

**Land Warfare Studies Centre**

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**‘EYES WIDE OPEN’:  
STABILITY, CHANGE AND NETWORK-  
ENABLING TECHNOLOGY**

by

Lieutenant Colonel David Schmidtchen

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## **ABBREVIATIONS AND ACRONYMS**

ADF	Australian Defence Force
ADO	Australian Defence Organisation
APS	Australian Public Service
NCW	network-centric warfare

## ABSTRACT

How can a large organisation, deeply rooted in tradition, order, and control, purposefully embrace change? Add to this eternal test the complexity of rapidly evolving technology and the challenges compound. The ability of the Australian Defence Force (ADF) to master the technologies associated with network-centric warfare (NCW) will largely shape its destiny. The implementation of NCW cuts deep, right to the organisational, social and cultural roots that underpin the entire Defence organisation.

NCW technologies seek to deliver greater connectivity and appear to smooth the way for a more fluid and ‘self-synchronised’ force. Yet technological change is ecological: it reshapes the environment, producing a range of consequences, some predicted, others unexpected. NCW offers greater connectivity and information sharing, but comes at the price of increased complexity and demand upon individual soldiers. Consequently, there is a growing need within the ADF for a more adaptable, versatile and flexible individual. The individual, however, may be the wrong place for ADF leaders to begin to understand the demands of network-enabling technology—the organisation itself needs to learn, remember and adapt.

The Department of Defence often treats strategy, technology and organisational change as discrete activities, blinded to the interplay and feedback of these factors. Increasing connectivity within the force will end this managerial fallacy. In order to master NCW, Defence leaders need a deeper understanding of technology and change.

The first part of this paper provides a basis for understanding the philosophy of technology, in particular its social dynamics. The second part explores the social complexity of technology-driven decisions. It offers an insight into the influences that shape decisions about technology and change. This paper concludes that Defence leaders can reduce the risks of implementing NCW if they approach technology with their ‘eyes wide open’.



**Eyes wide open:**  
**Stability, change and**  
**Network-enabling technology**

**David Schmidtchen**

*A search for the origins of the gasoline-engine-powered motorcar reveals that it was not necessity that inspired its inventors to complete their task. The automobile was not developed in response to some grave international horse crisis or horse shortage. National leaders, influential thinkers, and editorial writers were not calling for the replacement of the horse, nor were ordinary citizens anxiously hoping that some inventors would soon fill a serious societal and personal need for motor transportation ... In other words, the invention of vehicles powered by internal combustion engines gave birth to the necessity of motor transportation.*

George Basalla<sup>1</sup>

**PART I—**  
**THE SOCIAL DYNAMICS OF TECHNOLOGY**

**Stability, change and technology**

Heraclitus was a pre-Socratic Greek philosopher who criticised his predecessors and contemporaries for their failure to see the unity in experience.<sup>2</sup> For Heraclitus, opposites are necessary in life but they exist in a system of balanced exchanges. Thus, continual change, or ‘flux’, governs the world. Heraclitus’s approach is captured in the well-known saying: ‘You could not step twice into the same river; for

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<sup>1</sup> George Basalla, *The Evolution of Technology*, Cambridge University Press, Cambridge, 1988, pp. 6–7.

<sup>2</sup> Klaus Mainzer, *The Little Book of Time*, Springer-Verlag, New York, 2002, pp. x.

other waters are ever flowing on to you'.<sup>3</sup> Heraclitus regarded change as reality and stability as illusory. In this context, change means striving to balance naturally occurring opposites.

Writing after Heraclitus, and in opposition to him, was the Greek philosopher and poet Parmenides. For Parmenides, stability was the only reality. Everything was continuous and therefore changeless; he regarded change as illusory '... for there is not, nor shall be, anything else besides what is, since Fate fettered it to be entire and immovable'.<sup>4</sup> As an institution, the Australian Defence Organisation (ADO) is distinctly Parmenidean. It endures to serve, and service is the only reality. Hence, many people inside and outside the organisation see the systems that preserve social order in the Services'—the values and norms—as firm and constant. Today's force has a stake in preserving these values and norms, as does the force of yesterday and tomorrow.

Historically, the values and norms of military service draw their power and credibility from the institution's traditions. Military professionalism and a sense of individual military identity rest on the assumption that the utility of national defence is enduring. Institutionally, the ADO values discipline, order, process and control. For good reason, its leaders have always been wary of Heraclitian notions of change.

The Australian Defence Force's (ADF) ambition to evolve into a 'network-centric force' by 2020 implicitly embraces Heraclitus's notion of 'universal flux' or continual change. The ADF's *Future Warfighting Concept* concisely captures the issue: 'The key to creating this [warfighting] advantage is the ability to adapt to change rapidly.'<sup>5</sup> In the same document, however, Parmenidean stability remains: 'Regardless of what might change in the future ... Warfighting must therefore remain at the core of our preparation and training ...'<sup>6</sup>

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<sup>3</sup> Ted Honderich, *The Oxford Companion to Philosophy*, Oxford University Press, Oxford, 1995, pp. 351–52.

<sup>4</sup> Klaus Mainzer, *The Little Book of Time*, pp. x.

<sup>5</sup> Department of Defence, *Future Warfighting Concept*, Canberra, December 2002, p. 5.

<sup>6</sup> *ibid*, p. 14.

In 1971, the organisational philosopher Donald Schön argued that, rather than surrender to the momentum of change, institutions such as Defence must learn to transform without ‘intolerable threat’ to the function that they perform.<sup>7</sup> Schön recognised that the role an institution serves as part of a broader societal system constrains its capacity to change. Moreover, organisational stability is central to providing a social framework within which individuals can work confidently. Thus, Defence must accept the imperative for Heraclitian change while preserving Parmenidean stability.

Network-centric warfare (NCW) is a technology-driven transformation that is having, and will continue to have, a deep and far-reaching effect on individuals and the military communities, organisations and institutions in which they work. The champions of NCW, such as the late Vice Admiral Arthur Cebrowski, claim that it is a ‘paradigm shift’ for the profession of arms.<sup>8</sup> In many ways, NCW may represent a generational change in military thinking. The veracity of such a claim depends on the ability of today’s leaders to introduce and support purposeful change—that is, simultaneously technical, social and cultural. Historian and social critic, Lewis Mumford, neatly expresses the connection between technology and values when he states ‘technology is both a shaper of, and is shaped by, values’.<sup>9</sup> Clearly, the Department of Defence should not expect NCW technologies to be socially passive.

NCW is the driver of Heraclitian change in the ADO—a change that will fundamentally challenge Parmenidean stability. Therefore, it is important for all leaders in the ADO to understand the social dynamics of technology.

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<sup>7</sup> Donald Schön, *Beyond the Stable State*, Temple Smith, London, 1971, p. 60.

<sup>8</sup> Arthur Cebrowski and John Garstka, ‘Network-Centric Warfare: Its Origin and Future’, *Proceedings of the Naval Institute*, vol. 124, no. 1, January 1998, pp. 28–36.

<sup>9</sup> Casey Blake, ‘Lewis Mumford: Values over Technique’, *Democracy*, Spring, 1983, pp. 125–37. Cited in Thomas P. Hughes, *American Genesis: A Century of Invention and Technological Enthusiasm 1870–1970*, Viking Penguin, New York, 1989.

This paper is in two parts. The first part explores the social dynamics of technology and provides a basis for understanding the philosophy of technology. The second part offers an insight into the influences that shape decisions about technology and change. The paper concludes that Defence leaders can reduce the risks of implementing NCW if they approach technology with their ‘eyes wide open’ to the social complexity of network-enabling technology.

