Decision-making in

Complex Environments

Between theory and practice

By Mirea Catapano,

Dundee University

Cover Photo:

Complex Adaptive Systems: http://www.dis.anl.gov/exp/cas/index. html

About the Author

Ms. Mirea Catapano is currently in her 3rd year at the University of Dundee, pursuing her MA (Hons) in International Relations and Politics. This research paper was drafted while she was a Research Intern at the NATO School, Oberammergau. The paper was briefed to the NATO School staff and faculty at the end of the internship.

Contents

Introduction

Since the end of the Cold War, the security environment has undergone fundamental changes and nowadays, traditional state-on-state conflict has given way to a much more nebulous collection of asymmetric and irregular threats, with conventional Armed Forces fighting an increasingly diffuse, elusive and adaptive enemy. There is growing recognition that traditional military approaches are no longer adequate to address present and future challenges, and that the current paradigm of planning, organizing and controlling is not optimal for today's complex endeavours.[1] Military forces are now challenged to be effective in a complex and uncertain environment, where they simultaneously have to accomplish a combination of combat, security, engagement, and relief and reconstruction activities. Today's complex challenges require military forces not only to be increasingly effective, integrated, and deployable, but also to adopt a new organizational paradigm and to foster all dimensions of adaptability, in order to leverage success over unconventional, dynamic enemies as circumstances on the ground evolve in rapid and unpredictable ways. The paper attempts to analyse how military forces can attain the desired levels of adaptability and flexibility and how a learning culture can be fostered at every scale of a military organization. This will be primarily achieved by exploring the emerging field of Complex Adaptive Systems and assessing its relevance for contemporary military challenges, with the aim of offering a number of starting points for military organizations to prepare and train their leaders for the complex endeavours of today and tomorrow.

---

[1] Mick Say and Ben Pronk, 'Individual Decision-Making in Complex Environments', *Australian Army Journal*, Vol. IX, No. 3, p. 120, and Mink Spaans, et al., 'Learning to be Adaptive', 14th International Command and Control Research and Technology Symposium, 2009, pp. 1-2.

CHAPTER ONE - The Contemporary Security Environment

'The world is in a state of perpetual conflict with a milieu of complex threats that defy simple analysis, explanation, and solutions'.[2]

The twenty-first century has marked the onset of a revolutionary era in the history of mankind. The advent of globalization has made the world increasingly interconnected, and today the spread of communication and information technologies have fundamentally changed the way we conceive of previously fixed categories like 'space' and 'time'. To many of us, the world is shrinking and today, like never before, we have come to be part of a truly 'global village'. The phenomenon of globalization has brought about unprecedented levels of openness and connectivity and nowadays we live in a society where people, capital, services, goods and immaterial elements like ideas and information, are transferred in near-real time across national borders.[3] It could be argued that today it is no longer possible to draw a clear distinction between the domestic and the international realm as events taking place many miles away can affect distant localities and vice versa. On one side, these developments create new opportunities for economic prosperity, freedom and peace at a global level. Yet, on the other, 'they are also producing powerful sources for fragmentation, creating critical vulnerabilities and sowing the seeds of violence and conflict'[4]; many aspects of globalization have important security implications as they combine to increase the dangers of transnational treats like WMD proliferation, cyber terrorism and global crime that are becoming wider in scope and more serious in their effects.[5]

The twenty-first century has led us to expand and reconceptualise the notion of security as we are increasingly confronted with a myriad of unconventional threats that 'cannot be understood through the security paradigm specific to the last century'.[6] As argued by Lieutenant General David W. Barno[7], USA (Ret.), 'today, the threat is more obscure, far less tangible, and in some ways, for those reasons, more insidious and dangerous'.[8]

---

[2] Christopher M. Schnaubelt, 'Complex Operations: NATO at war and on the margins of war', Forum Paper, NATO Defence College, Research Division, July 2010, p. 50.

[3] 'Adaptive Campaigning 09 - Army's Future Land Operating Concept', Australian Army Headquarters, September 2009, p. 8.

[4] Lynn E. Davis, 'Globalization's Security Implications', *Rand*, p. 1.

[5] Ibid., pp. 1-2.

[6] Theodor Frunzeti, 'Strategic Impact', Carol I National Defense University of Bucharest, No 1, 2013, p. 6.

[7] Lieutenant General David W. Barno, USA (Ret.), is Director of the Near East South Asia Centre for Strategic Studies at the National Defence University. From October 2003 to May 2005, General Barno served as overall commander of U.S. and coalition military operations in Afghanistan.

[8] David W. Barno, 'Military Adaptation in Complex Operations', *Prism*, Vol. 1, No.1, 2009, p. 35.

The last decades have witnessed a shift away from traditional state-on-state conflict towards a new physiognomy of warfare in which opponents have markedly different military capabilities and the weaker side uses unconventional tactics such as ambushes, suicide attacks or roadside bombings to achieve an edge over forces that overmatch it in conventional capabilities. Nowadays, the vast majority of armed conflicts take place either between sub-state groups or between such groups and conventional military forces; although traditional interstate warfare will not completely disappear, conflict is acquiring new dimensions with the adaptation of the actors involved to advances in science and technology as well as to the new characteristics of the security environment.[9] The twenty-first century will be dominated by asymmetric, unconventional and 'hybrid' conflicts, defined by defence analyst Frank Hoffman as a "blend of the lethality of state conflict with the fanatical and protracted fervour of irregular war".[10]

> *The contemporary security environment is marked by volatility.*

The contemporary security environment is marked by Volatility, Uncertainty, Complexity and Ambiguity (VUCA)[11]; recent historical events have demonstrated that constant change and evolution are inherent characteristics of today's security environment. If the Alliance is to retain its role of security guarantor in the coming decades, it needs to understand the inherent complexity of the new operating environment and undergo a process of fundamental adaptation to effectively address the new challenges of the twenty-first century. Contemporary conflict can only be understood through a holistic approach that takes into account the role of social, cultural, political, economic and technological factors in the conflict itself. The global security environment will be increasingly affected by the interplay of state and non-state actors and characterized by a number of strategic trends such as the increasing role of information, the development of irregular capabilities, the growing importance of non-military aspects of warfare and the blurring distinction between military and civilian regarding the use of force.[12] Future decades will be marked by a gradual shift away from traditional large-scale conflicts towards 'small wars', as military forces will be

---

[9] Frunzeti, 'Strategic Impact', p. 6.

[10] Frank G. Hoffman, *Conflict in the 21st Century: The Rise of Hybrid Wars,* Arlington, VA: Potomac Institute for Policy Studies, 2007, p. 28, quoted in David E. Johnson, 'Military Capabilities for Hybrid War: Insights from the Israel Defense Forces in Lebanon and Gaza', *Rand*, Occasional Paper, 2010, p. 1.

