

Is NCW Information Sharing a Double Edged Sword? - Voices from the Battlespace.

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Abstract

One of the tenets of NCW is that increased information sharing enhances not only the quality of information but also encourages collaboration and increases shared awareness. The power of NCW lies in a robustly networked force and its ability to move information, manage it, and thus perform missions more effectively. Information, and more importantly knowledge, lies at the heart of NCW. While the role of information in NCW is clear there remains much to understand about how human beings share, absorb, and make sense of the available information, and subsequently make decisions based on that information. For example, simply increasing the amount of information available to commanders does not necessarily result in improved knowledge nor help them make better decisions. The premise that more information is better is not always true. While gathering information enhances intelligence, it also must aid understanding and sense making.

The paper is based on the findings of research into the Human Dimension of Future Warfighting which involved interviewing over one hundred ADF personnel with experience of the Middle East Area of Operations (MEAO).. Based on data from these interviews, this paper discusses the following issues: information sharing and management; reported human reactions to an increased volume of information; impact of technology on the dissemination of information, e.g. multiple channels and formats; requests for information from remote Headquarters; and the impact of information overload/stress on human decision-making processes.

1 Introduction

In the foreword to *The Implementation of Network-Centric Warfare (2005)*, the Director of the US Force Transformation stated that warfare is about human behaviour, in a context of organised violence, directed toward political ends. In the same vein, network-centric warfare (NCW) is about human behaviour within a networked environment. “The network” is a noun representing information technology, and can only be an enabler. “To network” is the verb, the human behaviour, the action, and the main focus. Therefore, implementation of NCW must look beyond the acquisition of technical enablers and capabilities to individual and organisational behaviour, such as organisational structure, processes, tactics, education and training, and the way choices and decisions are made.

Similarly, in his recent speech on Australia’s Defence Capabilities Priorities, Lieutenant General David Hurley highlighted an interesting point on NCW arising from a workshop conducted in early August 2005 on the human dimension of NCW— the emergence of the importance of the ‘networker’ over the ‘network’, and thus the introduction of the concepts of ‘Networker Centric Warfare’ and the ‘Networker at War’. General Hurley further stated “Nothing brand new here but...the possibility it offers to transfer our consideration of capability from technology-centric to people-centric warrants further work” (Hurley, 2005).

Recent literature and discussions on NCW (Alberts & Hayes 2003; Alberts, 2005; *The Implementation of Network-Centric Warfare*, 2005) refer to four tenets, all-starting with the concept of a robustly networked force:

- A robustly networked force leads to increased information sharing.
- Increased information sharing enhances not only the quality of information but encourages collaboration and increases shared awareness.

- Increased collaboration and shared awareness enables self-synchronisation.
- All of that together dramatically improves mission effectiveness and ability.

These four tenets serve to define a value chain that links the full spectrum of material and non-material investments to operational effectiveness and agility. These are important NCW principles; however, an important issue appears to be neglected from these, the human element. Although the human is the key element, the focus seems to be on hardware, bandwidth, and electronics. Even assuming that the information flows freely between and across all force elements, the challenge remains as to how human beings share, absorb, and understand the available information, and subsequently make decisions based on that information.

It is undisputable that new developments in technology have led to force transformation and the way wars are fought. However, notwithstanding the advances in technology, a military force is still built on the skills and qualities of the individual warfighter. Thus a well-trained, educated and motivated human being is the single most valuable element of the current and future force.

2 Research study and methods

This research was part of the larger DSTO Task: *Human Dimension of Future Warfighting*, which is discussed in more detail in another paper at this workshop.

The study begun with a review of the literature concerning NCW and future warfighting. Thereafter, the researchers undertook a series of in-depth interviews with ADF personnel who had returned from deployment to the Middle Eastern Area of Operation (MEAO) since the Coalition invasion of Iraq. The interview questions were largely based on future-warfighting issues prevalent in the current NCW literature. In total, a hundred interviews were conducted.

Although each of the interviewees related their own experiences, a number of common themes emerged from the research. This paper focuses on one of these themes, and addresses how people gather, share and deal with information overload in an environment characterised by uncertainty, complexity, and high tempo.

3 Information gathering and sharing

Whether by design or necessity, humans tend to collaborate to achieve set goals. Looking back in history, many significant developments resulted from group activity and sharing of know-how. In fact, this sharing of information and knowledge, and the willingness to cooperate, are the key elements for innovation and advancement. Warfare is no different from other endeavours.

