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Network Centric Warfare and the New Command and Control: An Australian Perspective

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ABSTRACT

The Australian Defence Force's *Future Warfighting Concept*[1] explains that Network Centric Warfare (NCW) "…seeks to…generate precision and combat power through shared situational awareness, clear procedures, and the information connectivity needed to synchronise our actions to meet the commander's intent". Command and control (C2) is central to NCW because it provides the unifying concept of commander's intent.

C2's role within NCW lies in the human dimension, which is all about helping Australian Defence Force (ADF) commanders make better decisions. It is C2's ability to translate information into actionable knowledge that helps commanders improve their situational awareness, distribute information and intelligence appropriately, gain timely access to expert advice, and create an optimal headquarters structure[2, 3]. An important requirement for translating information into actionable knowledge is an approach to C2 referred to as "power to the edge"[4]. Power to the edge, in combination with agility, is essential to focussing resources and activities so as to produce effective and timely combat power. For the ADF this means evolving from a top-down process[5].

This paper examines key assumptions about C2 that appear in the NCW literature. Based on data collected from over a 100 interviews, conducted across all ranks and Services, with ADF personnel who have served in the recent conflict in the Middle East, it seeks to determine

- whether a new C2 in the form of a furthering of decentralised control is, in fact, emerging as a result of information technology, and
- if so, is this new C2 better translating information into actionable knowledge and thereby improving agility and speed of response?

The data gives mixed evidence of whether a new C2 is emerging as a result of the information age. It suggests that some elements of a new C2 are definitely emerging; however, these are not due solely to information age technology. This paper provides an overview of the evidence behind this claim. Data relating to C2 arrangements and processes in the NCW environment are presented, alongside data on the decision-making processes that these recently deployed personnel experienced. Other related data are also presented: the personnel's perceptions of the rise of 'informal' C2 arrangements, the challenges associated with C2 in a multinational context, and their experiences of flexibility and adaptiveness, uncertainty, and autonomy and empowerment. The paper also discusses the implications of these findings for training and future C2 research and practice.

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1 Australian Department of Defence (ADF) (2003) Future Warfighting Concept. Defence Publishing Office, Canberra, ACT, pp29.

2 Australian Department of Defence (ADF) (2004) Enabling Future Warfighting: Network Centric Warfare. Defence Publishing Service, Canberra, ACT

3 Australian Department of Defence (ADF) (2005) NCW Roadmap 2005. Defence Publishing Office, Canberra, ACT

4 Alberts, David S and Richard E Hayes (2003) *Command and Control in the Information Age.* Information Age Transformation Series, CCRP Publication Series, Washington, pp4-5.

5 Australian Department of Defence (ADF) (2005) NCW Roadmap 2005. Defence Publishing Office, Canberra, ACT

Introduction

The Network Centric Warfare (NCW) literature[1] claims that as a result of information technology a new Command and Control (C2) is emerging that it is characterised by a furthering of decentralised control (also referred to in the much of literature as "power to the edge"). This new C2, it is claimed, is better translating information into actionable knowledge and thereby improving agility and speed of response. Whilst few would argue that information and communication technologies (ICTs) enable a speedier information-gathering cycle, it has been argued[2] that the military's response to new information technology tends to be greater centralised control. Of significance here is that greater centralised control prevents the faster decision-making cycle required by the increased tempo of operations that this speedier information-gathering cycle has brought about.

This paper examines these claims, based on data collected as part of the Human Dimensions of Future Warfighting (HDoFW) research project, conducted by the Defence Science and Technology Organisation of the Australian Department of Defence. The HDoFW project is about enabling the full exploitation of NCW and other future operating concepts so that they will become an integral part of concept development for future warfare. The project data was collected from over a 100 interviews with Australian Defence Force personnel, across all ranks and Services, who have served in the current conflict in the Middle East.

Based on these voices from the battlespace, this paper addresses the abovementioned claims about NCW—that information technology is changing C2 so that it more fully exploits power to the edge, and that in doing so, agility and speed of response are improved because information is better translated into actionable knowledge. In addressing these key assumptions, this paper focuses on:

— the extent to which ICTs are, or are not, clarifying the commander's intent and improving access to information needed for decision-making at the edge;

— the extent to which power to the edge is being enabled by devolution of authority, and by the resources available to, and the training and experience of, defence force personnel; and

— the impact on the clarity of commander's intent of working with the various partners of the coalition and the various military and non-military parties, and in particular the impact of cultural differences.