[11] Volker Franke, 'Decision-making under Uncertainty: Using Case Studies for Teaching Strategy in Complex Environments', *Journal of Military and Strategic Studies*, Vol. 13, No. 2 , 2011, p. 1.

[12] Frunzeti, 'Strategic Impact', pp. 7-8.

increasingly deployed in multiple, lesser contingency regional venues, where they will be confronted with a host of asymmetric threats and they will fight a myriad of 'shadowy adversaries often operating at the murky nexus between terrorism, transnational crime and illicit global money flows'.[13] In order to prepare for such complex endeavours, Armed Forces need to address potential 'gaps' in military training and develop new skills and competences that will enable them to achieve competitive edge over the enemy, such as flexibility, adaptability and the capacity to take decisions 'on the fly' under extremely stressful conditions.[14] Former Commandant of the USA Army War College, Maj. Gen. Robert H. Scales argued:

> *Today's conflicts demand officers who can perform in an uncertain, ambiguous, complex, chaotic and inherently unpredictable environment. Our educational system needs to produce more men and women who can anticipate conditions that do not yet exist. They must be capable of dealing with unfamiliar cultures and an enemy who is unconstrained by Western values and methods of warfare.[15]*

1.1 Major Drivers of Future Instability

Identifying future drivers and trends represents a first step towards effectively transforming the Alliance to meet the challenges of the coming decades. Members of the Alliance need to 'develop a shared perspective of the long-term future and then determine its implications and broad strategic requirements'.[16] The next section explores some of the major drivers of future instability as identified by NATO Allied Command Transformation (ACT) Strategic Foresight Analysis. [17]

Global Power Shift – The rebalance of power from the West to other regions of the world will challenge the Alliance both at the economic and political level. Already today, we are seeing the rapid development of the so called BRICS countries – Brazil, Russia, India, China and South Africa. 'Developing nations with fast rates of growth may be able to translate their rising economic power into greater political and military influence'.[18] Arguably, India and China will play a major role in the global arena in future decades. The potential for conflict and instability could increase in both traditional as well as new hotspots, with likely implications for the Alliance. The formation of new regional alignments in the

[13] Barno, 'Military Adaptation in Complex Operations', p. 30.
[14] Franke, 'Decision-making under Uncertainty: Using Case Studies for Teaching Strategy in Complex Environments', pp. 1-2
[15] Robert Scales, 'Return of the Jedi', *Armed Forces Journal*, October 2009, p. 22.

[16] 'Strategic Foresight Analysis: Draft Future Security Implications', Forging the Future - Leading NATO Military Transformation, NATO Allied Command Transformation, February 2013, p. 1.
[17] Ibid.
[18]'Strategic Foresight Analysis, 2013 Report', NATO Headquarters Supreme Allied Commander Transformation, p. 9.

Asia-Pacific region could challenge NATO's strategic advantage and cause increasing competition. Moreover, NATO's role as security guarantor may come under scrutiny as individual nations shift their focus away from the North Atlantic region and national political priorities change driven by the evolving political landscape.[19]

Demographics – The global population is likely to grow from 6.5 billion today to 8.5 billion by 2035, with the greatest growth occurring in areas of the world characterized by weak economies and dwindling resources; for instance, in Sub-Saharan Africa the population is set to grow by 80 per cent by 2035.[20] Population shifts will cause increasing migration from rural to urban areas, prompting the rise of 'megacities' where poverty, unemployment, overburdened infrastructure and ethnic tensions will undoubtedly sow the seeds of instability and conflict. Military operations will increasingly take place in urban environments, complex terrain, indoor spaces and subterranean locations which will challenge conventional Intelligence, Surveillance and Reconnaissance assets and expose Armed Forces to a myriad of asymmetric and irregular threats[21]; moreover, the application of military instruments will not suffice and greater cooperation with regional organizations

and international partners will be essential for success. 'Youth bulges, especially in West Africa and the Middle East, will provide fertile ground for recruitment into terrorist groups, criminal elements and drug cartels'.[22] Furthermore, high levels of population growth in the developing world will prompt increasing migration to the West, which by that time will be witnessing a reversed trend of population decline and rapid aging; migration could have a twofold effect: on one side, it could compensate for the shrinking pool of human and intellectual capital but on the other, it may lead to tensions and instability along cultural lines.[23]

Climate Change – 'The long-term warming of the planet is expected to continue at its current rate'[24]; the increasing incidence of extreme weather events such as hurricanes, typhoons, flooding or draughts will cause extensive damage to infrastructure and feedstock, creating conditions for instability and conflict in some of the most fragile areas of the world, with potential implications for the Alliance.[25] Furthermore, ocean warming and melting ice packs will create conditions for the exploitation of previously inaccessible resources in the Arctic region[26], thus paving the way for increasing competition not only among

---

[19] Ibid., pp. 9-12.
[20] Operational Environment, 2009-2025, *TRADOC*, Vol. 6, August 2009, p. 28.
[21] Ibid., p. 30.

[22] Ibid., 29.
[23] 'Strategic Foresight Analysis, 2013 Report', NATO Headquarters Supreme Allied Commander Transformation, p. 17-19.
[24] Ibid., p. 37.
[25] Ibid. pp. 37-38.
[26] Ibid. p. 39.

Arctic Council nations, but even beyond, with potential implications for the Alliance.

Resource Constraints – Climate change, coupled with population growth and rapid urbanization will cause increasing resource scarcity, particularly in the Middle East, Sub-Saharan Africa and South Asia.[27] The lack of reliable energy resources and adequate water supplies will constitute major problems for the international community. It is predicted that by 2030 energy requirements will be 50 per cent higher than today, with fossil fuels (oil, gas and coal) continuing to represent the world's primary energy source. At present, Russia and Iran control about 40 per cent of the world's gas reserve and it is projected that during the next decade the Middle East will account for over 35 per cent of global oil production[28]. The Alliance needs to develop alternative sources of energy as traditional ones are largely controlled by potentially hostile countries and will be exhausted soon. It is predicted that, in the coming decades, developing countries will make up over two thirds of world's energy demand; experts predict that China will need to increase its energy consumption by 150 per cent, while India, another major future player, 'will need to nearly double its consumption by 2025 in order to maintain a steady rate of economic growth'.[29] The lack

of sufficient water supplies constitutes another major threat; it is predicted that the total water usage will rise by over 30 per cent by 2025, and it is expected that, by that time, over two thirds of the world population will be living in water-stressed conditions primarily in the Middle East, Asia and North Africa.[30] Tensions are likely to arise among countries making use of shared water sources as the Rivers Ganges-Brahmaputra, Jordan, Tigris-Euphrates, Mekong and Nile. The Nile River is the lifeblood of eleven countries: Egypt, Ethiopia, the Sudan and South Sudan, Kenya, Eritrea, the DR of Congo, Tanzania, Uganda, Burundi, and Rwanda. Ethiopia has launched the largest engineering project ever attempted in the country – the Grand Ethiopian Renaissance Hydropower Dam, capable of storing more than an entire year's flow of the Blue Nile.[31] The construction of the dam will cause increasing instability in the region and tensions may easily escalate particularly between Ethiopia and Egypt, whose population is set to double over the next decade.