The research data clearly indicates that the willingness to collaborate and the interconnectedness of robust human networks were necessary ingredients for building up situational awareness, achieving agility and, ultimately, securing successful mission outcomes. This person to person networking allowed for linking of ideas and resources, seeking and sharing information and, overall, it played an important role in every aspect of deployment. It can be easily said that there is nothing new about personal networking. However, as the complexity of circumstances increases and as an environment of uncertainty prevails, the need for informal networking seems to increase. This person-to-person-networking was seen by many of the study participants as a conscious alternative to often obstructive or protracted bureaucracy or processes. Networking not only expanded each person's matrix of connections but it eliminated passing on of responsibilities and often led to decentralised and speedier decision making.

3.1 Trust and information sharing and gathering

Many factors underpin cooperation between individuals and groups in work settings. During the interview program, our participants were asked to identify those that were critical to Australian-US cooperation. One of the most frequently mentioned factors was "trust".

An important outcome of networking is trust building, a characteristic that was identified by most study participants as an essential factor for any future operations and information sharing. People spoke about trust as the glue that kept human networks and interconnections aligned and was also seen as an underlying foundation for collaboration:

...rapport and trust, especially trust, is completely essential.

...you also very quickly build up a rapport with people, and if you can build up a rapport very quickly and get to know them and they get to trust you and you trust them, it becomes a lot easier.

...it was in our best interest both professionally, socially and militarily to mix as much as we could. I think we were much better off for doing so.

Trust may be associated with pragmatic characteristics such as communication, openness, commitment, and transparency (i.e. competence-based trust), or it may be equated with traditional qualities such as integrity, truthfulness, a proven track record, and not ridiculing others if they do not know something (i.e. benevolence-based trust)(Cross & Parker, 2004):

When you task someone to do a job, you have to know - well, you have to trust that he can do the job and the job gets done properly...you'd also follow up to see that it is, but, yeah, if you can't trust people in an environment like that, it's a very sad environment.

We trusted each other implicitly in everything and that was a good feeling. You knew that if you could not make a deadline or you could not be in a place at a certain time you knew that your offsider would be there to help you out and to do it. So, that was without even saying anything, you just knew that they would be there to back you up. The feeling of trust was awesome. I think trust or teamwork was probably the first one...

Trust is one of those commodities that cannot be taken for granted. It requires time and effort to cultivate, and as one of our interviewees put it, *trust - very hard to build up, and very easy to destroy*. Interpersonal trust is elusive; however, developing relationships on a personal and professional level helped generate trust. Sometimes, rank, position, service or force affiliation, and perceived expectations created barriers that prevented the development of trust and subsequently, the sharing of information.

Almost all our interviewees said that breaking those barriers and establishing a personal connection was crucial for a productive relationship and trust building. Discovering non-work related commonalities allowed them to relate to each other on more than an instrumental basis. Socialising was perceived as a vehicle for developing wider networks, and therefore it enabled people to get to know each other. Getting to know each other and establishing rapport were seen as vital steps in building a team, building external relationships, sharing of information, and in achieving set goals. As team-members got to know each other they become aware of each other's strengths and weaknesses, what they could or could not do, their expertise and experience. People used various ways and means to develop these connections and networks and they all pointed out that it paid dividends in promoting interpersonal trust and paved a way for subsequent information and resource sharing:

I mean, even with the little bit of rapport that we had, the results were astounding - the things they were willing to do for us, just so we would give them a stuffed koala! ... The socialisation did contribute a lot to the success of our mission.

...you take time out of your really incredibly hectic day to sort of spend some time with them and just sit down quietly and just sort of talk about the work and whatever else. And you have things set up for them, you know, little things like you make up a little name plate made out of paper. Just sort of say, "You're a part of this team here. We value you". And when parcels come in you share the goodies around. You don't hoard it. These are very small examples. But together they build that jigsaw of trust and responsibility.

So I'd go up and have a chat with them and then I'd find out more of what they did. So when the boss would come up and say, "Look, you know, we need to know - find out about this and this", "Yeah, I know this

guy", and it was networking a lot of it, and although at the start you wouldn't know why they would be important to you, but as the job progressed on...