The paper also questions

— whether there may be an inherent conflict between taking power to the edge and maximising coordination of effort and congruence of intent from the commander through to the edge, and

1 For instance, Alberts & Hayes 2003; Crecine & Salomone 1989; Department of Defense 2001; Department of Defense 2005; Potts 2003; Roman 1996.

2 See, for instance, Roman, Gregory A 1996 *The Command or Control Dilemma: When Technology and Organizational Orientation Collide*. Research Paper presented to Air Force 2025, Department of Defense, Washington, chapter 3 for an overview of the military's responses to new information technology from the mid 1700s onwards.

— the extent to which personal relationships and informal channels, rather than cutting through the multiple chains, may in some ways hinder the path to a shorter C2.

The data on the decision-making processes that the interviewed MEAO personnel experienced provide the foundation for the conclusions in this paper. Interview data on flexibility and adaptiveness; uncertainty; and autonomy and empowerment were also examined because of their obvious links with decision-making processes and C2. Specific questions used to explore the nexus between decision-making and C2 arrangements, therefore, focussed on:

1. The decision-making that personnel experienced, how command and control worked within their units and across the units with which they had interaction, for instance
    a. how C2 arrangements affected individual and group decision-making,
    b. the degree of autonomy they were awarded,
    c. the type of consultation that was required in decision-making, and
    d. the responsiveness and agility of their command
2. The rise of 'informal' C2 arrangements, and
3. The challenges associated with C2 in a multinational context.

The HDoFW data suggests that there are, without doubt, elements of a new C2 emerging. However, as is discussed below, these are not due only to information age technology; they also result from the involvement of various national forces and non-military personnel in the processes of making and delivering command decisions. The HDoFW data provides mixed evidence of whether these elements of a new C2 have better translated information into actionable knowledge on a wide-scale, and whether they have improved agility and speed of response.

The Role of Command and Control in Network Centric Warfare

NCW has been described as the embodiment of an Information Age transformation of the US Department of Defense[1]. To meet the challenges of the 21st century this transformation must focus on C2, where information is translated into actionable knowledge. In essence, NCW enables the translation of information advantage into combat power by effectively linking friendly forces within the battlespace, providing a much improved shared awareness of the situation, enabling more rapid and effective decision making at all levels of military operations, and thereby allowing for increased speed of execution. Whilst this "network" is underpinned by information technology systems, it is exploited by the Soldiers, Sailors, Airmen, and Marines that use the network and, at the same time, are part of it[2].

It is generally agreed that, whilst the hierarchical structure of national security organisations in the Industrial Age and in the Cold War was appropriate because these times were characterised by consistency, conformity, and continuity, today our national security organisations need to be designed for agility and flexibility and for

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1 Department of Defense (2001) *Network Centric Warfare Department of Defense Report to Congress*., Network Centric Warfare Department, Washington.

2 Department of Defense (2005) *The Implementation of Network-Centric Warfare*. Office of Force Transmission, Washington, DC.

effective information sharing, collaboration, and the building of shared awareness[1]. As Alberts and Hayes explain, today "the emerging threats are different and are continuing to evolve…and our force structure and concepts of operation are not agile enough to keep abreast of the continuing changes…[However], information age technology will …generate the agility needed to defeat (some might say prevent or dissolve) asymmetric threats."[2].

The Department of Defense (2005) makes the point that an important element of NCW is that when implemented, it takes full advantage of the trust we place in our junior and non-commissioned officers, and as information moves down the echelon, so does decision making. Thus, smaller joint force packages can possess more flexibility and agility and are, therefore, able to wield greater combat power than before[3].

Who are the Key Players in Command and Control under NCW?

C2 is a driving factor in the ability to respond in a timely manner and it is a major determinant in achieving agility. Albert and Hayes explain that whilst it is C2's ability to translate information into actionable knowledge that will provide the best opportunity to achieve agility, current approaches to C2 will not enable this transformation. Instead what is needed is an approach referred to as "power to the edge"[4]. *Power to the edge* involves the empowerment of individuals at the edge of the organisation where it interacts with its operating environment, and so it entails expanding access to information and eliminating unnecessary constraints. Moreover, moving power to the edge requires an organisation that has greatly enhanced peer-to-peer interactions. Command and control based on *power to the edge* principles "…enables an enterprise to bring all of its available information and its brain power to bear by allowing information to be recombined in untold ways and by allowing individuals to interact in unplanned ways to create understandings and options not previously possible"[5].