WMD Proliferation – Weapons of Mass Destruction comprise Chemical, Biological,

---

[27] Operational Environment, 2009-2025, *TRADOC*, Vol. 6, August 2009, p. 26-27.

[28] Ibid.

[29] Ibid.

[30] Alex Evans, 'Resource Scarcity, Climate Change and the Risk of Violent Conflict', World Development Report 2011, Background Paper, Centre on International Cooperation, New York University, p. 3.

[31] For more information see Peter Gleick, 'The Promise and Threat of Ethiopia's Dam on the Nile: 21st century Water Conflicts', Science Blogs, accessed online 20th June 2013, http://scienceblogs.com/significantfigures/index.php/2013/06/02/the-promise-and-threat-of-ethiopias-dam-on-the-nile-21st-century-water-conflicts/.

Radiological, Nuclear and High-Explosive (CBRNE) Weapons. Despite the efforts made by the international community to halt the spread of WMDs, proliferation is likely to continue in some of the world's most unstable regions like North Korea, Syria and Iran.[32] Of crucial concern is the nexus between terrorism and WMD proliferation: even if nowadays the prospects of terrorist groups developing nuclear capabilities seem somewhat remote, in the future they might be able to acquire them from colluded states. Furthermore, we cannot exclude the possibility of terrorist cells developing biological and chemical weapons and using them as a tool for coercion and violence. The USA Defence Intelligence Agency (DIA) projects that chemical and biological agents will become increasingly sophisticated and diverse in the future[33] and it is predicted that bioterrorism will constitute a major challenge for which conventional Forces must be well prepared and equipped. At the same time, **terrorism** will become even more widespread and extreme[34] and the threat will be posed not only by the Al-Qaeda senior leadership based in the border areas of Afghanistan and Pakistan and their affiliates, but also by the increasing number of Al-Qaeda inspired home-grown terrorist cells and individuals, that self-radicalize through communication and information

technologies.[35] This is a net result of globalization.

Technology as an Accelerant – Global communication networks have profoundly changed the way individuals communicate, manipulate, and react to information. Nowadays, the quantity of information available and the speed of its transfer outpace states' ability to control the flow of information.[36] Arguably, communication technologies have provided the enemy 'with a global Command, Control, Communications, Computers, Intelligence, Surveillance and Reconnaissance (C^{4}ISR) capability'.[37] Over the last decade the adversary has proven very much adept at exploiting newly emerging technologies to reach new audiences; for instance, virtual environments like Second Life, an online three-dimensional virtual world launched in 2003 where users can customize their avatars, socialize and connect using free voice and text chat, are increasingly used to recruit and train terrorists.[38] In the future new technologies employed for malevolent purposes might challenge the Alliance, damage its infrastructures and weaken its capabilities[39], for this reason, it is crucially important to further strengthen cyber-defence.

[32] Thomas Brevick, 'Future Security Environment 2025, PDD (TC) – Environmental Security', Supreme Allied Commander Transformation, slides No. 5-6.

[33] 'Operational Environment, 2009-2025', *TRADOC*, Vol. 6, August 2009, p. 24.

[34] Brevick, 'Future Security Environment 2025', slide No. 9.

[35] Insights from M5-66 A-13 NATO Defense Against Terrorism Course

[36] Brevick, 'Future Security Environment 2025', p. 19.

[37] Ibid., p. 20.

[38] Ibid.

[39] 'Strategic Foresight Analysis, 2013 Report', NATO Headquarters Supreme Allied Commander Transformation, p. 26.

In the future, asymmetric tactics will play a crucial role in warfare 'as both state and non-state actors seek en edge against those that overmatch them in conventional military capability'.[40] Military forces are now challenged to be effective against a multiplicity of enemies, ranging from weak, failing and rogue states to more elusive entities like terrorist groups, guerrillas, local warlords as well as criminal networks and drug cartels. Today's enemy is unintelligible because its resources, whether human, financial or informational, are much lower than those of conventional forces. A major example is provided by insurgent groups in Afghanistan, 'that are much lower in number, equipment and means of warfare compared to multinational coalitions operating under a UN mandate'; nevertheless, by using brutal and often improvised means of warfare, they can cause considerable human and material losses to conventional military forces.[41] Today's enemy is imperceptible in that it acts individually or in small groups; in this respect a major example is the open network of Al-Qaeda, whose elements can easily 'appear and disappear', thus being invulnerable to indirect actions. The opponent is also increasingly elusive and irrational because it 'hides' among the innocent population and it opposes an adversary that is numerically and technologically superior.[42]

Lieutenant General David W. Barno argues that the Armed Forces 'have struggled to adjust their doctrines, trainings, weapon systems and culture from a wholesale focus on conventional state-on-state military conflict to a much more nebulous collection of uncertain threats'.[43] According to many experts, traditional military training fails to prepare future personnel for the complex endeavours of the present and coming decades. A key reason for this is the lack of adequate focus on adaptive skills and meta-cognitive competences that nowadays are crucial to solve complex crisis situations. Traditional military training is still characterized by a hierarchically focused, linear strategic thinking while the contemporary operating environment requires military forces to develop non-linear cognitive competences which enable them to effectively deal with uncertainty and ambiguity.[44] The end of the Cold War in the early 1990s paved the way for greater interaction with the civilian environment as well as for greater involvement of military units in a wide range of activities and tasks aimed at post-conflict stabilization and reconstruction. Western Armed Forces are now challenged to be effective in complex and dynamic environments, where they

---

[40] 'Securing Britain in an Age of Uncertainty: The Strategic Defence and Security Review', Command of Her Majesty, 2010, p. 16.
[41] Frunzeti, 'Strategic impact', p. 9.

[42] Ibid.
[43] Barno, 'Military Adaptation in Complex Operations', p. 32.
[44] Franke, 'Decision-making under Uncertainty: Using Case Studies for Teaching Strategy in Complex Environments', p. 2.

simultaneously have to address multiple challenges, for instance, fighting insurgent groups and provide security, while supporting reconstruction and rebuilding programs for the indigenous population.[45]

Although organizational adaptability is the cornerstone of success in today's complex operating environment, 'the discussion about these changes remains at the superficial level and the nature of the changes required in still not very understood'.[46] How can military organizations foster such adaptability? How can military training be modified to be effective in the contemporary and future security environment? These are all questions that the author will attempt to answer in the paper.