Since trust was built upon close personal relationships, events that disrupted these relationships (for instance, personnel rotation) undermined the benefits to interoperability that trust provided. As illustrated in the following account, such events brought about periods of trust-rebuilding:

We didn't want to upset our host nation, if you like, so any dealings we had were just very formal until - and once they get to know someone they sort of only want to deal with that particular person, because that was the person that they trust. But when - if you've been rotated or something well then - the next person has to sort of build up that rapport again.

This resonates with other research examining the impact of personnel rotation. For example, Warne, Ali and Pascoe (2003) argue that the rotation of staff brought about by posting cycles impedes the development and maintenance of corporate knowledge.

3.2 Relationships and information sharing

In the literature review on the network centric warrior, Warne et al, (2004) point out that information sharing lies at the core of NCW. Information sharing enhances quality of information and shared situational understanding. Atkinson and Moffat (2005) further state that sharing of information is based on trust developed through social interaction, shared values, and beliefs. A human is a node in such interactions and a link is a bond that people develop which is based on mutual trust. Therefore, a significant component of a person's information environment consists of the relationships he or she can tap into for various informational needs. Sharing of information has a behavioural component and the emphasis is usually on one-to-one networking initiative and effort. It requires time and space (physical, cognitive and social) to develop the sense of safety and trust that is needed for information sharing. These informal networks usually developed in order to produce 'action' where formal processes were not agile enough for it to occur.

Without the trust and interaction, on a social level, where they were happy to have a joke with us and establish something like what we would call "mateship", where they were happy[to] respond to any requests we might make, it would have been much more difficult.

It is still about building a relationship, I think, because to get something out of someone that they do not necessarily want to give up, then it is all about them knowing and trust and liking and thinking there is going to be a mutual benefit out of it.

Conversely, it was also pointed out that a lack of networking skills was detrimental to effective operations:

There are so many military people that miss opportunities to either get the job done or to be able to achieve things, because they don't know how to ask in either the right tone or the right words to communicate with the person they need help from. And they aren't either humble enough or aren't assertive enough to ask and it really depends on who you're asking and what you're asking for, and a timeliness of when you're asking for it. And you've got to give that person a reason why they should help you. So, you've got to look at their position and what their needs are. So, take yourself out of your shoes, there's no military training for that. In the military we tend to go, "This is what I want and now you will give it to me". That doesn't work.

3.3 Information management

NCW is about deriving combat power from distributed interacting entities with significantly improved access to information (Alberts et al, 1999). This can only occur through effective information sharing. Information sharing succeeds when the right information is provided to the right people at the right time and place. Effective sharing of information requires an information management policy and data management strategies.

Information management (IM) is typically defined as “the planning, budgeting, manipulating, and controlling of information throughout its lifecycle” (Office of Management and Budget, 2000). It may be understood as “a set of intentional activities which maximise the value of information in support of the objectives of the enterprise” (Linderman et al, 2005). These activities control information, from creation, through dissemination and use, to final disposal. Many of these activities are also referred to as: data management, records management, content management, or knowledge management.

The purpose of an information management strategy or plan is to improve participants’ ability to find the data they need and to understand that data when they receive it. Data and information must be visible, accessible, understandable, trusted, interoperable, and made available in response to user needs. Moreover, the individuals or units must be able to obtain all the data/information needed and be able to retrieve that information repeatedly for verification (Renner, 2005).

Our interviewees were critical of the lack of information management practices during deployment as illustrated by the following quote:

Unfortunately there was no data base and there was no information. So, you know, that was one of my biggest bugbears was there was no really useable data base. I had to develop my own data base over there just to store my information and to be able to see it.

This led to frustration and difficulties in the verification of information. Many of the interviewees said that once they saw a presentation or a report at some of the briefings it was almost impossible to find it again and go over the details, unless they were able to save it on their own database system. Taking into account that the network-centric environment is characterised by a large number of participants and a plethora of information, the need for management of all information resources is crucial as overall advantage and agility over the adversary will come from readily available information and knowledge.

Renner (2005) describes an effective IM policy for a network-centric environment as having four key elements:

- A body that exercises authority over data, i.e. what data must be collected and made available, how it should be represented and stored, quality/accuracy of data or information, how it will be validated and maintained.
- Shared information spaces – collection of data/information intended to suit the needs of different groups of information consumers. The defining aspects of the information space are data content and governance processes: who posts what to the information space, validation of who can be a consumer of the available information, and how the data should be organised.
- Common vocabularies – shared understanding of terms used and what the data means, for instance, simple dictionaries to keep consistency and aid understanding.
- Implementation infrastructure – information systems operated by data/information producers and consumers.