Pigeau and McCann[6] define control as the instrument of command, whereby command can be exercised by everyone in the enterprise. Command and control can be seen to become unbundled within organisations that apply *power to the edge* principles because, as senior personnel are moved into roles that put them at the edge, there is a reduced need for middle managers whose role is to manage constraints and control measures. According to Alberts and Hayes[7], Pigeau and McCann are making the case for moving from a concept of command that is tied to an individual

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1 See for instance, Gingrich, Gerry (March 2005) Network centric warfare panel, National Press Club, Washington. http://www.af.mil/news/story.asp?storyID=123010127

2 Alberts, David S and Richard E Hayes (2003) *Command and Control in the Information Age*. Information Age Transformation Series, CCRP Publication Series, Washington, p4

3 Department of Defense (2005) *The Implementation of Network-Centric Warfare*. Office of Force Transmission, Washington, DC, pii

4 Alberts, David S and Richard E Hayes (2003) *Command and Control in the Information Age*. Information Age Transformation Series, CCRP Publication Series, Washington, p4-5

5 Alberts, David S and Richard E Hayes (2003) *Command and Control in the Information Age*. Information Age Transformation Series, CCRP Publication Series, Washington, p90

6 Pigeau, Ross, and Carol McCann. (2002). "Reconceptualizing Command and Control." *Canadian Military Journal*. Vol 3, No 1.

7 Alberts, David S and Richard E Hayes (2003) *Command and Control in the Information Age*. Information Age Transformation Series, CCRP Publication Series, Washington, p18

commander to a concept of command that is widely distributed. As they explain, this idea of distributed command was introduced in *Command Arrangements for Peace Operations* in recognition of (1) the absence of a single chain of command and (2) the variety of the players involved in peace operations. This idea was generalised beyond peace operations and appeared in the literature with the shift from "commander's" intent in *Network Centric Warfare*[1] to "command" intent in *Understanding Information Age Warfare*[2].

In organisations that apply *power to the edge* principles, commanders become responsible for creating the initial conditions that make success more likely, and they then exercise control by:

- creating congruent command intent across the enterprise;
- allocating resources dynamically; and
- establishing rules of engagement and other control mechanisms that the fighting forces implement themselves[3].

Achieving power to the edge provides the conditions that allow NCW to reach its fully mature form–a self-synchronising capability. A force's ability to self-synchronise is closely related to its agility. Force agility includes robustness—the ability to maintain effectiveness over a range of conditions and circumstances[4] and regardless of the several levels of agility that exist in the military universe (tactical/operational agility, organisational agility, deployment agility, sustainment agility, acquisition agility, and conceptual agility), the contribution to mission effectiveness comes from flexibility in applying and directing force capabilities[5].

Is a new C2 emerging and is it translating information into actionable knowledge?

There can be no doubt that the use of ICTs and the employment of coalition forces influence not only the extent to which authority is devolved but also the way that ADF command decisions are made and how they are delivered along the command line. The issue of greater importance, however, is whether these are translating information into actionable knowledge.

Information and Communication Technologies

The ways in which ICTs can shorten the C2 process and bring power to the edge are many and varied. For instance, communication technologies improve access to information needed for decision-making at the edge; similarly, spreadsheets, presentation software, word processing and similar applications can improve the usability of information required at the edge (and at the various points prior to it), by

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1 Alberts, David S., John J. Garstka, and Frederick P. Stein. (1999). *Network Centric Warfare: Developing and Leveraging Information superiority*. 2nd Edition (Revised). Washington, DC: CCRP Publication Series.

2 Alberts, David S., John J. Garstka, Richard E. Hayes, and David T. Signori. (2001). *Understanding Information Age Warfare.* Washington, DC: CCRP Publication Series.

3 Alberts, David S and Richard E Hayes (2003) *Command and Control in the Information Age*. Information Age Transformation Series, CCRP Publication Series, Washington.

4 Alberts, David S., John J. Garstka, Richard E. Hayes, and David T. Signori. (2001). *Understanding Information Age Warfare.* Washington, DC: CCRP Publication Series.

5 Dekker, Anthony H. (2006) "Measuring the Agility of the Networked Military Forces", Journal of Battlefield Technology, Volume 9, No. 1

manipulating it so it is suitable for these various audiences. The typical example is that information manipulated into tabular or graphical form, rather than as straight text, is more easily digested and used.

Additionally, the clarity of the commander's intent, we would expect, would be better preserved as a result of communication technologies' ability to disseminate information to numerous parties simultaneously and across distances. However, the HDoFW data indicate that various factors can impede the shortening of C2 by hampering this dissemination. The data suggests that, at times, ICTs actually increase ambiguity around information.