1.2 Military Transformation

In order to successfully meet the challenges of the present and future decades, military organizations need to undergo a fundamental process of transformation. But what exactly does transformation entail? Hone and Friedman define it as 'a change in concept, organization, process and technological application through which significant gains in operational effectiveness and operating efficiencies are achieved'.[47] The process of military transformation entails fundamental changes to the entire fabric of a military organization to make forces more effective and responsive in an increasingly complex world.[48] The United States Department of Defence (DoD) defines military transformation as encompassing three major areas: how Armed Forces conduct military business, how they work with other agencies and partners and how they fight. This involves not only adapting capabilities and military assets but also developing closer links with other governmental and non-governmental agencies 'to eliminate duplication of efforts and unnecessary delays, streamline the equipment acquisition process, reward innovation' and troops flexibility.[49]

Over the last couple of years the Alliance has been moving towards a new concept of Smart Defence, aimed at making military forces more effective and flexible at times of increasing budgetary constraints. Smart Defence is based on a) the need for 'pooling and sharing' military assets and forces to eliminate the gap between requirements and capabilities; b) the need to define a common range of security priorities among members of the Alliance and c) the need to establish strategic synergies between NATO

---

[45] Mink Spaans, et al., 'Learning to be Adaptive', 14th International Command and Control Research and Technology Symposium, 2009, p. 1.

[46] Anne-Marie Grisogono and Mink Spaans, 'Adaptive Use of Networks to Generate an Adaptive Task Force', 13th ICCRTS: C2 for Complex Endeavours, accessed online on 16 July 2013, http://www.dodccrp.org/events/13th_iccrts_2008/CD/html/papers/021.pdf.

[47] James P. Follwell, 'Contributing to Army Transformation and Leadership Effectiveness: Training Entry-level Soldiers to Meet Emerging Requirements', Royal Roads University, 2009, p. 11.

[48] Ibid., p. 15.

[49] Ibid., pp. 14-16.

and other regional or international organizations. [50]

1.3 The Importance of Strategy

The new security environment requires non-linear cognitive competences – this can only be achieved by teaching strategy more effectively as part of military training.[51] Strategy is the bridge between desired outcomes and the concrete actions to achieve them. It serves as 'a general framework providing guidance for actions to be taken and is itself in turn shaped by those actions'.[52] By enhancing strategic thinking, forces on the ground could further identify potential opportunities and develop them to achieve more desirable outcomes. Strategy is inherently proactive as it aims at shaping the operational environment rather than simply reacting to it. 'Traditional military thinking has been characterized by imposed certainty through predetermined standard operating procedures'.[53] This sort of planning is simplistic and highly methodical, intended to reduce risk and eliminate ambiguity[54], but in the new operating environment this could turn out to be a double-edged sword; the rigid mechanisms that have informed military thinking in the past may today be 'powerful inhibitors of innovation because of the vested interests they create in the status quo'.[55] The new operating environment requires personnel with strategic leadership capabilities such as mental agility, cognitive flexibility, professional astuteness, and cultural awareness. Detailed long-range plans are no longer crucial for success and nowadays, the ability to develop a full understanding of the situation, to sense changes and respond accordingly through rapid adaptive action, is heralded as the key to competitive advantage.[56] There should be a shift in focus towards pattern recognition; military leaders should develop such an understanding of the surrounding environment so as to spot patterns and take appropriate action to structure those patterns in their favour.[57]

The use of case studies represents one of the most valuable ways of preparing junior leaders for their decision-making role in the new security environment. Case studies prepare students to take difficult decisions in conditions of uncertainty and cope with the complexities of contemporary realms, compelling them to identify the most important aspects of the problem,

---

[50] Jacob Henius and Jacopo Leone McDonald, 'Smart Defence: A Critical Appraisal, Forum Paper', NATO Defence College, March 2012, pp. 6-7.

[51] Volker Franke, 'Decision-making under Uncertainty: Using Case Studies for Teaching Strategy in Complex Environments', *Journal of Military and Strategic Studies*, Vol. 13, No. 2 , 2011, p. 2.

[52] Ibid., p. 3-4.

[53] Ibid., p. 6.

[54] Franke, 'Decision-making under Uncertainty', p. 6.

[55] Christopher R. Papparone, Ruth A. Anderson and Reuben R. McDaniel, Jr., 'Where Military Professionalism Meets Complexity Science', Armed Forces & Society', Vol. 34 No. 3, 2008, p. 445, quoted in Franke, 'Decision-making under Uncertainty', p. 6.

[56] Liedtka and Rosenblum, 'Teaching Strategy as Design', p. 285, cited in Franke, 'Decision-making under Uncertainty', p. 7.

[57] Kurtz and Snowden, 'The New Dynamics of Strategy', p. 466, in ibid., p. 13.

determine possible solutions, formulate strategies and confront obstacles to their implementation. Case studies can be either retrospective or fictional; in case of retrospective exercises, students are asked to analyse why certain decisions were taken, what mistakes were made and what alternative options there were that could have led to more desirable outcomes. Probably fictional case studies are more complex that retrospective ones because they place students at the centre of difficult decisions in novel one-off situations of which they have little or no expertise.[58]

---

[58] Ibid., p. 18.

CHAPTER TWO - Complex Adaptive Systems

'A system is an organized mess'[59]

Many analysts argue that the heuristics used to guide decisions in the past is no longer adequate in today's increasingly interconnected world. Traditional paradigms of military thought are not optimal to address the challenges posed by the contemporary and future operating environment.[60] In the view of many, the *Science of Complexity* offers a more successful method to deal with the threats of the twenty-first century. The origins of Complexity Science can be traced back to the founding of the Santa Fe Institute in 1984, a New Mexico research centre where experts from diverse disciplinary backgrounds work together to pursue 'a common theoretical framework for complexity'.[61] The Santa Fe Institute is devoted to the study of Complex Adaptive Systems (CAS): such systems are 'complex' because they comprise a myriad of mutually interacting and inter-related agents that constantly expose emerging behaviour. As a result, 'their union creates a whole which is completely different from the sum of individual parts'.[62] In a CAS, complexity increases in line with the number and diversity of its constituent elements as well as with the level of interaction among them; 'it is thus the relationships between agents, rather than the actual agents themselves, that proves the critical factor'.[63] At the same time, complex systems are also 'adaptive', in that have the capacity to evolve and adjust to fit the ever changing environment in which they exist. Examples of CAS are numerous in both the natural and human world. In the natural world, cells, immune systems, brains, ecologies and ecosystems fall under this category, whereas if we consider the human world, political parties, societies and even the global economy are examples.[64] Let's take a closer look at the immune system to understand the 'adaptation' component in a CAS. The human immune system comprises two different layers of defence, with different degrees of specificity. The innate immune system provides an immediate, non-specific response by eliciting an inflammation that vanquishes most foreign invaders. Nevertheless, if pathogens successfully evade the innate response, human beings possess a second layer of protection, the

---

[59] Clay, Peter and Austin Warwick. *Another Way of Thinking: A Discussion paper on Systemic Design* (Canberra: Chief of the Australian Army Exercise Reading Package, November, 2006), p. 39, quoted in Paul R. Burns, 'Complex Adaptive Special Operations (CASO)', School of Advanced Warfighting, Marine Corps University, 2007, p. 2.