### **The empty–vessel fallacy**

Technology is a blend of science and values; it is about ‘devices’ and the use to which people put those ‘devices’. Thus, technology is socially dynamic. NCW requires the Department of Defence to change radically the way in which it considers, plans and develops its operating capabilities. Such a change in thinking will need to permeate personnel, processes and culture. This will require time and collective effort.

New technology alters social relationships and questions organisational structures. It is also the source of social and organisational turbulence because it changes the traditional order; new technology is thus subversive. Yet ADO planning for the implementation of NCW continues to portray technology-driven change as though it was not a threat to a Parmenidean view of institutional stability.

Although new technology brings many benefits, it also unavoidably brings threats that societies, institutions, organisations and individuals must manage. People ‘negotiate’ with technology about the degree of risk—personal, social and cultural—that they are willing to tolerate.<sup>10</sup> This is the dilemma of technology. It is a fact with which people live, not a problem that they can solve. There is no ultimate solution, no final ‘technological fix’.<sup>11</sup> While attempts have been made to limit the negative effects of technology, ultimately the institution must embrace all of its possibilities. Indeed, in a study of technology-based disasters, James Chiles highlights humanity’s increasing dependence on technology: ‘[O]ur machines take us into

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<sup>10</sup> John Street, *Politics and Technology*, MacMillan, London, 1992.

<sup>11</sup> Alvin Weinberg, ‘Can technology replace social engineering?’, *University of Chicago Magazine*, vol. LIX, October 1966, pp. 6–10. Reprinted in Albert Teich (ed.), *Technology and the Future*, 7th edn, St Martins Press, New York, 1997, pp. 55–64.

risky locales, which might be outer space, up on a two thousand foot tower, or an artificial island, making our lives entirely dependent on their proper functioning'.<sup>12</sup> The challenge for defence planners is to understand that, when a new technology enters the institution, they must embrace all its effects—good and bad.

Accordingly, the ADO should strive to understand the nature of technology rather than persist with the view that technology is passive. The social dynamics of technology should be the subject of thoughtful reflection among senior officials. Yet technology is not a consistent feature of ADF military education, nor do the Department's civilian employees consider it an important ingredient in executive development. Currently, the ADO workforce's appreciation of technology, where one exists at all, is instrumentalist—a means to an end—and the social consequences of applying it are, at best, of secondary concern. In an age of rapid and pervasive technological innovation, an instrumentalist approach to technology imposes serious limitations to building a competent and capable workforce. New network-enabling technologies will challenge the ADO's instrumentalist approach by presenting ethical and organisational dilemmas that leaders must resolve, or at the least consider, before embracing innovation. For example, the reassuringly simple phrase 'non-lethal weapon' concealed from senior military leaders the ethical and legal dilemmas that arose following the employment of these technologies by the US Marine Corps in Somalia, Haiti and Bosnia in the mid- to late-1990s. Similarly, but even less visibly, network-enabling technology challenges the social and organisational framework of professional militaries.

As technology advances in sophistication, it becomes more socially powerful and the ADO needs great maturity in order to maximise the benefits and minimise the risks. The drive for improved performance, and in particular the ability to adapt to change rapidly, means that each technological advance requires a similar advance in organisational and social maturity. In successful organisations the two phenomena coexist.

In periods of rapid technological innovation, organisational maturity often lags. The gap between new technology and the institutional

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<sup>12</sup> James Chiles, *Inviting Disaster: Lessons from the Edge of Technology*, HarperCollins, New York, 2001, p. 3.

maturity to use it effectively can become a capability gap. The faster leaders can close the gap, or the quicker the organisation can absorb and integrate the technology, the more capable the organisation becomes.

However, the Department of Defence is not an ‘empty vessel’ into which technocrats simply pour new technology for an eager and adaptive workforce to optimise.<sup>13</sup> In general terms, the Defence workforce evaluates each new technology against prior experience; they compare it with the familiar and then judge its impact on them. So, organisational culture, collective workforce practice and individual attitude all play a part in, first, determining whether the technology will be used at all, and second, the way it will be incorporated into the existing patterns of workforce behaviour.

The solution to the ‘empty-vessel fallacy’ is to better understand the prevailing social system and the extent to which it can adjust to technology-driven change.<sup>14</sup> Building bridges between existing social practice and new technology is central to transforming the ADO from a platform-centric to a network-centric organisation. Notions of ‘disruptive innovation’<sup>15</sup> and the internal and external urging for rapid transformation represent a technologist’s optimism about the ease with which the ADO adapts to change. The truth is, culture fights back.

### **The ‘ecological’ growth of technology**

Accompanying the ‘empty-vessel fallacy’ is the equally naïve idea that leaders can ‘bolt’ a new technology onto an existing organisation without consequence—the notion that technological change is ‘additive’. In action, the ADO seems to subscribe to this view. The social and organisational dimensions of technology, whether in concept development or procurement, receive cursory attention from officials and military planners.

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<sup>13</sup> See Everett Rogers, *Diffusion of Innovations*, 4th edn, Free Press, New York, 1995.

<sup>14</sup> *ibid*, p. 240.

<sup>15</sup> Disruptive, or non-linear, innovation occurs when the technological change is so profound that the system of organisation must be redesigned either because it has become dangerously out of date or easily compromised by an enemy possessing the new technology.

Unfortunately, technological change is not additive—rather, its effect is ecological in that, once released, it reshapes the environment, producing desired, foreseen and unforeseen consequences that are both positive and negative.<sup>16</sup> The relationship between technology and organisations is ecological in the same sense that it is not accurate to represent the relationship between the Cane Toad and Kakadu National Park as ‘Kakadu plus the Cane Toad’—rather, Kakadu National Park has become a new ecological system.<sup>17</sup> The impact of technology on military organisations is similar. An Army equipped with helicopters is not simply the existing capability plus helicopters. Rather, it is a new system with an altogether different capability. Simply removing the helicopters does not result in reconstituting the original Army. Instead, it leaves an Army that knows the generic value of helicopters but does not have them anymore. Each addition and deletion of technology changes the entire system in some way.

As people tend to invest technology with significant expectations, technology has a clearly cultural dimension. Yet the nature of the interdependency between culture and technology remains a matter of debate. Does culture control technology, or does technology control organisational culture? Either way, if Australian defence officials are to manage the transition to a network-enabled force, then they must first be familiar with the implications of the interdependent relationship between organisational culture and technology.

The question as to whether technology is additive or ecological is part of a wider debate on whether technology is neutral. Views on the neutrality of technology are polarised. At one pole, technology is perceived as neutral in itself, and whether technological change improves people’s quality of life depends on how people choose to use it. Max Weber, and later Jacques Ellul, argued that while technology is neutral, it is the systemisation of technology—the use to which it is put by people—through Western rationalism (with its

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<sup>16</sup> See Daniel Bell, *The Coming of Post-Industrial Society: A Venture in Social Forecasting*, Basic Books, New York, 1999.

<sup>17</sup> This is an ‘Australianised’ metaphor adapted from Neil Postman, *Technopoly: The Surrender of Culture to Technology*, Vintage Books, New York, 1993, p. 18.

emphasis on efficiency) that is the real source of concern.<sup>18</sup> At the other pole, technology is not viewed as neutral because social values and social interests govern its development and application. An ideology—such as growth, prosperity, capability or efficiency—supports the technology. This view argues that technology is always allied with, and reinforcing of, a central philosophy about the place of people in society. For example, proponents of this view would argue that when new agricultural machinery made its way into Great Britain, the central philosophy was not about improving agricultural farming, but instead was about undermining the power of the rural workforce.<sup>19</sup>

The tension between these competing positions is not merely an abstract philosophical debating point, but one of practical importance in the transition to an NCW environment. Both views contain some truth and each highlights an important practical point: the first, that context is important and the second, that technology is ideological. Technology comes with an agenda that impacts directly and forcefully on organisational design and the workforce.