The following highlights one type of uncertainty that can arise when using ICTs:

> …during the war we used to sit in the operations room downstairs and were able to look at the xxx chat room, and xxx conducted fire missions against the xxx based on chat…And chat is just the real time extension of email, and no one ever used to do anything based on email but now email is acceptable as an authority to do things. And next thing you know, chat will be too. Except how do you know - is that the admiral on the other end typing it or is it Seaman Bloggs, you know? At least an email comes from the admiral's account, you know, so, yeah, it's strange.

And:

> there was a deal of information that flowed and…our experience was that the traditional voice communications between ships was very much put to the back…What we found, and it depended very much on the number of ships that were out there, was that on occasions you could have six or seven chat windows all up at the same time and you're communicating with different people and there was certainly…potential there to be overrun by the number of chats that were all going on. Additionally, because of the manner in which the USN was looking to use that system, it was at times difficult to know if I was being ordered to do something or if it was just general conversation…[and] it was resolved by going back to them and saying "Is this an order? Do you want me to do this?"

The second of these interview excerpts relates to the use of chat and highlights that sometimes the lack of accompanying vocal and physical non-verbals exacerbated this ambiguity and misinterpretation. Furthermore, on some occasions the sheer magnitude of simultaneously received information made possible by ICTs hampered accurate interpretation of that information.

The example below highlights how ICTs can open up the C2 process but that this can have its downsides as well:

> "we had a lot of meetings on board…there was the opportunity to use videoconferencing…and we could use collaborative tools, and I didn't want to use them…my concern was that with video conferencing and the collaborative - electronic collaborative tools, what you're in fact doing is actually opening up the - the opportunity for more and more people to be involved in the planning, which was going to make the planning more difficult. So there was more than enough people putting their oar in, opening it up even more."

This comment also highlights that, whilst the use of ICTs in the C2 process can provide more diverse opinions and a wider range of information in the planning process, they can also create multiple and non-official lines of access to information and thereby convolute the C2 process.

An interesting comment made by one of the interviewees highlights both sides of the ICT debate:

> …in years gone by…if you…were stuck out there in the middle of the ocean you'd have no one to talk to if a problem came your way. These days it's easy, you can email someone or even talk to them on the…sat phone, straight away. So you've got other people to call on easier, so information is more dynamic, you can get more instant, hopefully the right information…quicker…but it's a double-edged sword, that means your decisions have got to be right and more timely and you can't think of things too much.

Devolution of Authority

Whilst ICTs play a major role in facilitating a new C2, power to the edge cannot be achieved without the devolution of authority. The data provides mixed evidence of whether devolution of authority is occurring. Furthermore, the extent to which it does occur was often reported to be a result of personal differences; some commanders are less willing than others to let go of authority, and some were considered by their staff to micro-manage. Additionally, differing C2 philosophies also contributed to varying degrees of devolution.

There were many clear cases of decreased hierarchy and a consequent shortening of C2 pathways, as depicted in the following comments. In accordance with general arguments in the NCW literature, some participants found that they had been granted higher levels of decision-making authority than previously. As one put it:

> …there was very little direction of what I should do with the xxxx. It was largely, you know, I briefed a concept early on in the piece and they were largely happy with that…Some days it was a little bit much but there you go, you know. But that was fine and it worked…they basically gave me the same decision-making ability that xxx had.

By contrast, many participants also spoke of an absence of autonomy and empowerment, regardless of rank and service. Typical comments, reflecting perceptions of an overall lack of devolution include:

> "…there certainly wasn't too much mission command" "…the commanding officer is god…"
> "…the chain of command [was strictly] adhered to, actually"

And, when asked how much flexibility they were able to bring to their activities, one officer interviewed stated:

> No flexibility, really. We had timings dictated to us by Sydney…and that is fine. That is just the way you are trained.

In the majority of cases, interviewees expressed the opinion that whether their commanders were willing to let go of authority was a matter of personal differences. For instance, as one participant put it:

> To a large extent [I was quite autonomous in my decision-making, or most of it]. Anything that affected capability I always had to talk to my boss about. I would always have to say, "Sir, this is off line. This is why. This is what I recommend to fix it." While I was there, there was a rotation of my bosses so I went through two different bosses and two different sets of ways of doing it. My first boss was very much, as long as I gave a technical reason and explained it to him… he would say, "No worries, xxx, go for it." Largely he left me to run my section. The second boss was not quite so like that.

Another example:

> I found it tended to be very much personality based rather than procedures based. So, you know, you could have two different people in the same job, like you get a handover/takeover. One person was quite happy to let you get on with it but another person felt that they had to micro-manage. You just felt, 'You have got your own problems, let me worry about mine'.