[60] Mick Say and Ben Pronk, 'Individual Decision-Making in Complex Environments', *Australian Army Journal*, Vol. IX, No. 3, p. 120,

[61] Rebecca Dodder and Robert Dare, 'Complex Adaptive Systems and Complexity Theory: Inter-related Knowledge Domains', Research Seminar in Engineering Systems Massachusetts Institute of Technology, 2000, p. 3.

[62] Ibid., pp. 120-121, and Alex Ryan, 'The Foundation for an Adaptive Approach: Insights from the Science of Complex Systems', *Australian Army Journal,* Vol. VI, No. 3, pp. 70-71.

[63] Ibid., p. 121.

[64] Dodder and Dare, 'Complex Adaptive Systems and Complexity Theory: Inter-related Knowledge Domains', p. 1.

adaptive immune system which provides an antigen-specific response; its T-cells and B-cells can in fact adapt to the specific pathogen and neutralize it by killing infected cells and producing antibodies. However, also pathogens adopt 'an adaptive strategy' to avoid detection and neutralization by the immune system[65] - a major example is the human immunodeficiency virus (HIV). Over the years medical researchers have struggled to find an effective AIDS vaccine because the virus genome mutes on a constant basis to survive the body's defense system.

The next section addresses the military relevance of CAS and attempts to highlight the ways in which CAS theory could provide military forces with a tool to better understand complex problems and find feasible solutions to them. In light of this, the author will first address the major sources of complexity in today's operating environment:

Interdependence - As previously stated, what make a situation truly 'complex' are the networks of interdependencies between its constituent agents. As a result, 'the situation cannot be successfully treated by dividing it into sub-problems that can be handled separately'.[66] If such an error is made, unintended consequences may arise which could undermine the mission's overall outcome. Moreover, because of interdependence, 'there are multiple interacting causal and influence pathways leading to, and fanning out from, any event or property'[67]. As a consequence, military decision-makers cannot expect any simple causality or lineal causal chain, in other words no direct connection between cause and effect can be assumed when addressing complex situations.[68]

Nonlinearities – in a highly interconnected world linearity is the exception rather than the rule; today's complex situations are shaped by highly nonlinear dynamics and for this reason, military forces cannot afford to make predictions or inferences as these would lead them to serious errors. The linear extrapolation of current conditions represents one of the most dangerous cognitive traps for the militaries[69]; it occurs 'when a naive analysis of stability is derived from the absence of past variations...for instance, imagine someone who keeps adding sand to a sand pile without any visible consequence, until suddenly the pile crumbles'. [70] In this case, confidence in stability was maximum until the last grain of sand was added to the pile; however, we

[65] 'Immune System', Wikipedia, accessed online on 30th July 2013, http://en.wikipedia.org/wiki/Immune_system, and 'The Gatekeepers of the Immune System', *The Nobel Prize in Physiology or Medicine 2011,* The Nobel Assembly at Karolinska Institutet, 2011, pp. 1-2.
[66] Ibid., p. 121, and Anne-Marie Grisogono and Vanja Radenovic, 'The Adaptive Stance – Steps Towards Teaching More Effective Complex Decision-Making', New England Complex Systems Institute, p. 716.
[67] Grisogono and Radenovic, 'The Adaptive Stance – Steps Towards Teaching More Effective Complex Decision-Making', p. 717.
[68] Ibid.
[69] Ibid., p. 716.
[70] Nassim Nicholas Taleb, *The Black Swan: the Impact of the Highly Improbable,* (Allen Lane, London, 2007), p. 40-41.

cannot blame the collapse on the last grain, but rather on the 'structure of the pile' itself, which was the problem.[71]

Opaqueness – When attempting to solve complex situations, military personnel should be aware that many of the most important aspects of the problem might be hidden, and that any prediction based on a limited knowledge or understanding of the situation might be dangerous in that it may lead to unintended consequences. 'Decision heuristics which may be adequate in simpler situations can become dangerous cognitive traps' when dealing with complex problems.[72] As argued by Alex Ryan of the US Army School of Advanced Military Studies, Armed Forces must learn how to distinguish between 'complicated' and 'complex' problems.[73] For instance, when a military vehicle breaks down, this is a complicated problem and the best to solve it is with the help of a subject-matter expert, a mechanic with an in-depth knowledge of the vehicle. The mechanic can isolate the cause of the problem by checking the different parts that make up the vehicle. In this case 'parts are interrelated, but their relationships are effectively static over time'.[74] This means that taking the system apart and then reassembling it is absolutely feasible. Nevertheless, when a military

vehicle breaks down in a crowded market place in Kabul, Afghanistan, this is a complex problem because 'the appropriate course of action is sensitive to both time and context', and many questions about potential threats and risks to military forces and civilians alike must be quickly evaluated before deciding what to do.[75] 'Whether the commander decides to let the crew attempt to repair it, wait for support or abandon the vehicle, different risks will be incurred with different ramifications for the mission'.[76] In this case, relying on a narrow expertise is not enough, and rather an holistic assessment of the context is required in order to determine the most appropriate course of action. Nor will decomposing the problem lead to an effective solution, because this would ignore the complex network of interactions among parts. This simple example shows that complex problems require techniques and strategies completely different from the ones used to solve complicated problems.[77]

Rather than attempting to solve complex crisis situations through the construction of rigid courses of action, military planners should focus more on carefully observing what is actually happening on the ground and respond accordingly in a timely and readily manner.[78] Today's operating environment is so rapidly evolving that

[71] Ibid.

[72] Grisogono and Radenovic, 'The Adaptive Stance', p. 718.
[73] Alex Ryan, 'The Foundation for an Adaptive Approach: Insights from the Science of Complex Systems', *Australian Army Journal,* Vol. VI, No. 3, pp. 74.
[74] Ibid.

[75] Ibid.
[76] Ibid.
[77] Ibid.
[78] Say and Ben Pronk, 'Individual Decision-Making in Complex Environments', p. 122.

predictions seem futile at best, detrimental at worst. In the same way, rather than seeking to over-simplify the 'complex', military planners should embrace the fact that '*chaos*' and '*messiness'* are central to the contemporary operating environment and that as a result, any attempt to eliminate friction and to 'make things smoother' might undermine efforts and outcomes.[79] According to Alex Ryan, 'friction is roughly those factors that differentiate between real war and war on paper'.[80]

> *Today's operating environment is so rapidly evolving that predictions seem futile at best, detrimental at worst.*

It is of paramount importance to accept the new twenty-first century reality and direct all energies towards *pattern recognition*, crucial to spot potential vulnerabilities in the adversary. Military organizations should change their focus 'from trying to *know* the world to *making sense* of the world'.[81] This can only be achieved through greater cultural and situational awareness, crucial to fully understand the surrounding environment and effectively address emerging challenges.

