Title: Sense-making in Digitized Command: Information Superiority does not Guarantee Decision Superiority

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Sense-making in Digitized Command: Information Superiority does not Guarantee Decision Superiority

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It has been recognised that many recent military operations are characterized by significant uncertainty and often require more creative decision-making than previous operations (McCann and Pigeau, 2000). While uncertainty has always been a problem in military operations, the implications of it have been mediated by the introduction of sensor systems designed to improve situation awareness. The problem is thus not more uncertainty, but rather that the uncertainty is not expected and as a result is poorly managed.

Creativity is necessary for the increasingly familiar Operations Other Than War (OOTW) such as those described by Bonn and Baker (2000) and in counter-insurgency operations such as those recently experienced in post-invasion Iraq. It is possible that traditional command tools and systems supporting a monolithic command structure will not embrace the changing requirement effectively and the dynamic of the modern battlefield, required for future operations (Brehmer, 2000). Indeed, it has already recognised that traditional engineering approaches to command and control system design may exaggerate the limitations of human cognition and obstruct the normal creativity of mental analysis because of an engineering design process which often ignores the human contribution to problem solving (Artman, 2000; Cook, 2000).

A traditional view of command & control takes for granted the idea that increasing information creates greater certainty and more effective decision making, although there are numerous historical examples suggesting that this is not always the case (Bolia, Vidulich, Nelson, & Cook, in press). The first wave of digitised command and control development was concerned with issues such as information overload and not task-related concerns of what had to be achieved with the information (Cook, Stapleton and Artman, 2000). Historically, information superiority, such as that given by code breaking and intelligence, has not always provided an effective guide to the intent of the
enemy forces without additional sources of information, such as cultural aspects of the
nations involved or personality characteristics of the commander (Bolia, in press). The
interpretation of command & control as an information gathering process suggests a
scientific view of the world based on experimentation, where hypotheses are generated
and rigorously tested to determine the validity of the model behind the predictive
statement. This scientific analysis is not complete because in science the space of
possibilities is constrained by theoretical perspectives and by critical tests that may prove
or disprove the model proposed. However, in the physical sciences the object of study
does not attempt to knowingly deceive the investigator or to conceal information in a
manner that makes it difficult to interpret. The use of information warfare, including
deception and decoys, as a strategic weapon by less capable adversaries in asymmetric
warfare has been identified as a potential area of risk (Hall, 2003) and C4I systems must
address this possibility. The search for greater certainty on the battlefield may draw the
command staff into a fruitless search for more information and create a reluctance to take
decisions without comprehensive knowledge, impairing the dynamic nature of the
decision making process. In addition, the effort of managing and sustaining the
information resource may create motivational and cognitive inertia to adapt to changing
circumstances when evidence indicates that the current interpretations are wrong. This is
in direct contrast to the view that digitisation of the battlefield will produce greater
velocity (Leonhard, 1999). Finally, the effort diverted into information management may
not provide more effective decision-making than that sustained by minimal information.
It has been recognised that the war fighting problems are no simpler as a consequence of
technology and that the craft of managing war fighting to deliver manoeuvre must be
sustained and supported by the new technology rather than obstructed by it (Antal, 1999).

A more effective metaphor for information management in the domain of
command & control might be drawn from a narrative approach with an emphasis on
multi-attribute encoding of the data to allow searches to be sensitive to the value
(significance) or the trust (confidence) invested in data. Historical analyses of military
decision-making and qualitative analyses of transcripts from senior commanders suggest
that specific dimensional attributes are salient in decision making processes, and that
these represent critical lines of inquiry for command staff (Macklin et al., 2002). Expert
commentators on information systems that support distributed cognition lend support to
the view that systems should support reconstructive and interpretive information
management subject to continuous revision (Boland and Tenkasi, 2001). In asymmetric
warfare it is easy to imagine that information superiority is advantageous but against an
enemy with a small footprint embedded in a complex environment this may create an
overwhelming range of possibilities where the command system may amplify the
complexity. Effective information systems need to manage both information and the
knowledge structure, affording methods for searching data for patterns that may be
coincidental (apparently unconnected) or information clusters that seem distinct even
though they share a range of related data points. In simple terms the quantity of
information collected by future systems and sensors may create an illusion of
comprehensive analysis that is seriously misleading. Many of the methods for searching
data spaces are highly linear even though the information space itself is non-linear and
the collection process is equally non-linear. The user’s tools for managing such
information and relationships is equally weak, given that the database systems are
dependent on special support staff, with limited domain awareness, and the structures produced are relatively rigid and inflexible.

The narrative approach to structuring data with a parallel database of raw information from which critical links are drawn is likely to encourage divergent thinking and creative approaches to problem solving at the user interface. The use of agent-based technology to find and monitor important patterns or coincidences will release the user from tedious and unnecessary information management. The advanced information technology needs to bring together the flexibility of rapid prototyping and a data warehousing capability with a knowledge manipulation interface that embraces much of the power of the predictive system.

The type of system proposed to replace the current command and control systems would meet the requirement for effective decision-making described by Brehmer (2000) in that it would support decisions in a changing environment where time is an important factor and the user and the environment are agents of change. The non-uniformities of knowledge make the collection and aggregation of disembodied information more dangerous than ever before as the pace of the battlefield field accelerates, creating more opportunities for friendly fire and co-lateral damage (Fischer, 1999) that are unacceptable in the modern era of war. It is difficult to appreciate the significance and importance of high-level command & control assets when the impact of such assets will never be as obvious as the precision-guided weapons, the advanced aircraft technology or the other frontline equipment used by forces in the Gulf Wars (Werrell, 2003). Significant effort is now expended on C4ISTAR/C4ISR technology assessment and analysis of command staff re-structuring. It seems that the critical question of what exactly are commanders and their staff are going to be doing in the future has not been addressed and the real requirement is lost under a new wave of information systems development promoted by a software industry no longer prioritising the needs of the military and a military system industry trailing the edge of innovation.

References