And another:

> I think it's unfortunately personality based. I felt that my first boss was a bit of a micro manager, but I realise - like he wanted to know what you were doing all the time and I guess for someone who's come from a different background, I was given a lot of autonomy, and report back with the bigger story, not the minute detail, this guy wanted minute detail. I actually said, "Look, you know, I'm not used to being micro managed, I really need a bit more space here. I don't have to report three times a day telling you what I'm doing when no significant change has occurred."

When shortening of the C2 process did occur, it was not always as a result of planning and intention. Sometimes circumstances forced power to the edge. These circumstances included:

- lack of resources
- lack of experience
- unclear goals (although one interviewee pointed out that duty statements are now in place that address this issue).

For instance:

> Our communications were not great …therefore these folks had to try and do a lot on the ground with what they had. They would be putting in requests for this, that and the other, some of which could be satisfied, some of which couldn't be, but you just couldn't stop. So it was, "Do the best you can, lads". So a lot of authority, in my environment, was pushed down …to relatively junior folks, largely because we did not control our own lines of communication.

As one interviewee put it:

> Certainly the folks that we had out in the provinces, we had relatively junior officers, majors, running major camps. Call it the camp commandant, if you will, but it was camp commandant and more. He was responsible for force protection, discipline, equipment, training, a whole raft of things for hundreds of Iraqi soldiers. So the breadth of responsibility of some of these junior fellows was very wide, and the guidance that they got was pretty limited.

And yet another:

> once they trusted you, they devolved it all down…if they knew that you were mature enough to then come back and ask them if you had any problems. Now, if they didn't know, quite often they'd go out and say, "Don't know, xxxx, whatever you reckon"... Which places you under a little bit more stress, but at the end of the day you just make a decision and run with it…and you document why you made it, and if it turns out that you made the wrong one, c'est la vie.

Even when intended, devolved authority was sometimes reported to create complications. For instance:

> I was let down, and I think, again, it's part of that you can only support a mission command function - pushing command to the lowest level - if your training continuum is robust, and so I was putting inherent trust and faith in people, and not micro managing them when they lacked the faculty to actually make those decisions.

Sometimes personnel, themselves, would express hesitation and confusion when authority was devolved to them. For instance:

> What authority do we have to make stuff that we've never been trained in, and stuff like that. And who's going to say that, "This is okay." I know we're in war contingencies here and a lot of rules can be broken, that's why we sort of just needed the authority, you know, "What role am I playing here? Am I just one of them or can I actually have a role as a higher ranking type person as well?"

On a number of occasions the point was made that micro-management had an adverse effect on personnel's confidence in their own capabilities. For instance:

> …we became so strictly supervised and controlled in what we were doing that you lost all confidence to make a correct judgement call because – and the reaction to a poor, or maybe not every a poor, but a perceived poor judgement call, was out of control. It was irrational.

And

> …and so I began to get emails and direct phone calls at 4 in the morning…Gulf time, from my commander, "Why haven't I told you about this? "What about this?" And it really – not undermined – well, it did undermine me but, also, at the same time, it made me start second-guessing my decision-making processes in terms of, you know, you employ someone and you trust them to – an officer to pass information that they – they're not just…a messenger, not a secretary.

On a number of occasions personnel expressed the opinion that more effective C2 training was needed. For instance:

> One of my lessons learnt out of the rotation, out of the Gulf trip, was that if an officer or commander is prepared to accept that you want to give your subordinates decision-making and mission command functions, you need to – there's got to be a very robust training program. I was bitten by that, and I've learnt that lesson…

And

> I think they need to advance their people management skills, if I could put it that way. I think the general consensus was…that these people went about things the wrong way. I think their way of doing things…was to use a hammer on a walnut. So, rather than try and get their team involved using the skills and knowledge of their team, using the synergy that team have, their sort of style was always directive. It was either their way or no way and they had no qualms about shooting people down in front of their peers and colleagues and juniors as well.

The question arises as to whether there is an inherent conflict between taking power to the edge and maximising coordinated effort and common intent along the command line. Of relevance here is that numerous interviewees spoke of the importance of supportive as well as strong lines of command if authority is to be effectively evolved. The point that was being made was that the devolution of authority did not mean that strong command was no longer important. In fact, strong and effective command, in the form of clear intent, was seen as critical to the effective devolution of authority.

A typical example reflecting these perceptions of strong and effective command where there was also clear intent follows:

> The direct command for xxxx was very much devolved to me. Commander xxxx was excellent. He wasn't a micro-manager, he was the sort of guy that would give you broad command requirements and tell you, "Get on and achieve it", and that's exactly what all the heads of department were keen to do, is to manage our own departments.