Given the inherent difficulty to forecast future events, it is not possible for military forces to rely exclusively on previously tested courses of action as these may not be adequate to tackle newly emerging threats, rather, military training should focus more on teaching junior leaders how to cope with ambiguity and how to effectively adapt to novel one-off situations of which they have little or no expertise. Military forces need to enhance their capacity to improvise and take decisions 'on the fly' even in the most stressful circumstances.

Multi-scalarity and Open Boundaries – There is increasing recognition that complex situations cannot be addressed at a single scale and that military forces should instead adopt a multi-scale approach which takes into account the local, regional, and wider implications of any given problem. Furthermore, due to the effect of external influences on the system, it is not possible to establish some arbitrary boundaries because these would only distort the problem's contours and render military forces more vulnerable to unexpected phenomena. Military personnel should be constantly aware that external forces may influence the development of the system and consider any problem as free from delimitations.

According to many analysts, traditional military thinking is excessively linear to function effectively in the modern operating environment, where linearity is the

---

[79] Ibid.

[80] Alex Ryan, 'The Foundation for an Adaptive Approach: Insights from the Science of Complex Systems', *Australian Army Journal,* Vol. VI, No. 3, 2009, p. 70.

[81] Christopher R. Paparone, Ruth A. Anderson and Reuben R. McDaniel Jr, 'Where Military Professionalism Meets Complexity Science', *Armed Forces and Society*, Vol. 34, No. 433, 2008, p. 439.

exception, rather than the rule. In an ideal world, we would take decisions by ordering all the alternatives and then choosing the option which maximizes expected utility - nevertheless, this presupposes clear understanding of a given problem as well as full awareness of all its aspects and dimensions, even the most hidden ones. Unfortunately, in the real world, we only have limited knowledge of the surrounding environment and as a result 'we cannot base our choices on decision strategies reflecting outbounded rationality'.[82] Military forces should refrain from making predictions and inferences, as these would inevitable lead them to miscalculations and irreparable mistakes.[83] Linearity in traditional military thinking can be viewed as existing in both the horizontal and vertical planes. Horizontal linearity manifests itself in the constant attempt to predict the unfolding of future events and is also apparent in what CAS theorist Dietrich Dörner calls 'ballistic behaviour', the assumption that initial conditions in a given situation will remain constant throughout.[84] Nevertheless, this could never happen in a complex system because it evolves on a constant basis and conditions in existence at one time may not be in place at another.

'Vertical linearity refers to the belief that hierarchical military structures are an effective means of commanding and controlling a CAS.'[85] In order to develop greater flexibility and effectively adapt to the enemy system and the surrounding environment, forces 'on the ground' should be able to take effective decisions and employ new strategies within increasingly shorter timeframes; this could only be achieved if deployed personnel were conferred near autonomous freedom of action with only minimalist control by higher headquarters, just like Forces in the Complex Adaptive Special Operations construct addressed in following sections of the paper.[86]

Uniqueness - Each complex problem is unique and cannot be tackled using tools and plans employed in previous circumstances. Even if, at first sight, two problems may look similar, how to be sure that the particulars of the problem under consideration do not override its commonalities with a previously addressed one?[87] This is even more relevant given the fact that many aspects of the situation may be hidden and that, as a result, when deciding future courses of action military forces only rely on a limited understanding

---

[82] Volker Franke, 'Decision-making under Uncertainty: Using Case Studies for Teaching Strategy in Complex Environments', *Journal of Military and Strategic Studies*, Vol. 13, No. 2 , 2011, p. 7.
[83] Say and Pronk, 'Individual Decision-Making in Complex Environments', p. 122-125.
[84] Dietrich Dörner, The Logic of Failure: Recognizing and Avoiding Error in Complex Situations, (New York, Metropolitan Books, 1996), p. 170.

[85] Say and Pronk, 'Individual Decision-Making in Complex Environments', p. 126.
[86] Paul R. Burns, 'Complex Adaptive Special Operations (CASO)', School of Advanced Warfighting, Marine Corps University, 2007.
[87] Horst W J Rittel and Melvin M Webber, 'Dilemmas in a General Theory of Planning', Policy Sciences, Vol. 4, 1973, p. 160 quoted Say and Pronk, 'Individual Decision-Making in Complex Environments', p. 124.

of the situation. For all these reasons, it is absolutely essential to avoid what Clausewitz defined *methodism*, 'the unthinking application of a sequence of actions that we have once learnt'.[88] There is a tendency among military planners to oversimplify complexity by trying to identify similarities with previously addressed problems and employing already tested courses of action. Military planners thus 'convince themselves that the solution to that problem will also fit their current dilemma'.[89]   It is suggested that 'methodism is more likely to flourish in those situations that provide feedback on the consequences of our actions only rarely or after a long time'.[90] Nevertheless, given the uniqueness of today's complex problems, this is only likely to lead to terrible miscalculations and planning mistakes. 'The prevailing decision heuristics in use today are those which proved successful in a completely different security environment and under very different constraints'.[91] At the national level, there is a need for a whole-of-government approach; greater interagency coordination should be achieved when dealing with important security issues. At the

multinational level, there is a need for greater interoperability and cooperation among state actors employing both military and civilian instruments. There is increasing recognition that the threats of the twenty-first century cannot be addressed effectively by a single state, rather they require a joint effort by the members of the international community. Likewise, it is not possible for military actors to address emerging challenges alone because we have arguably reached a point in time when civil-military cooperation has become essential, this is also reflected in NATO's 2010 Strategic Concept which stresses the importance of cooperating with civilian actors not only in terms of information sharing but also joint training, operation planning and conduct.[92]
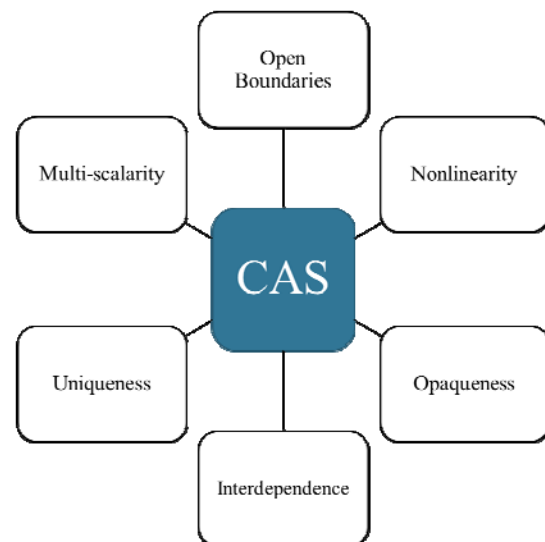
Figure1. Sources of complexity in CAS

---

[88] Dörner, The Logic of Failure: Recognizing and Avoiding Error in Complex Situations, p. 170.

[89] Say and Pronk, 'Individual Decision-Making in Complex Environments', p. 124.