Understanding these two viewpoints is critical to creating a management system to control the desired, foreseen and unforeseen effects of technology.<sup>20</sup> People seek to harness and regulate technology's effects once it is released. The sophistication with which people use technology is determined by how well they reconcile the intent of the organisation with the intent of the technology. For example, the capacity for self-synchronisation has been identified as a product of

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<sup>18</sup> Max Weber, *The Protestant Work Ethic and the Spirit of Capitalism*, trans. Talcott Parsons, Charles Scribner, New York, 1958 (1903); Jacques Ellul, *The Technological Society*, trans. J. Wilkinson, Vintage Books, New York, 1964.

<sup>19</sup> In 1969, Emmanuel Mesthene and John McDermott were at the centre of a debate over the role of technology in society. The themes of their original articles remain relevant today. Both Mesthene's 'The role of technology in society?' and McDermott's 'Technology: The opiate of intellectuals' have been reprinted in Albert Teich (ed.), *Technology and the Future*, 7th edn, St Martin's Press, New York, 1997. For a broader discussion of the evolution of technology in society see George Basalla, *The Evolution of Technology*, Cambridge University Press, Cambridge, 2002.

<sup>20</sup> Bell, *The Coming of Post-Industrial Society*.

using network-based technologies.<sup>21</sup> The question for Australian defence officials is how can the intent of the network-based philosophy be reconciled with the intent of the prevailing organisational culture? There are two choices: either the ADO can seek to anticipate the nature of change and actively build organisational bridges between the existing organisational system and the desired organisational state, or the ADO can trust in the ability of its local-level leaders to successfully manage the conflict between the new and the old systems.

Both approaches will require significant organisational effort to implement. Building bridges between today and tomorrow is consistent with the philosophy of experimentation contained in the *NCW Roadmap*. The workforce routinely tests new processes, practices and procedures, with the best of these then being diffused across the network by a central authority. Placing trust in local leaders to manage the balance between the old and the new is consistent with a philosophy of self-synchronisation. However, it depends on a settled, common understanding of the end-state and gives the authority to individual leaders to decide how best to achieve that collective outcome (that is, not to act in their own immediate self-interest). The point is that senior leaders must make a *conscious decision* about how to advance change because, regardless of the approach adopted, the social investment made by today's force in the prevailing organisational system will ultimately limit capacity for change in the future.

### **Getting beyond machines**

Science and technology are now indistinguishable partners in driving economic and social growth.<sup>22</sup> Technology historian Joel Mokyr notes that:

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<sup>21</sup> Department of Defence, Capability Development Group, *NCW Roadmap*, Commonwealth Department of Defence, Defence Publishing Service, Canberra, 2005.

<sup>22</sup> Traditionally, technology and science have been separate but related topics. While this remains true today, the boundaries between science and technology are blurring. Science is the process of systematic study of people and their environment from which general laws can be formulated, while technology is the application of science to industry or applied science.

...even the view that science prepares the way for applying technology, a technology-is-applied-science model, has been abandoned as a means of explaining the relationship. Technology leads to more science just as much as science provides the knowledge base for new technology.<sup>23</sup>

However, technology is not just about machines or device technologies. Its social and cultural impact includes the set of arrangements that allow the technology to work—that is, social technologies.<sup>24</sup> For example, the car is a complex piece of engineering, but when removed from the context of its practical application, it is an interesting novelty.<sup>25</sup> When considered in context with the roads and social rules that allow it to run as a means of transport, the car ceases to be an interesting novelty. Suddenly, it has psychological and social effects because it changes, magnifies and quickens existing transport. It enlarges the scope of human activity, affecting economics and society as well as our views of work and leisure. For example, the car shaped politics, leisure and suburban development in Australia.<sup>26</sup> The car is far more important as a social dynamic—its connections and interactions—than it is as a product of advanced engineering science. Similarly, adopting a new weapon system, or even new tactics in a military context, is of limited value unless there are accompanying organisational, social and cultural changes. The changes that followed the introduction of radar, tanks, submarines and helicopters were not limited to discreet areas of the force, but also led to flow-on changes in command and control, logistics, organisation, workforce specialisation and training.<sup>27</sup>

Importantly for those responsible for implementing NCW, the increasing power and sophistication of computing technology is

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<sup>23</sup> Joel Mokyr, 'Thinking about Technology and Institutions', paper presented to the Macalester International College Roundtable, 'Prometheus's Bequest: Technology and Change', 2002, <<http://www.faculty.econ.northwestern.edu/faculty/mokyr/macalester3.PDF>>.

<sup>24</sup> This division of technology is adapted from the work of sociologist Daniel Bell in *The Coming of Post-Industrial Society*.

<sup>25</sup> John Street, *Politics and Technology*, p. 9.

<sup>26</sup> Graeme Davison with Sheryl Yelland, *Car wars: how the car won our hearts and conquered our cities*, Allen & Unwin, Sydney, 2004.

<sup>27</sup> See Williamson Murray and Alan R. Millet (eds), *Military Innovation in the Interwar Period*, Cambridge University Press, Cambridge, 1996.

creating a broader range of expert systems that substitute algorithms for intuitive judgments—known as cognitive technologies. This group is fast emerging as the dominant technology of NCW. Crucial to enabling network-centric warfare is the need to link the sensor, information and command grids, thereby increasing connectivity and collaboration.<sup>28</sup> In doing so, the ADF increases its reliance on decision aids and expert systems that automate many traditional information collection, collation and analysis processes. In these systems, from a pure efficiency perspective, the human being is the weak link.<sup>29</sup> In two separate fratricide incidents during Operation *Iraqi Freedom*, the US Army's Patriot Missile Defense System destroyed a British Tornado and a US Navy F-18. An investigation into the Patriot system identified a shortfall as the 'operating protocol [which] was largely automatic, and the operators were trained to trust the system's software'.<sup>30</sup> While automation may have been appropriate for heavy missile attacks, this philosophy was inappropriate for the conditions in Iraq. The report concludes that 'the Patriot system should migrate to more of a "man-in-the-loop" philosophy versus a fully automated philosophy—providing operator awareness and control of engagement processes'.<sup>31</sup> However, despite the incidents of fratricide, debate continues about the balance between automation and human intervention in the Patriot system.

NCW is a more subversive and far-reaching philosophy than any single piece of technology. It poses a social threat to the existing power relationships embedded in work structures and routines of behaviour. This threat presents Defence (and particularly the ADF) with a set of social and cultural dilemmas.

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<sup>28</sup> Department of Defence, *Force 2020*, Commonwealth Department of Defence, Defence Publishing Service, Canberra, 2000, p. 19.

<sup>29</sup> Thomas Adams, 'Future Warfare and the Decline of Human Decision-Making', *Parameters*, vol. XXXI, no. 4, Winter 2001–02, pp. 57–71.

<sup>30</sup> Office of the Under Secretary of Defense for Acquisition, Technology, and Logistics, *Report of the Defense Science Board Task Force on Patriot System Performance (Report Summary)*, Washington DC, January 2005, p. 2.

<sup>31</sup> Cited in John Hawley, 'Patriot Fratricides: The Human dimension lessons of Operation Iraqi Freedom', *Field Artillery*, January–February 2006, p. 18.

The ADO has a keen sense of the close connection between science and technology, routinely expressing the importance of the relationship in the *NCW Roadmap* and related doctrine. Technology-based experimentation in Defence is comprehensive and always improving. The Defence Science and Technology Organisation (DSTO), partners in Defence Industry and associated international agencies continually create and adapt new technical knowledge for the ADF. However, the ADO does not complement this pragmatic focus on device technologies with an equivalent degree of attention to the social and organisational characteristics that promote the institution's capacity to adopt and diffuse technology. In a cultural sense, the ADF is instrumentalist and tactical in its approach to adopting technology. The doctrinal description of the organisation's current position as 'platform-centric' confirms an underlying philosophy of technology that pervades decision-making in the ADO.<sup>32</sup> However, the objective of *Force 2020* is to move the institution from a tool-based culture to a more sophisticated systems-based culture. This will require different thinking and new organisational practices.