And another:

> Pretty much a lot of flexibility. A lot of it, like I said, the captain that we had was really good. He had a good understanding of how the xxxx worked... So, a lot of the plans that we brought up to him, he would say, "Oh, by the way," you know, "this might work a little bit better", or whatever, so we would amend them and by the end the flexibility was really good. I mean, here I was let reign and you could tell - you get that level of trust that you could form that bond with command as long as you're doing the right thing.

And another:

> my immediate boss was good in that he didn't stuff us around unnecessary. He let us get on with it. At the same time, you know, gave clear direction and so you always knew where you stood. So, that was pretty good.

There is another reason to question whether there is an inherent conflict between taking power to the edge and maximising congruence of intent through the command chain. Although ICTs enable dissemination of decision-making information to the edge, the data indicates that decision-making is not always occurring at the edge. Whilst possible explanations have been discussed above, there is another possible explanation and therefore obstacle to taking power to the edge. Inherent frailties in the human communication process mean that the commander's intent will not always remain congruent as it travels to the edge.

The following highlights this:

> And the other thing is, you read into words - and this is a thing about communication - when you write things, you write things to make sure that there is no - you've got to be clear and concise, but being concise, you can actually - you can actually take away from the meaning…I'm not saying you do, but you can. But the other thing is, if you're not clear and there's ambiguity in there, by reading it, I may - I might develop an opinion that is not necessarily along the lines of your clear instructions. You can have that anyway, but in a face to face, there is no - if you're unclear, it can be cleared up.

And another:

> the Army's mechanisms are sort of very hierarchical, you know, you tell this person and they tell the next person down the chain till - till the end of the line, the poor soldier at the end gets some kind of Chinese whisper that may or may not have something to do with what was originally said. Whereas, I think, the Navy plan is much more inclusive and, you know, a Navy CO can talk to the most junior seaman any time he wants to, and does. So I think some of the hierarchies were difficult.

There is an old adage whereby the commander's order of:

"…bring reinforcements, we're going to advance" arrives at the battlelines as:

"…bring three and four pence, we're going to a dance"

This adage illustrates how easy, if not normal, it is for slippage to occur in the human communication process. This being the case, ICTs and devolution of authority are necessary but insufficient requirements for power at the edge. Power at the edge also requires awareness of the likelihood of misinterpretations occurring and the preparatory action that comes with the recognition of this likelihood.

As will be seen in the next section of this report, cultural differences are another major factor that can compromise the positive aspects of this new C2 that is said to be emerging as a result of NCW.

The Impact of Coalition and Joint Forces on C2

The data indicates that there is a general perception that command lines can be convoluted and confusing. This perception arises, in part, because C2, decision-making processes, and the command lines are influenced by numerous and varied

participants—sometimes all three services from various nations. This combination of forces and services appears to have paved the way for ambiguity and uncertainty to arise from: i) cultural differences between the various partners of the coalition and between the various military and non-military parties, and ii) non-cultural differences between individuals, services, coalition partners and the other parties.

Cultural Differences

The ambiguity and misinterpretation that can arise when multiple command lines are in existence can be expected to be exacerbated when the communication parties are from culturally different backgrounds. As one interviewee put it, the same word can mean something completely different to each of two communicating parties. Even use of the richer communication channels (face-to-face, or voice-to-voice), could not always prevent ambiguity and misinterpretations between parties from different cultural backgrounds. Another interviewee, in discussing the tight control of responses to activities carried out by Iranian vessels, pointed out that these responses came right down the chain, and that it was vital to take care that:

> "the wrong interpretation or a local interpretation of the rules of engagement didn't lead to something escalating beyond the point of which it should have."

Non-cultural differences and their impact on individual perceptions and accuracy of interpretation

The impact of individual and cultural differences on human perceptions is at the root of ambiguity, uncertainty, and outright misinterpretation of the meaning of terms. To some extent military training and professional experience will reduce differences in interpretation by providing a common foundation for personnel. However, a person's personal experience has a great impact on their interpretations and so there is a limit to which a common foundation can be provided for personnel. This also means that there will be a limit to the extent to which we can anticipate the possibilities for differing interpretations between us and our colleagues. Furthermore, it is simply human, regardless of individual and cultural differences, for slippage to occur as a message moves from one communication partner to another. And the longer the C2 line, the greater the number of transfer stations, and the greater the number of transfer stations, the greater the opportunities for minor distortions, and the greater the sum of those distortions.