[90] Dörner, The Logic of Failure, p. 172.

[91] Say and Pronk, 'Individual Decision-Making in Complex Environments', p. 124

[92] 'A "Comprehensive Approach" to Crisis Management', NATO, accessed 20th June 2013, <http://www.nato.int/cps/en/natolive/topics_51633.htm>.

'The primary colours are only five in number, but their combinations are so infinite that one cannot visualize them all'.[93]

--Sun Tzu

Understanding is central

Developing a well-rounded understanding of CAS is absolutely important in today's operating environment. CAS theorist Dietrich Dörner conducted a series of experiments using computer-based microworlds involving decision-making in complex situations. Participants were asked to solve issues like poverty, poor medical conditions, sick cattle, inadequate water supplies and excessive hunting and fishing, faced by populations in some region of the world.[94] Participants could choose among a wide range of policy initiatives, for instance improving cattle care, immunizing children or drilling more wells. Computers would then project what was likely to occur in the region as a consequence of their policies not only in the short term but also over a larger time scale.[95] The vast majority of participants achieved initial successes, but when confronted with unexpected consequences their performances deteriorated dramatically.[96] They failed to see the complex, system-wide implications of particular interventions. For instance,

they may have understood the value of drilling more wells to provide water, but they did not foresee the energy and environmental effects that the drilling might cause, thus endangering the food supply. Only a minority of participants were able to see 'a number of steps down the road' and understand the likely impact of their interventions on the system. [97] Those participants that devoted time to developing a well-rounded understanding of the problem, prior to deciding which policy to choose, were consistently successful to the end. What contributed to their success was their level of ambiguity tolerance as opposed to the vast majority of participants whose behaviour reproduced several cognitive traps, most notably linear extrapolation of nonlinear conditions, over-simplification of complexity and an excessively narrow approach to the problem which made them lose sight of the 'big picture'. Another major contributor to poor performance was *confirmation bias*, the tendency of participants to focus exclusively on those elements that supported their own views, while ignoring elements signalling failure.[98] 'These behaviours amount to an almost inescapable *logic of failure* and provide valuable lessons for military decision-

[93] Sun Tzu. *The Art of War*, translated and with an Introduction by Samuel B. Griffith (London, Oxford University Press, 1963), p. 91.
[94] Cass R. Sunstein, 'A New Progressivism', Chicago John M. Olin Law & Economics Working Paper No. 245, p. 1.
[95] Ibid.
[96] Say and Pronk, 'Individual Decision-Making in Complex Environments', p. 126.

[97] Sunstein, 'A New Progressivism', pp. 1-2.
[98] Say and Pronk, 'Individual Decision-Making in Complex Environments', p. 126.

makers when confronted with complex problems'.[99]

---

[90] Ibid., p. 127.

CHAPTER 3 - The Adaptive Stance

3.1 The Meaning of 'Adaptability'

'Adaptability' is a highly contextualized term, with different meanings in various disciplines and knowledge domains.[100] However, for the purposes of this paper, adaptability is "an individual's ability to repeatedly try new and different strategies to solve problems, while incorporating useful feedback with the purpose of improving overall success".[101] Two types of adaptive expertise exist:

Improvisational adaptive expertise, 'the ability to generate new or unique solutions in response of previously unencountered challenges'[102]

Repertoire-based adaptive expertise, 'the ability to switch among one's known repertoire of strategies rapidly and efficiently in response to a situation that has changed'. This type of expertise only applies to situations encountered before, with the strategies and tactics used to address them already practiced in previous circumstances. Rather than on creativity, it relies more on recognizing changes in the situation and 'overcoming mental inertia to

quickly start the process of applying a different solution'.[103]

Adaptability is a meta-cognitive skill that military organizations need to develop in order to effectively cope with uncertainty, complexity and rapid changes in the operating environment. Training interventions to develop adaptability should occur throughout an individual's career and should become an integral part of every military organization's training regimen. Adaptability cannot be treated as a single cognitive construct but rather, it must be broken into different components, which require different training interventions.[104] As a meta-competency, adaptability in fact comprises many different component skills, not only cognitive, but also relational such as open-mindedness, flexibility, agility, problem-solving ability, intuition, critical thinking and emotional intelligence.[105]

In order to be adaptable, military organizations must constantly test new actions, tactics and strategies, 'learn from experience' and apply new knowledge to each situation; as knowledge increases, military organizations can gradually adapt their doctrines, training materiel, leadership, education, personnel and facilities to best address newly emerging challenges.[106] Military forces are facing an

---

[100] Peter Berking, 'Training for Adaptability', Advanced Distributed Learning Co-Laboratory, March 2012, accessed online on 14th July 2013, http://research.adlnet.gov/newsletter/academic/201203.htm.

[101] Grisogono and Radenovic, 'The Adaptive Stance', cited in Berking, 'Training for Adaptability'.

[102] Berking, 'Training for Adaptability'.

[103] Ibid.

[104] Ibid.

[105] Ibid.

[106] 'Training For Full spectrum Operations', Field Manual No. 7, Headquarters Department of the Army, Washington, DC, 2008, p. 5.

increasingly diverse set of missions which require combination of combat, security, engagement, as well as relief and reconstruction activities in an increasingly resource-constrained environment; they must be able to operate and even cooperate with diverse actors, including International Organizations (IOs), Non-Governmental Organizations (NGOs), and national and foreign government agencies. Moreover the use of latest generation technologies should be enhanced both at the training and operational level in order to constantly retain competitive edge. Military forces need to 'maintain competency against a traditional enemy while actively fighting a complex, elusive and adaptive adversary' that makes use of available technologies, advanced weapons, WMD and information to gain advantage.[107] The 2009 USA 'Capstone Concept for Joint Operations: Joint Force 2020' (CCJO) argues that:

> *…tomorrow's joint forces must be prepared to deal with all these challenges, anywhere in the world, potentially on short notice and for indeterminate duration, in response to unexpected events. The specific time, location, and form of any particular challenge will be practically impossible to predict…Moreover, each challenge*

will tend to evolve over time. Finally, preparing for any one challenge will not necessarily prepare joint forces for another.[108]

Even if foundational technical skills and tactics remain crucial, future military training should put further emphasis on mission-specific skills such as combat hunting or training in hone cognition as well as foster language and cultural awareness.[109] In the future, Armed Forces must be increasingly flexible and agile, able to adapt rapidly to the changing environment and to quickly incorporate lessons learnt. From an intellectual viewpoint, training should focus more on harmonization, unity of efforts and common organizational understanding.[110] Effective twenty-first century training should focus on enhancing military forces' ability to sense changes and quickly respond to emerging threats and risks; it should be further open to constant innovations and improvements, encourage and reward interdependence as well as 'foster an environment that supports the learning of others and avoids a scapegoat culture'[111]

---

[107] 'Strategic Plan for the Next Generation of Training for the Department of Defence', Office of the Under Secretary of Defence, September 2010, p. 3.