All ADO leaders need to begin thinking in a more integrated way about device, social and cognitive technologies. Planning for the introduction of network-enabling technologies requires deeper consideration of the socio-technical links between *technology*, *people*, *ideas* and *organisation*. The following sections of this paper describe the social dynamics of technology in order to highlight the importance of these linkages.

### **Determined technology**

An underlying theme in popular writing on emerging technology is that technology has gained an independent momentum that not only puts it beyond human control but which also allows it to order all human behaviour.<sup>33</sup> Many of the arguments that support the philosophies of 'green' politics possess a common thread of negative technological determinism—all nature is good and must be protected

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<sup>32</sup> Department of Defence, *Force 2020*.

<sup>33</sup> James Gleick, *Faster: the Acceleration of Just About Everything*, Little, Brown & Company, London, 1999.

from the unrelenting march of technology, which is all bad.<sup>34</sup> This sense of determinism is also a persistent sub-theme of the current bioethics debates around genetically modified foods. Determinists argue that technology creates a relentless and constant pressure for change but gives people little discretion or opportunity to decide the form that change will take.

In Lewis Carroll's classic story *Through the Looking Glass*, the Red Queen captures the relentlessness of change in her remark: 'Now, here, you see, it takes all the running you can do, to keep in the same place. If you want to get somewhere else, you must run at least as twice as fast as that!'<sup>35</sup> In nature, the 'Red Queen effect' is at work in the struggle between predator and prey. The predator learns to run faster; the prey responds by acquiring better camouflage; the predator then develops a better sense of smell; the prey starts to climb trees; and so on.<sup>36</sup> Likewise, for a determinist, life is a constant adaptive struggle determined by the rationality of the tools that people employ. According to the technological determinist's view, technology has an agenda that decides a future that people cannot avoid. Choice and judgement play little part in the direction in which a society, organisation or individual is moving. Technology has a logic and driving force of its own, possessing a powerful rationality that shapes, forms and limits the nature of people's social choices and the character of their institutions. For an advocate of autonomous technology, to drive a car is also to be driven by what it allows.<sup>37</sup> In this view, once released, technology transforms and has a singular momentum that potentially transforms institutions and societies. Technological determinism suggests that the view that people lack control over their lives is a constant feature of an advanced society.

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<sup>34</sup> The alternate position in the debate over genetically modified food is that all technology is good, which is equally deterministic.

<sup>35</sup> Lewis Carroll, *Alice's Adventures in Wonderland and Through the Looking Glass and What Alice Found There*, illus. Sir John Tenniel, The Library of Imperial History Pty Ltd, Melbourne, 1982 (1865), pp. 240–41.

<sup>36</sup> Stuart Kauffman, 'Escaping the Red Queen Effect', *The McKinsey Quarterly*, no. 1, 1995, pp. 118–29.

<sup>37</sup> Paul Virilio and Sylvère Lotringer, *Pure War*, Semiotext(e), New York, 1997, p. 35.

There is an intuitive attraction to such a view of technology. The determinist view provides a ready explanation for the common experience of unrelenting change that individuals often express as ‘change fatigue’. However, in its simplicity, this philosophy has some problems in accounting for differences in the form, organisation and effect of technology in various social and cultural settings. Other causes shape how people use technology in different settings—context is important. In *The Pursuit of Power*, William McNeill explains that political criteria determine the development and application of military technology.<sup>38</sup> The values and judgments of decision-makers shape the evolution of technology, as do the institutional structures that organise and convey its use to the workforce.

Similarly, both the positive and negative determinists invest technology with an inherent ‘rationality’ and ‘perfection’ that seems difficult to justify.<sup>39</sup> The development of the car and its diffusion into Australian society might be unavoidable, but its adoption is far from infallible. The costs associated with pollution, accidents and social control (for example speeding and drink-driving) show that using technology can present as many problems as solutions.<sup>40</sup>

In some ways, the ADF subscribes to a deterministic view of technology. There is an unexpressed assumption that technological change is inevitable and will improve capability. For example, much of the early discussion about the benefits of NCW was overly optimistic. An accompanying corollary is the lack of choice arising from that inevitability. Therefore, the ADF believes it must keep a position as close as possible to the leading edge of technological development. However, as political scientist Colin Gray argues, it is also true that decisions made as part of policy, strategy, operations, organisation and tactics can offset technological deficiency.<sup>41</sup> Technology’s accessibility, combined with its capacity to diffuse across national, institutional and organisational barriers, makes most

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<sup>38</sup> William McNeill, *The Pursuit of Power*, Blackwell, Oxford, 1983.

<sup>39</sup> John Street, *Politics and Technology*, p. 30.

<sup>40</sup> Graeme Davison, with Sheryl Yelland, *Car Wars*.

<sup>41</sup> Colin Gray, *Weapons for Strategic Effect: How Important is Technology?*, Occasional Paper No. 21, Center for Strategy and Technology, Air War College, Air University, Maxwell Air Force Base, January 2001.

technological advantage fleeting.<sup>42</sup> The real capability advantage is in abilities others cannot readily copy—institutional culture, organisation design and the workforce's competence (individually and collectively).

### **A 'gentler' determinism**

While intuitively appealing, the autonomous stance on technology offers a hard and dehumanising view of organisational and social progress. There is a softer view that technology reduces choice and demands social adaptation. Technology also demands that, through a progressive division of labour, people create a distinctive social infrastructure. Without specialisation, technology cannot work. A gentler form of determinism allows context to aid in explaining the social dynamics of technology. As one advocate notes:

Technology means the systematic application of scientific or other organised knowledge to practical tasks. Its most important consequence ... is in forcing the division and subdivision of any such task into its component parts.<sup>43</sup>

The character of the technology that leaders introduce into an organisation sets up the need to coordinate, fund and organise the division of labour. The technology calls the organisation into being; it controls the need for, and the form of, the social infrastructure. Introducing aircraft into the military led to a specialised Air Force whose organisation and cultural artefacts have evolved around a specific technology. Similar arguments can be made about the organisational evolution of the Navy and Army in response to new technology. Specific technologies shape workforce specialisation and affect the broader social infrastructure because leaders must fund, coordinate and incorporate the platform into existing capability.

### **Choice and change**

In economic terms, technological determinism represents a supply-driven view of technology. It argues that, once technology comes into being, individuals and organisations automatically absorb and

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<sup>42</sup> *ibid.*

<sup>43</sup> John Gailbraith, *The New Industrial State*, Penguin, Harmondsworth, 1974, p. 31.

use it regardless of their needs. However, this view has two flaws. First, it takes no account of the choices people make in selecting and adopting technology—the individual's or organisation's decision-making processes.<sup>44</sup> Technological determinists only concern themselves with the form of the new capability after its introduction into the institution. Second, determinism assumes a degree of rationalism and efficiency that is an unrealistic expectation of any undertaking that involves people. Genuine choices arise in principle and practice during any technological or social transformation.<sup>45</sup>

## Choice

Genuine choice arises from the demand for technologies that will deliver capability, not from the available supply of new technology. The growth of NCW-related technologies arose from a statement of demand for a different capability. In the Cold War, the prevailing demand of the US military was for the supply of technologies to support a nuclear weapons paradigm. With the collapse of the Soviet Union, the imperative for nuclear strategy lessened in importance and Western political leaders re-positioned their military forces in order to meet new threats, which in turn created the demand for different technologies. Similarly, the US Marine Corps' need to protect the final withdrawal of United Nations forces from Somalia in 1995 was the spur that created a military demand for non-lethal weapon technologies.

