate at night, during sandstorms, and in ways that they had not previously experienced.²⁶ Moreover, major headquarters, even those out of theatre, were able to follow the battles and advance toward Baghdad much more accurately than in previous ground combat.²⁷ However, an examination of the experience with particular systems, such as Blue Force Tracker²⁸, found that their use and impact were heavily impacted by:

- The length of time the unit had possessed the technology.
- The amount of training its personnel had in the use of the system.

- The mechanical reliability of the systems and the ability to repair them in the field.
- The density of the equipment within each unit.
- Command emphasis on their use.

Similar issues were also present in air-to-ground operations²⁹. While the value of having air attack platforms on the same digital network as the ground controllers was clearly demonstrated, particularly for missions where precise delivery was essential for protecting friendly forces and avoiding collateral damage, only a fraction of the air platforms and ground controllers were properly equipped to join the same network.

Conclusions

The promise of NCO remains bright. None of the evidence available from experiments, exercises or operations implies that the promise is wrong. However, the documented results also make it clear that:

- Network Centric Operations are enabled by technology, but technology is not sufficient to conduct NCO effectively.
- NCO allows us to develop Mission Capability Packages in which new work processes, doctrine, organisations, and leadership enable professional forces to increase agility, effectiveness, and efficiency.
- NCO is, at its heart, about people sharing information, collaborating, and working synergistically. The human element remains paramount. ■

NOTES

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