The voices from the battlespace that have been presented in this paper show that moving power to the edge requires an organisation that has greatly enhanced peer-to-peer interactions. These voices also show that although information age technologies are claimed to have reduced the fog and friction in warfare, thereby giving rise to new C2 approaches, the human dimension remains pivotal in ensuring the co-ordinated effort required to ensure that the commander's intent is realised. Speed and flexibility of response requires that players clearly see and understand their current circumstances. This can only be achieved with accurate perceptions; and this, in turn, can only be achieved with the acceptance that, because of the differing perceptions that individuals hold of the same situation, multiple realities exist. Only with this recognition comes the opportunity to consider our own perceptions and examine whether they are as accurate or undistorted as they might be.

Conclusions and implications for training

Whether the effectiveness of devolution of authority is being compromised or not, and if so, whether this is due to a lack of strong and supportive command, or the inherent limitations of the communication process, the solution is the same—training. Similarly, whether access to information at the edge or removal of constraints is being compromised by multiple command lines, cultural differences, or other issues arising from the involvement of the various national forces and services, the solution is the same—training. Furthermore, human interaction is at the core of these issues, and electronic communication advances cannot fix them. For instance, providing strong and supportive command and suitable amounts of guidance without compromising autonomy, as well as addressing the communication process in terms of avoiding ambiguities and misinterpretations, all relate to interpersonal communication. Training, therefore, needs to address interpersonal communication techniques, and it needs to do so by attending to a range of issues from the complex right through to the simplest issues. Examples of complex communication issues include creating (and maintaining) communication climates that will foster productive personal interaction styles and open, clear lines of communication that are uncontaminated by personal agendas; by contrast, simple communication issues include the ability to use language, and even to choose concrete terms and verbs, rather than abstract nouns, so as to maximise the chances that message sent is the same as message received (in other words, so as to maintain clarity of intent).

Admittedly, joint and coalition military training and professional experience will reduce differences in interpretation by providing a common foundation and frame of reference for communication partners; however, there is a limit to which a common foundation can be achieved given that one's personal experience greatly impacts their interpretations; hence the need for interpersonal communication training as indicated above.

However, it is important to recognise that there will also be a limit to the extent to which even the above type of training can help avoid misinterpretation between us and our colleagues. It is simply human for slippage to occur as a message moves from one communication partner to another. Therefore, the longer the C2 line, the greater the number of communication partners, and the greater the opportunities for minor distortions and the sum of those distortions. There are obvious gains to be made if the C2 line could be made as short as practicable. Another argument for making the C2 line as short as possible is that, contrary to the *power to the edge* concept of bringing autonomy and decision-making power to those at the edge, the data supports Atkinson and Moffat's[1] claim that (because of the connection of the military and the civil with political goals in the 20th century, and the connections in the 21st century brought about by globalisation) today's wars are fought on a much less autonomous basis. In previous times a commander could be given his marching or sealed orders by his Commander-in-Chief and allowed to prosecute the war with little direct interference (unless he required more resources or seemed to be losing) because he was likely to be in remote unconnected locations, and beyond the purview of accountable politicians and the world's media.

[1] Atkinson, Simon Reay and James Moffat. (2005) *The Agile Organization*. Washington, DC: CCRP Publication Series

On these bases, it is recommended that training programs include elements that will enable personnel to

- communicate in ways that are less likely to lead to misinterpretation, and
- broaden their own perceptual skills so as to reduce their own chances of misinterpretation, and enable them to more easily break free of their mental models.

These programs would address the use of language and other elements of communication in the encoding process so as to minimise slippage and defensive and closed communication climates, and to maximise accurate interpretation and open and supportive communication climates.

Summary and Implications for Further Research

C2 is a key player in the NCW process of enabling more rapid and effective decision making at all levels of military operations, because it carries out the role of translating information into actionable knowledge[1]. The way in which C2 accomplishes this is by employing *power to the edge*—empowering individuals at the edge of an organisation, at that point where it interacts with its operating environment and has an impact or effect on that environment. This empowerment is achieved by providing these individuals with access to available information and expertise, and by eliminating the procedural constraints that were previously needed to deconflict elements of the force in the absence of quality information[2].

The data referred to in this paper indicates that whilst the new elements of C2 may be providing greater access to information, this access is often not streamlined and the information itself is not always being translated into actionable knowledge. Furthermore, the amount of information and the processes by which it is made available often creates overload and ambiguities. Moreover, the involvement of multinational forces as well as non-military personnel tends to compound rather than eliminate procedural constraints. A diagrammatic representation of the issues raised in this paper appears in figure 1.