The relationship between adopting a strategic position based on an assessment of most likely environmental demands and a position that is derived from the possibilities allowed by new technology is rarely clear. However, just as with the co-evolution of science and technology, there is a mutually reinforcing relationship between strategic choice and the supply of technology.

The theories of technological determinism portray technology as an end in itself. Like most other institutions, the military should be ends-driven, with the objective of increasing fighting power and survivability in hostile environments. To realise this, there is often

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<sup>44</sup> John Street, *Politics and Technology*, p. 35.

<sup>45</sup> Langdon Winner, 'Who will we be in cyberspace?', *The Information Society (TIS)*, vol. 12, no. 1, 1996, <<http://www.indiana.edu/~tisj/>>.

compromise as the capacity to achieve the desired endstate is matched against the means available. The form of the overall need does not change and the organisation retains substantial choice and autonomy in deciding which technologies to employ and how. So, leaders do retain considerable scope making choices about using technology.

However, planning processes in the ADO continue to treat strategy, technology and organisational change as separate and discrete areas of activity. One group manages strategy development, a second group develops and buys technology, and a third group manages change. The links between the three corporate areas of the ADO are weak at best. The reforms of the Kinnaird Review led to the creation of the Capability Development Group and the transformation agenda for the Defence Materiel Organisation.<sup>46</sup> These reforms create a firmer link between strategy and technology. Unfortunately, the Kinnaird reform agenda did not extend the beyond these technical arrangements to consider, for example, how to improve the ADO's capacity to effectively manage organisational change.

If the absorptive capacity of the ADO defines the rate at which the force can make the transition to a network-centric force, then the slender link between strategy, technology and change is a serious oversight. The ability of the workforce to translate, adapt, absorb, integrate and use technology in a defence culture is fundamental to making the transition from a 'platform-centric' to a 'network-centric' force. That Australian Defence officials have not attended to this supports the view that the more dehumanising threads of technological determinism and the 'empty-vessel fallacy' continue to dominate thinking within the organisation.

## **Change**

In the ADO, when the decision-making emphasis moves from the 'geo-political context' and 'technological hardware' towards the 'softer' people issues, the change process becomes vulnerable. This weakness is not specific to the ADO. The catalogue of change management disasters in Australian (and international) public- and

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<sup>46</sup> Department of Defence, *Defence Procurement Review* (known as the Kinnaird Review), Defence Publishing Service, Canberra, 2003.

private-sector organisations is testament to a generic leadership problem. This is the phase where the professional experience of most senior leaders, military or civilian, is weakest.

Current professional development programs do not equip Defence's senior leaders to manage organisational change.<sup>47</sup> The ADO exacerbates the problem by constantly rotating senior military personnel.<sup>48</sup> It is therefore hardly surprising that this is where the 'handling errors' begin to creep into performance.<sup>49</sup> The problem is not a lack of leadership ability or the mental capacity of the Senior Leadership Group. Rather, the problem stems from the short time each leader spends in an appointment. Limited tenure restricts an individual's opportunities to become familiar with both the problems and the likely solutions. Professional development in the ADF—and increasingly the Australian Public Service (APS)—operates on the assumption that talented and committed individuals will always rise above the disadvantages of unfamiliarity with both the task and the environment, and as a result will improve their levels of performance.<sup>50</sup> Yet, technical, political and social problems are complex, dynamic and messy. These problems also take time and continuity of effort to solve.

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<sup>47</sup> Nick Jans with David Schmidtchen, *The Real C-Cubed: Culture, Careers and Climate and How They Affect Capability*, Canberra Papers on Strategy and Defence No. 143, Strategic and Defence Studies Centre, Australian National University, Canberra, 2002; and Nick Jans with Jane Harte, *Once were Warriors: Leadership, Culture and Organisational Change in the Australian Defence Organisation*, Leadership Papers 3/2003, Centre for Command Leadership and Management Studies, Australian Defence College, Canberra, 2003, p. 13.

<sup>48</sup> In 2002, nine percent of ADF officers at the rank of Brigadier and above have been in their position for 2 years or more. For the Australian Public Service, thirteen percent of officers at the equivalent level have been in their position for 2 years or more. The median appointment for all Defence officers at this level was 1.2 years. These findings are based on figures provided by the Directorate of Senior Officer Management on the Senior Leadership Group in June 2003. A recent Australian study found that corporate employment tenure tends to be stable, with the average Australian business executive spending around 5 to 6 years in each significant job.

<sup>49</sup> Nick Jans with David Schmidtchen, *The Real C-Cubed*.

<sup>50</sup> *ibid.*

Maximising the value of new technology demands accompanying organisational, social and cultural changes. Responding to a different strategic outlook always provokes a change in an organisation's structural, intellectual and social capital—sometimes slight, sometimes significant. Such changes tend to cascade throughout the organisation, leading to consequential reforms in the social infrastructure of the institution. The compatibility between the three elements of capital mentioned above and the current organisational form defines the institution's capacity for change. In addition, it dictates the extent of organisational change and the likely change management strategy.

*Structural capital* refers to those activities and systems that frame the bureaucracy's policies. For example, workforce planning provides the means for relating workforce management to the Defence financial cycle. The industrial relations policy sets the parameters for the relationship between the workforce and the employer. These systems are often based in legislation or longstanding practice and describe organisational limits. Clearly, financial limitations also play a large part in shaping what is possible in Defence.

*Intellectual capital* refers to those activities and systems that define the practice of workforce management and development. These systems inform, develop, motivate and reward workforce behaviour. Where the systems of structural capital describe the constraints on what is to be achieved, the systems of intellectual capital describe how change will be achieved. For example, career management and development in the ADF and the APS differ markedly. Civilians are not restricted to employment in the Defence Department. Consequently, the APS subscribes to a model of general employability within an open workforce market. Therefore, the principles of self-identification and individual responsibility are characteristics of employment in the APS. In contrast, the ADF is a closed labour market, developing people for employment within one institution. In turn, the professional military practices are characterised by centralised and collective career management. These systems of structural and intellectual capital combine to make a substantial contribution to shaping the distinctiveness of these two workforce cultures. Conversely, any change in these systems would reshape the character of these institutional cultures.

The systems of *social capital* are the intangibles of culture, climate and leadership. Social capital is the collective understanding and expression of the organisation's sense of meaning, values and norms, power and authority, and group relationships. Social capital is the home of those social patterns of behaviour that have been learnt, assimilated and consolidated over time.<sup>51</sup>

*Force 2020* sketches a different form of organisation for Defence—a network-centric organisation. Thus, Defence officials should consider the implications for structural, intellectual and social capital. The systems that support and generate these three forms of capital in Defence have evolved to suit a philosophy of firm central control. The ADO is constrained by managerial systems that seek to avoid the 'worst possible outcome'—systems that seek to centralise. If senior officials expect the network-enabled force to behave differently, for example to be more innovative, then they must focus on those systems that directly communicate the institution's expectations of the workforce—the systems of organisational infrastructure. In the transition to a network environment, Defence leaders must commit to purposefully managing the institution's capacity for social change. As US writer Stephen Blank notes, 'modernity's continuous and profound technological changes are inseparable from the parallel revolution in social organization'.<sup>52</sup>

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<sup>51</sup> David Schmidtchen, *Network-centric Warfare: The Problem of Social Order*, Working Paper No. 125, Land Warfare Studies Centre, Canberra, July 2005.

<sup>52</sup> Stephen Blank, 'Preparing for the Next War: Reflections on the Revolution in Military Affairs', *Strategic Review*, vol. 24, no. 2, 1996, p. 19.