Since NCW places an additional demand on information storage and retrieval, it is of paramount importance that the information needs of various consumers be addressed and that policies are in place long before operations begin.

3.4 Information overload

Information technologies have advanced to the point where it is now possible to “produce, manipulate and disseminate information ... much faster than we can process it” and “instead of better enabling a person to do their job [this] threatens to engulf his or her control over the situation” (Edmunds & Morris, 2000). This phenomenon is now well known as “information overload”. Other terms referring to the same thing are “infoglut” and “data smog” (Shenk, 1997), and the effect on those exposed and affected by it has been called “analysis paralysis” (Stanley & Clipsham, 1997) and “information fatigue syndrome” (Oppenheim, 1997). Four major factors have been found to contribute to information overload: the sheer volume of information, the difficulty or impossibility of successfully managing it due to time constraints, the irrelevance or unimportance of most of it, and the multiple sources from which it arrives. However, it appears that the volume of information (Farhoomand & Drury, 2002) and the time pressure aspect (Kock, 2000) are the most important.

It is quite evident that the power of NCW is the information and the ability to move it, manage it and thus perform missions more effectively. However, increasing information available to commanders does not necessarily improve knowledge or help them make better decisions. The premise that some information is good but more must be even better is not always true. Concise information is often more effective. During World War II the orders that stopped Operation Market Garden in 1944 and forced the British retreat from Arnhem required about two typed pages of information and a few additional annexes (Langley, 2004). While gathering of information enhances intelligence, it also must aid understanding. If the volume of information is indigestible, the human brain will undertake automatic filtering. The result is that only a fraction of the available information, usually information that matches previous experiences or is familiar or easy to absorb, will be considered, thus, affecting the decision making process. Such instances were often related to the researchers during the interviews and are illustrated by the following quotes:

...because we don't have any way of managing that information we will grab a piece of it we understand...because we want to feel we are getting ahead. Because... all this time away from family, risks throughout – they want to feel it's worthwhile.

One of the major concerns is about the amount of information that we've got available to us – that there is so much of it, that it becomes more and more difficult to pluck out the really important things. You just can't see the wood for the trees.

I find that I had far more than I needed, and actually I got to the stage where I would cut off things.

More experienced and senior commanders recognised that to make sound judgements, it was of paramount importance to stop, reflect and process information. A number of senior officers spoke of a need for training for junior officers to help them develop awareness and understanding of the symptoms and consequences of information overload. When under pressure, it is not negligence to concentrate only on what seems important; it is a necessary human survival characteristic.

...unless we either filter the information for the younger, or junior commander, unless we do that, provide those filters, or unless we train them to understand that they need to only extract the information that is pertinent to them, there will be that additional information overload which will affect their ability to think properly.

And certainly the intelligence staff over there did seem to work incredibly long hours. And I think it was principally because of the amount of information that was available. I mean that's one of your modern problems.

Advocates of technological solutions to information dissemination and management argue about the ability of computers to sort, filter, and selectively distribute information. In their study of information overload, Farhoomand and Drury (2002) find that filtering is the most commonly suggested solution to the problem. But the obvious question that arises is 'how'? Any kind of automated filtering assumes that it is possible to identify what would be interesting, relevant or important in the information beforehand. However, in a typically unstructured, confused and chaotic military environment this is not an easy task. What clearly transpired from the interviews was that people often had to develop their own means of dealing with information overload and the available technology played only a small part in assisting in this process:

I think we're going to have to come up with a better way of filtering information. I think we're going to start suffering from information overload, if we're not suffering from it already.

...there was no efficient mechanism of weeding out the information requirements and in fact the daily situation report that was out there was just very, very prescriptive.

Human filtering of information was a preferred solution, however, putting the responsibility for filtering onto personnel trying to cope with understanding the information and deciding what is of importance sometimes required staff dedicated to that purpose:

How do people cope with this enormous amount and seek what is important, what is crucial and what can be - not disregarded... you've got to decide what you are going to look at because you can't look at everything. And that's why I've got a watch-keeper, two watch-keepers working 24 a day, 24 hours a day, day shift and night shift and their job is to go through and pull out items which identifies anything pertinent to us which we need to know. Otherwise, you just skip.