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1 Department of Defense (2005) *The Implementation of Network-Centric Warfare*. Office of Force Transmission, Washington, DC.

2 Alberts, David S and Richard E Hayes (2003) *Command and Control in the Information Age*. Information Age Transformation Series, CCRP Publication Series, Washington, p5

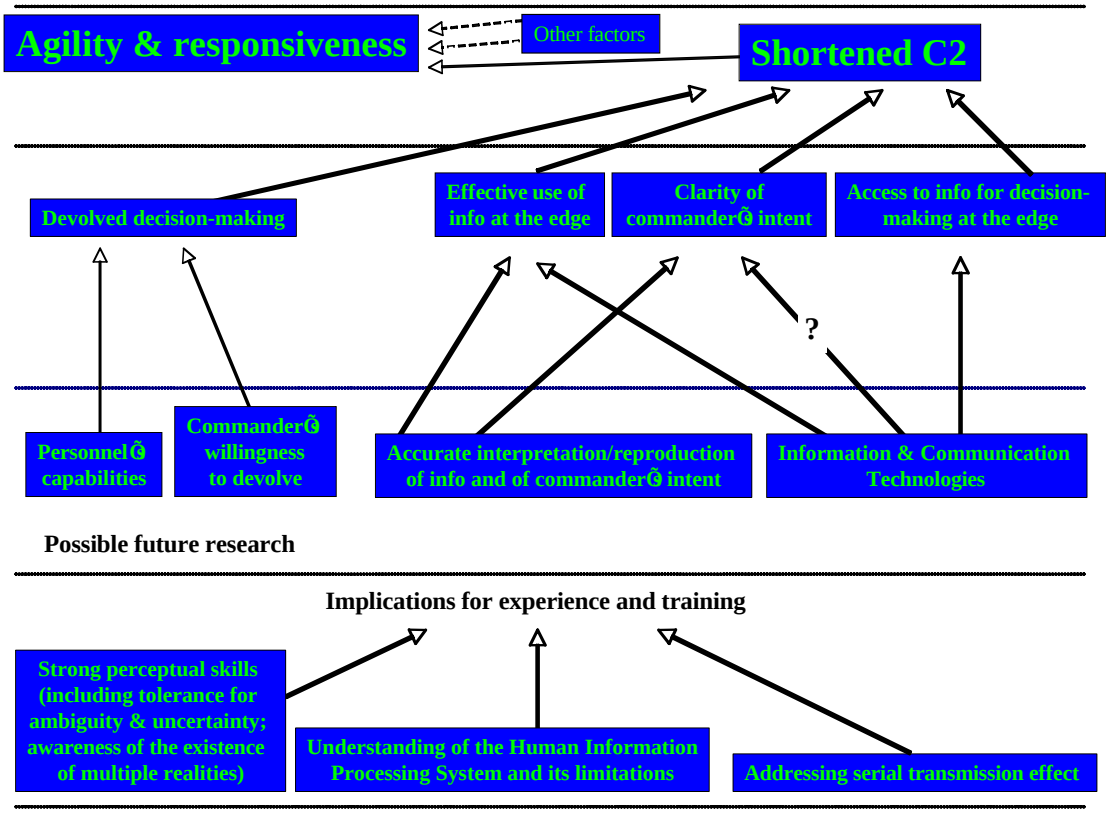

Figure 1

The data also substantiates the claim that moving power to the edge requires an organisation that has greatly enhanced peer-to-peer interactions[1]. Although information age technologies are claimed to have reduced the fog and friction in warfare, thereby giving rise to new C2 approaches, the human dimension remains pivotal in ensuring the co-ordinated effort required to ensure that the commander's intent is realised.

The following areas for future research are therefore indicated by the data:

1. What are the differences in C2 philosophy between coalition parties, both military and non-military, and how do they influence the achievement of power at the edge and shortened C2?
2. Whilst personal relationships provided the vehicle for cutting through the multiple, and therefore less clear, chains of command arising from deploying different forces, to what extent might such informal networks hinder a shorter C2 because they create larger numbers of channels?
3. How well do ICTs help preserve the clarity of the commander's intent, and its dissemination?
4. To what extent might ICTs enable too much information and input into various processes and thereby reduce the efficiency and effectiveness of these processes?
5. To what extent is increased ambiguity and misinterpretation occurring when communication parties have culturally different backgrounds, and to what extent does this reduce the effectiveness and efficiency of coalition forces, overall?

[1] Alberts, David S and Richard E Hayes (2003) *Command and Control in the Information Age*. Information Age Transformation Series, CCRP Publication Series, Washington.

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