## PART II—MAKING DECISIONS ABOUT TECHNOLOGY AND CHANGE

### Politics and technology

John Street's account of the relationship between politics and technology notes that recognising the social dynamics of technology is one step towards establishing control over the change process.<sup>53</sup> He goes on to observe that the other important element is deciding how to judge the direction of change and its effects. Street then poses two questions that are relevant to the implementation of NCW:

- How do we make coherent choices between competing change strategies?
- How do we measure the good and bad effects?

These questions address the ethics of technology-driven change. Despite the plethora of models offering systematic processes for successful change management, few concern themselves with the ethics of change. Therefore, before jumping to a hasty solution, it is worth reflecting on the difficulties that face decision-makers trapped between Parmenides's need for organisational continuity and Heraclitus's demand for constant change. As Robert Greene notes, this 'trap' is a constant feature of human behaviour:

One of the critical dualities of human nature is that people understand the need for change, knowing how important it is for institutions and individuals to be occasionally renewed, they are also irritated and upset by changes that affect them personally [*sic*]. They know that change is necessary, and that novelty provides relief from boredom, but deep inside they cling to the past. Change in the abstract, or superficial change, they desire, but a change that upsets core habits and routines is deeply disturbing.<sup>54</sup>

The following four sections on bias, uncertainty, risk and expertise highlight the social complexities for leaders who must balance the

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<sup>53</sup> John Street, *Politics and Technology*, p. 115.

<sup>54</sup> Robert Greene, *The 48 Laws of Power*, Joost Elffers, London, 1998, p. 396–7.

security of continuity against the competitive advantages of technology-driven change.

## **Bias**

Choices about initiating change are rarely divided into neat categories that decision-makers can compare and contrast with ease.<sup>55</sup> In undertaking the transformation to a network-centric environment, the *NCW Roadmap* favours self-synchronisation over the traditional hierarchical control systems. However, the possibility of self-synchronisation does not guarantee that the ADF has the capacity to implement it on a large scale.

The paradox of complex systems is that further fragility and adaptability arise from both increased interdependence and independence of each component part of the network.<sup>56</sup> While self-synchronisation at local levels provides versatility, it also risks considerable losses in functionality. The power and authority delivered to the ‘strategic private’<sup>57</sup> provides the ADF with local adaptability and versatility, but as the number of potential strategic privates increases, so does the fragility of the entire network. The ADF’s peak doctrine focuses on the opportunities for adaptability and self-synchronisation offered by increased connectivity but does not identify the greater fragility of the entire network as a significant risk. Consequently, this social and organisational form of risk receives less intellectual or financial investment than the development of robust communication systems. Yet finding the right way to regulate human behaviour within a network is central to protecting the institution against the fragility of the whole system.

The ADF’s deeply held cultural beliefs about the nature of command and, more particularly, organisational control are central to deciding between the existing hierarchical system and Defence’s emerging desire for self-synchronisation. The decision, as ADF forward-

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<sup>55</sup> John Street, *Politics and Technology*, p. 116.

<sup>56</sup> Duncan Watts, ‘Unravelling the Mysteries of the Connected Age’, *The Chronicle of Higher Education*, vol. 49, no. 23, 14 February 2003.

<sup>57</sup> Lieutenant General Peter Leahy, Speech by the Chief of Army to the Defence Watch Seminar, National Press Club, Canberra, 10 February 2004, <<http://www.defence.gov.au/army/PUBS/CAspeeches/20040210.pdf>>.

thinking doctrine represents it, is simple. It is in the ADF's best interests to choose self-synchronisation.

This doctrine argues that retaining hierarchical control could lead to a situation where the control system is more robust but less adaptable to changes in the operational environment. Therefore, it might not be responsive in a fast-paced environment that demands increased responsiveness. Self-synchronisation shifts the responsibility and burden of decision-making to those lower levels of the organisation that, in theory, are better able coordinate responses to emerging threats. In enabling the opportunity for self-synchronisation, there is no need to keep the expensive and redundant hierarchical control systems. It all seems straightforward.

General Douglas MacArthur stated that: '... in no other profession are the penalties for employing untrained personnel so appalling or so irrevocable as in the military'.<sup>58</sup> Spreading the responsibility for decision-making to a larger number of strategic privates exponentially increases the potential for organisational failure. The organisational gamble is much greater because it exposes the fragility of the entire system. While preserving an extensive hierarchical control system is expensive and potentially less adaptable, the cost is small when compared to the cost of failure. As behavioural scientist Daniel Kahneman has repeatedly demonstrated, it is not risk aversion that drives decision-making behaviour but loss aversion.<sup>59</sup> Therefore, it is more likely that senior decision-makers—seeking to avoid MacArthur's penalties for getting it wrong—will centralise hierarchical control wherever possible. An often overlooked aspect of network-enabling technology is that while connectivity enables self-synchronisation, equally it enables increased centralisation—the 3000-mile screwdriver dreaded by all junior commanders.

Given the choice between adopting a hierarchical control system and a system of self-synchronising organisational units, senior Defence

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<sup>58</sup> General Douglas MacArthur, Annual Reports War Department, Fiscal Year ended June 30, 1933, Report of the Secretary of War to the President, p. 21.

<sup>59</sup> Amos Tversky, and Daniel Kahneman, 'Advances in Prospect Theory: Cumulative Representation of Uncertainty', *Journal of Risk and Uncertainty*, vol. 5, no. 4, 1992, pp. 297–323.

decision-makers are not disinterested. There is a distinct bias towards the former although it might not be the ideal solution. A higher number of intimate control mechanisms, coupled with increased regulation, is a distinct alternate possibility in the transformation to a network-centric force. A more open network-based organisational system might also challenge the principles of Mission Command that are gaining hold in the social and intellectual capital of the ADF.<sup>60</sup> In making decisions about network-enabling technologies, Defence leaders might be predisposed to hedge their bets by supporting mechanisms that increase organisational control because this provides the best means available for reducing the risk of failure. Ultimately, and unfortunately, crisis or failure is the only thing likely to provoke a genuine change in thinking and behaviour. Each successful operational experience reinforces the prevailing bias.

There is no single ‘optimum’ solution; each choice has different advantages and disadvantages. Every strategy builds on different assumptions and offers different results. Any decision must work within the constraints of earlier decisions, and so change is difficult, costly and time-consuming. The successful transition to a network-centric force will involve tempering the optimism of current doctrine with the realities of human behaviour in organisations.

## Uncertainty

Institutional decisions about technology are biased because they offer different degrees of uncertainty.<sup>61</sup> As the economist Frank Knight noted, ‘With uncertainty present, doing things, the actual execution of activity, becomes in a real sense a secondary part of life; the primary problem or function is deciding what to do and how to do it’.<sup>62</sup> The promise of information transparency put forward by NCW’s advocates creates an expectation that increased certainty is a

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<sup>60</sup> Department of Defence, *Future Warfighting Concept*, p. 31; ‘Commanders will exploit the benefits of mission command, which is a decentralised command philosophy that focuses on achieving an intent, within an information environment that offers significantly greater situational awareness than has been experienced in the recent past.’

<sup>61</sup> John Street, *Politics and Technology*, p. 118.

<sup>62</sup> Frank Knight, *Risk, Uncertainty and Profit*, Houghton Mifflin Company, Boston, 1921, p. 268.

distinct possibility in a network—this seems a false hope. As decision-makers seek to exploit the advantages of information sharing across functions (sensor, shooter and commander) and between organisational layers (tactical, operational and strategic), it seems likely that the relentless search for information certainty will become a dominant feature of decision-making behaviour.

Leaders who are responsible for deciding the ‘right thing to do’ are under greater scrutiny to be precisely wrong rather than generally correct. As technology increases the expectation of certainty, so to the measures for protecting the institution from uncertainty become more exacting. For all leaders, there is an increasing demand that they ‘know’ the consequences of their decisions before they act. Unfortunately, this demand ignores the fact that making decisions in a network involves initiating a web of effects rather than having a precise and limited effect. This is not to suggest that decision-makers should escape scrutiny. Rather, such scrutiny must accept the complexity of the decision environment and apply a risk assessment approach better suited to working in a network.