While the available technology makes it much more efficient to disseminate information, this ease of copy/paste and attaching files contributes to the sheer volume of distributed information. Often our interviewees related situations where they received huge volumes of information or had to attend numerous and lengthy presentations that added little value to the overall situational awareness. Instead, a concise text or brief would greatly enhance the assimilation of information.

With the creation of email all of a sudden the person is asking for all these key performance indicators, all these green lights, red lights, amber lights and that's only been able to be achieved because we can email information in every port and XCEL spreadsheets and all that sort of stuff. They probably don't really use that information that much.

Yeah, there was a lot of information. And it's not only chat information, it was also all the emails coming through. And worse than that were all the databases. It was just, you know, thousands and thousands pages of database information. And the hardest part was trying to work out what was relevant and what wasn't relevant.

Another aspect that is directly connected with technology is the ability to access multiple channels and formats of communication. Whilst this can be very advantageous, it also can be a double-edged sword. A further problem associated with dealing with huge volumes of information was answering requests for information by remote HQ. As much as most of these requests were legitimate, some were superfluous due to the lack of coordinated information management system:

We can have a common operating picture. We can have a whole heap of tools, access to databases and things that allow us to mine information for various headquarters back in Australia. We have the joint command support system, which has various software applications, someone has to do that. We have various protocols and procedures about how information is managed. And we didn't have an information management plan.

Zimm (1999) points out that human decision-making processes change under stress and time constraints. Although the response to stress varies from one individual to another, generally speaking, as stress increases and time constraints prevail, decision makers tend to:

- Concentrate more on decisions and less on situational awareness. As situational awareness deteriorates, decisions are based more and more on an obsolete understanding of the environment.
- Become serial processors i.e. problems are handled one at a time rather than in parallel.
- Abandon prioritisations. The problems that are addressed are not necessarily the most important, but those that just happen to arrive at the right moment.
- Change decision-making modes-from trying to obtain the best decision (optimising) to a more knee-jerk mode.
- Rely on a limited fraction of the available information; sometimes the critical indicators are selected more because they are familiar than because they are relevant.
- Concentrate on short-term problems and delay dealing with longer-term issues.
- Make more mistakes, and yet be less likely to recognise or acknowledge errors.
- Become wedded to the existing plan and make only small incremental changes, even when abandoning the plan would be the better course of action.
- Be influenced by different motives-such as the desire not to be embarrassed in front of their group-rather than by the operational goal.
- Increase their micromanagement of subordinates or freeze up and make fewer and fewer decisions.

Many things contribute to stress during operations, for instance, fatigue, high tempo, severe time constraints, low morale, frustration, and danger. Even more significant to network-centric warfare are work overloads and an excess

of unprocessed or irrelevant data. Collecting too much data and dumping it on a decision maker increases stress and contributes to the deterioration of command processes.

4 Summary and conclusions

In spite of many insights into the human aspect of current and future warfare it still remains the least understood and researched domain of NCW. There seems to be a shift in emphasis from “the network” indicating the information technology, to a “networker” or “to network” representing the human behaviour, the action, which should be the main focus.

The research data clearly indicates that willingness to collaborate and the interconnectedness of robust human networks were necessary ingredients for building up situational awareness, resource and information sharing, achieving agility and, ultimately, securing successful mission outcomes. Trust was seen as the glue that kept human networks and interconnections aligned and was also seen as an underlying foundation for collaboration. Furthermore, the decision making process, i.e. C2 processes need to be enhanced by a degree of empowerment and autonomy embedded into the system to better recognise the role of informal networks in an operational environment.

Sharing of timely and accurate information is at the core of NCW. It seems clear that this results in more information for military personnel and commanders to handle than ever before. Perhaps, therefore, there is a need for a dedicated new role – a person whose job it is, and who is trained specifically for the task, to scan incoming information for anything that might possibly be unusual, interesting or important in the incoming stream and pass it on to others for consideration, analysis and decision. This might counter the two major factors in information overload – volume and time constraints. First, volume could be coped with better because the responsibility would not be to assimilate the incoming information, just to note unusual features in it without any further analysis. Secondly, the time constraint would be alleviated because that is all such a person would be required to do. No other demands would be made of them. Once the process is better understood, it may be possible to automate it.

The implications of this research are that it highlighted a number of important issues dealing with how people cope in the environment characterised by high tempo, uncertainty, complexity, and plethora of information and information sources. These, combined with the often significant time pressure to reach a decision, means that the issue of information sharing and overload are ever more important and require further research.

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