Increased access to information in a network seems to result in more uncertainty, not less. Despite providing more information in a more timely fashion, the decision-making tempo has increased and the cycle-time for carrying out responsive initiatives has decreased.<sup>63</sup> In order to make a valued contribution to military capability, all leaders must be able to decide consistently and act quickly. A decision to introduce change involves exercising judgment in the face of uncertainty. In a network, where uncertainty is high and action is dependent on a larger number of decision-makers of varying quality, the risk of failure increases.

The search for information certainty reduces responsiveness. On the one hand, the network offers the possibility of information certainty while on the other it demands responsiveness and customisation. The dilemma is not about information but rather about people and systems. Will an environment where ‘certain knowledge’ is a

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<sup>63</sup> Thomas Barnett, ‘The Seven Deadly Sins of Network-Centric Warfare’, *United States Naval Institute Proceedings*, vol. 125, Issue 1, January 1999, pp. 36–9.

theoretical possibility undermine trust in a leader's ability to exercise professional judgment? For an institution that prides itself in the quality of its leaders at all levels, resolving this issue should be a priority.

Making decisions is about settling the tension between individual expectation and organisational need. This is neither a simple nor a clear-cut operation. Everybody working in a network must have a high degree of tolerance for ambiguity and uncertainty. Scrutiny, borne from expectations of information certainty, which seeks definitive answers to the likely impact and progress of change, hampers responsiveness and initiative. It is possible that expectations of certainty will erode the confidence of leaders to act.

Uncertainty is inherent to technology-driven change. Pushing to remove uncertainty, or even using excessive measures to guard against it, is likely to reduce the drive for continuing experimentation or development. Equally, there are varying degrees to the difficulty in anticipating different uncertainties. It is easier to identify short-term uncertainties rather than ones that exist in the long term. This quandary may account for why Defence officials devote more attention to the uncertainties surrounding the daily operation of the ADO and its workforce over the long-term effects of technology-driven change associated with implementing NCW.

## **Risk**

Risk assessment is the exercise of judgment over uncertainty and is an inherent part of all Defence activity. There are two stages in risk assessment. The first involves determining what can go wrong and what is the chance of this happening. The second stage involves deciding if the risk is worth taking.<sup>64</sup>

There is a large body of literature on risk assessment that will not be reviewed in this paper. The two essential points are, firstly, that people (both individuals and groups) are poor judges of risk; and secondly, the values of individual decision-makers count.<sup>65</sup>

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<sup>64</sup> John Street, *Politics and Technology*, p. 122.

<sup>65</sup> See James Reason, *Human Error*, Cambridge University Press, Cambridge, 1990; John Adams, *Risk*, University College of London Press, London, 1995; Dietrich Dorner, *The Logic of Failure: Recognising*

How people assess risk is a function of its presentation. Therefore, diversity in the processes of assessment and understanding the intellectual, emotional and cultural biases of decision-makers are central to reducing the potential for bad judgments. People judge the same risk differently, depending on how it is described. That is, people assess risk options according to the phrasing, not according to the facts.<sup>66</sup>

Even when the assessment of the risk is not vulnerable to people's problems with numbers and words, values and judgments are an integral part of the process. People put dissimilar values on the same outcomes, or the results are given different priorities, or there may be divergent interpretations over what the results mean.<sup>67</sup> In the ADF, any change initiative that confronts tradition and culture is full of such questions. How are leaders to compare and evaluate the loss of leadership autonomy against the gains in economic, technical or organisational efficiency? To answer questions of this nature, it is necessary to understand the underlying cultural assumptions of the organisation.

The Prime Minister, John Howard, in a speech at the Australian Defence Force Academy, noted that Australians are 'prepared as

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*and Avoiding Error in Complex Situations*, Addison-Wesley, Reading, Mass., 1996; Andrew Hopkins, *Safety, Culture and Risk: The Organisational Causes of Disasters*, CCH Limited, Sydney, 2005.

<sup>66</sup> Daniel Kahneman and Amos Tversky started their research investigating apparent anomalies and contradictions in human behaviour. Subjects, when offered a choice phrased in one way, might display risk aversion, but when offered essentially the same choice formulated differently might display risk-seeking behaviour. In 2002, Kahneman and Tversky won the Nobel Prize in economics for their comprehensive research into what has become known as 'prospect theory'. See Daniel Kahneman and Daniel Lovallo, 'Timid choices and bold forecasts: A cognitive perspective on risk taking', *Management Science*, vol. 39, no. 1, 1993, pp. 17–31; and Daniel Kahneman and Amos Tversky, 'On the psychology of prediction', *Psychological Review*, vol. 80, 1973, pp. 237–51.

<sup>67</sup> John Street, *Politics and Technology*, p. 123.

pragmatic people'.<sup>68</sup> Defence Department people (especially members of the ADF) see themselves and their institution as the finely tuned embodiment of Prime Minister's pragmatic Australians. But how accurate is this self-image?

A pragmatic streak is a desirable trait for an organisation dealing with ambiguity and uncertainty as it gives a sense of purpose and control. There is a fundamental confidence in the ability to describe cause, effect and a method for action in a practical and 'can-do' way. Pragmatists feel that by applying rigorous method they can structure, understand and manage chaos. However, pragmatism is also incremental; it suppresses theorising and reflection, preferring to focus on refining the lessons of practice. Nor should pragmatism be mistaken for conservatism. A true zealot of pragmatism has a single, clear purpose and is practical and ruthless in discarding the old for the new. Dedicated pragmatists seek efficient progress toward achieving a clearly named end.

For most people, pure pragmatism—the ideal—is disagreeable because it is lifeless. It gives no credibility to belief, faith and trust, which are central to the sociology of military organisations. Military personnel must believe in their weapon systems, they must have faith in the capability of their team, and they must trust in their leaders.

Belief, faith and trust confound a philosophy of pragmatism because they breed a distrust of change—a distrust of progress. Just below the surface of Defence Department culture there is always a low simmer of social tension fuelled by the competing demands of the past and the future. On the one hand, there is a need to ruthlessly pursue new approaches to warfighting, while on the other there is distrust of anything that undermines the traditions that define the identity of the ADF. The ADF's traditions are important because they are a touchstone for social identity and central to building social cohesion, which in turn reinforces the importance of belief, faith and trust.

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<sup>68</sup> Transcript of the Prime Minister, The Honourable John Howard, MP, Address at the Australian Defence Force Academy's, *Safeguarding Australia—Frontline Issues*, Conference Dinner, 31 July 2003, <<http://www.pm.gov.au/news/speeches/speech394.html>>.

Defence culture has a strong nostalgic streak that it hides behind a mask of pragmatic action. The success of the ADO, and particularly the ADF, often rests on its capacity to balance the friction between tradition and pragmatism. This is why understanding organisational culture is important to initiating and managing technological change. For the unwary, a pragmatic change initiative that unwittingly undermines tradition will meet with a purely emotional response from Defence leaders—a response that, on the surface, defies logic.

Initiating change involves taking intellectual risks and challenging cultural assumptions. Most importantly, however, it involves sociology, psychology and the art of persuasion. Those designing the transition to an NCW-based force must create meaning for those who will carry out and support change. To create a commonsense framework for others, the NCW planners must understand how technology and military culture interact. If left unaddressed, the likelihood of failure during implementation will increase. It is worth reflecting on a comment from the man most credited with bringing NCW into focus, Arthur Cebrowski: ‘culture trumps technology every time’.<sup>69</sup>

Are leadership judgments of risk—arising from a pragmatic need to improve future capability—to be taken more seriously than those based on protecting prevailing culture and tradition? In an organisation with a long history of cultural continuity, such as Defence and the ADF, this question is not as simple as it appears, but may yet be fundamental to managing the transition to a network-centric force.

## Expertise

Experts, with specialised knowledge and experience, can be called on to mitigate the risk of taking complex decisions. Such experts often belong to professional bodies with practice boundaries, codified knowledge, and standards for entry and ethical practice. Ignorance and prejudice do not cloud the judgments that experts make about technology and change.<sup>70</sup> Is this a rational belief? Technological determinists argue, with notable weight, that expertise is an expression

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<sup>69</sup> Cited in Michael Evans, ‘Fabrizio’s Choice’, *National Security Studies Quarterly*, vol. VII, no. 1, Winter 2001, pp. 1–25.

<sup>70</sup> John Street, *Politics and Technology*, p. 128.

of increased division of labour that stems from implementing technology. Each new technology—device, social or cognitive—creates a new breed of experts. As Langdon Winner remarked,

... to invent a new technology requires that (in some way or another) society also invents the kinds of people who will use it; older practices, relationships and ways of defining people's identities fall by the wayside; new practices, relationships and identities take root.<sup>71</sup>

Experts of different generations have the 'know-how' but also a body of more analytic knowledge that explains or rationalises why particular practices work the way in which they do. Technology-driven change has the potential to compromise not only a body of professional understanding but also of professional practice. A threat to a routine is a threat to an expert. The strength of the cultures in Defence comes from the professional orientation of its subcultures—subcultures that technology has called into being. Experts are partial to the status quo because their interests are tightly woven into the social fabric of the prevailing culture. NCW threatens the expertise and routines of the many subcultures in the military profession. Are senior 'experts', whose careers and professional identity are closely linked to current practice, in the best position to advise on future practice?

The paradox of network complexity is that, while the traditional knowledge boundaries blur, the growth in available knowledge leads to a greater number of specialisations. Potentially, each new expert knows a great deal about less. In his 1959 Rede Lecture entitled *Two Cultures*, C. P. Snow warned of the effects of professional cultures that are unable to communicate effectively:

Persons educated with the greatest intensity we know can no longer communicate with each other on the plane of their major intellectual concern. This is serious for our creative, intellectual, and above all, our normal life. It is leading us to interpret the past wrongly, to misjudge the present, and to deny our hopes of the future.<sup>72</sup>

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<sup>71</sup> Langdon Winner, 'Who will we be in cyberspace?'

<sup>72</sup> C. P. Snow, *The Two Cultures*, Introduction by Stefan Collini, Cambridge University Press, Cambridge, 1998 (1959), p. 60.

In a complex environment that generates a greater number of specialities, there are fewer ‘experts’ able to take a vantage point, unclouded by ignorance or prejudice, from which to judge the systemic impacts of technology and change.

The final observation about experts is that expertise is socially created.<sup>73</sup> The values and judgments of the decision-makers influence their decisions on what counts for authoritative knowledge on a subject. This is relevant in a military environment dominated by a career system that favours some subcultures over others. cursory observation of the senior leadership of the Service cultures shows that Navy favours ‘ship drivers’, Air Force ‘pilots’ and Army ‘combat arms commanders’. This is not, as it is often portrayed, a result of the survival-of-the-fittest approach to career management, but rather an in-built bias of the selection process. The reality is that most of Defence’s senior military leaders (and their civilian counterparts) draw on a narrow experiential base. This is not the place to argue the ‘right’ or ‘wrong’ of the career management process (it has been addressed elsewhere).<sup>74</sup> Rather, in the context of this paper, it highlights that a lack of diversity in senior military leadership potentially leads to a bias in what expertise is valued. This observation may go some way to explaining why Defence leaders routinely acknowledge the importance of the human dimension of NCW while their decision-making remains firmly fixed on technical issues.

### **Eyes wide open**

Through NCW, the ADF seeks to master uncertainty and synchronisation on the battlefield. It is the newest phase in the endless pursuit of the military ‘Holy Grail’: dispersing the fog of war. What choices will NCW force on Defence? What possibilities will it close down?

The social technologies—the processes, practices and procedures—that surround NCW are most important. Not only will organisational practice need to adjust to meet the demands of the new technology but it will also need to account for existing habits of thinking and behaviour that will fight to resist any change. Defence leaders must

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<sup>73</sup> John Street, *Politics and Technology*, p. 130.

<sup>74</sup> Nick Jans with David Schmidtchen, *The Real C-Cubed*.

approach implementing NCW with their eyes wide open not only to the complexities of a network-centric approach but also to the ‘weight’ of the proven social infrastructure.

In Plato’s *Phaedrus*, Socrates tells the story of Thamus, the king of a great city of Upper Egypt.<sup>75</sup> The story relates the consequences of introducing a writing system that, like the technologies of NCW, would result in greater wisdom. King Thamus’s approach to writing shows the insights of a leader who had his eyes wide open. Additionally, Thamus offers a way in which to negotiate the obstacles of change that Heraclitus and Parmenides represent.

The story goes that Theuth, who discovered numbers and calculation, geometry and astronomy, also discovered writing. Theuth exhibited his discoveries to the King of Egypt, Thamus, and urged him to disseminate them to all Egyptians. When it came to writing, Theuth said:

O King, here is something that, once learned, will make the Egyptians wiser and will improve their memory; I have discovered a potion for memory and for wisdom.

After listening carefully to his ‘expert’ (Theuth), King Thamus makes three observations about writing that might also apply to NCW. He replies to Theuth:

O most expert Theuth, one man can give birth to the elements of an art, but only another can judge how they can benefit or harm those who will use them. And now, since you are the father of writing, your affection for it has made you describe its effects as the opposite of what they really are. In fact, it will introduce forgetfulness into the soul of those who learn it: they will not practice using their memory because they will put their trust in writing, which is external and depends on signs that belong to others, instead of trying to remember from the inside, completely on their own. You have not discovered a potion for remembering but for reminding; you provide your students with the appearance

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<sup>75</sup> This illustration was originally used by Neil Postman in *Technopoly*. The text shown here is from Plato, *Phaedrus*, trans Alexander Nehamas and Paul Wodruff, Hackett Publishing Company, Indianapolis, 1995, pp. 79–80.

of wisdom, not with its reality. Your invention will enable them to hear many things without being properly taught, and they will imagine that they have come to know much while for the most part they will know nothing. And they will be difficult to get along with, since they will merely appear to be wise instead of really being so.<sup>76</sup>

This story is instructive because it neatly summarises the issues discussed in this paper. It is about the social dynamics of technology, not the technology itself. It concerns the character of technology-based decisions and the bias of experts in assessing the ultimate benefits of new technology. It is also about embracing both the good and bad aspects of technology.

King Thamus's three proclamations are reminiscent of Henry Thoreau's observation that technology can offer 'improved means to unimproved ends'.<sup>77</sup> Thamus's approach does not seek to delay technology-driven change, but rather encourages us to think more coherently about the nature of technology and change. Defence is a pragmatic culture that fosters leaders who believe that through their efforts order can come from chaos. This will continue to be a valuable trait. But pragmatists are also incrementalists. There is a danger that if Defence leaders fail to consider the sociology of technology and change in the transition from a 'platform-centric' to a 'network-centric' force, they may hinder the growth and development of the workforce's capacity to make best use of the technology. Like King Thamus, all Defence leaders should approach NCW with their 'eyes wide open'.

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<sup>76</sup> *ibid.*

<sup>77</sup> Henry Thoreau, *Walden*, Koneman, Köln, 1996 (1854), p. 49. [Full quote: 'Our inventions are wont to be pretty toys, which distract our attention from serious things. They are improved means to unimproved ends.']

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