[108] The Capstone Concept for Joint Operations, Vol. 3, Department of Defense, Washington, DC, 2009, pp.11-12.
[109] 'Strategic Plan for the Next Generation of Training for the Department of Defence', Office of the Under Secretary of Defence, p. 5.
[110] Ibid., p. 5.
[111] Say and Pronk, 'Individual Decision-making in Complex Environments', p. 133.

3.2 The Adaptive Stance

"It is not the strongest of the species that survive, nor the most intelligent, but the ones most responsive to change." [112]

-- Charles Darwin

The Australian Defence Science and Technology Organization (DSTO) has sought to operationalize adaptation and to embed it in a familiar military framework by developing an Adaptive Stance, an intellectual stance for effective decision-making in today's complex endeavours. The Adaptive Stance is based on the interdisciplinary studies carried out at the Santa Fe Institute

> **The Armed Forces must be increasingly flexible and agile, able to rapidly adapt to the changing environment and to quickly incorporate lessons learnt.**

and on the empirical work conducted by Professor Dietrich Dörner at the University of Bamberg in Germany. 'The Adaptive Stance is the necessary complement of Mission Command; it both depends on, and is essential for, Mission Command. Neither will work without the other.' [113] At the individual level, the Adaptive Stance embodies military ideals like flexibility, initiative, intuition, cool-headedness and objectivity; the contemporary security environment also requires some degree of autonomy, because excessive reliance on prescriptive command would undermine the capacity of the troops 'on the ground' to quickly adapt to the changing operating environment.[114] In order to cultivate an Adaptive Stance, a number of key personal qualities are necessary:

Ambiguity Tolerance– today's operating environment is inherently uncertain, ambiguous and elusive; any attempt to remove ambiguity may prove detrimental in that it may lead to unintended consequences. Every effort must therefore be made to resist the urge to oversimplify complexity and accept that 'messiness' is key. [115] Today's complex problems must be addressed through a holistic approach to constantly keep sight of the 'big picture' and understand all facets of the problem.

Failure acceptance – given the inherent uncertainty and volatility of the contemporary security environment, it is almost impossible to make accurate

[112] Charles Darwin quoted in Paul R. Burns, 'Complex Adaptive Special Operations (CASO)', School of Advanced Warfighting, Marine Corps University, 2007, p. 1.

[113] Mink Spaans, et al., 'Learning to be Adaptive', 14th International Command and Control Research and Technology Symposium, 2009, pp. 4-5.
[114] Anne-Marie Grisogono, 'Conceptual Framework for Adaptation', JSA Action Group 14, The Technical Cooperation Program, Technical Report, 2010, p. 4.
[115] Say and Pronk, 'Individual Decision-Making in Complex Environments', p. 127.

predictions of the future and develop effective plans accordingly. Adaptation entails elements of trial and error[116], failure constitutes an integral part of process, and it is only by acknowledging one's own mistakes that military forces can learn how to successfully meet the challenges of the coming decades. 'The Adaptive Stance appreciates that it is much more important for personnel to be prepared to be wrong than to feel that they always have to be right'.[117] The contemporary security environment requires a mind-set change in military training and a renewed focus on preparing and training junior leaders to manage complexity and uncertainty. This can only be achieved 'through realistic training that employs a free-thinking opposing force with real-world capabilities and strategies'.[118] New approaches should be adopted which take military personnel out of their 'comfort zone' by subjecting them to physical and well as moral and physical challenges.[119] Once deployed, junior leaders will encounter a wide range of operations and certainly only a small portion of those will draw upon their tactical expertise.[120] Armed Forces can no longer rely on previously tested courses of

action, as there are no guarantees that these will be the most adequate ones to counter future threats. Military training should place greater emphasis on junior leaders' ability to sense, improvise, and take initiatives and decisions 'on-the-fly' even if the risks are high and there are no guarantees of success. "The development of 'cognitive gyms' at training centres offers a controlled and reduced risk medium to enhance decision-making in complex environments…these gyms would use real-time strategy gaming to expose personnel to complex problems".[121] Mistakes in 'cognitive gyms' would be tolerated and even acknowledged as essential elements of the learning process. A major example is provided by the US Army Adaptive Leadership Model which seeks to enhance junior commanders' adaptability through a scenario-based learning process.[122] We could also point to the US Army Excellence in Leadership (AXL) project, an online educational tool aimed at enhancing junior Army officers' tacit leadership knowledge and cultural awareness and it is especially designed to prepare them for complex endeavours in the Middle East.[123] Junior leaders are presented with case studies about military leadership and they are then asked to examine and discuss key issues embedded in the cases. This is an extremely

---

[116] Ibid., p. 128.

[117] Ibid., p. 128, and Mink Spaans, et al., 'Learning to be Adaptive', *14th International Command and Control Research and Technology Symposium (ICCRTS)*, 2009, pp. 4-5.

[118] Say and Pronk, 'Individual Decision-Making in Complex Environments', p. 129.

[119] Ibid.

[120] Michelle L. Zbylut, Jeffrey D. Mark and Christopher Vowels, 'Challenges and Approaches to Evaluating a Leadership Intervention for Army Officers', paper presented at the annual meeting of the Academy of Management, Atlanta, GA, August 2006, p. 1.

[121] Ibid., pp. 129-130.

[122] Say and Pronk, 'Individual Decision-Making in Complex Environments', p. 130.

[123] Zbylut, Mark and Vowels, 'Challenges and Approaches to Evaluating a Leadership Intervention for Army Officers', pp. 1-2.

innovative educational tool in which paper-based case studies have been replaced by highly realistic Hollywood-style movies. Such decision stem from the fact that films can achieve a level of realism and complexity significantly higher than paper-based studies and therefore, they are much more effective in that future leaders can 'form detailed mental representations of the situation depicted'.[124] So far, two filmed case studies have been produced: *Power Hungry* and *Tripwire.* The first one, *Power Hungry* (2003) 'depicts a captain tasked with securing a site for a food distribution operation in Afghanistan'[125], however the mission fails because the food truck is seized by an Afghan warlord. Several reasons amount to failure, including terrain issues, time constraints, as well as poor interpersonal skills and cultural awareness.[126] The second film, Tripwire, was created in 2005 and is set in Iraq; the mission this time, is to arrange a meeting between two tribal leaders. The forces on the ground encounter many difficult challenges including the assassination of the interpreter, insurgent activity and improvised explosive devices (IEDs)[127].

Self-Reflection – military planners should repeatedly ask themselves: 'How would I know if I was wrong?' and 'What would the implications be?'[128] They should constantly

find new ways to test their decisions and assess the accurateness of their own beliefs and the effectiveness of their strategies, especially in situations which offer feedback only rarely or after a long time.

Emotional Intelligence – military organizations should devote more time to fostering junior leader's emotional intelligence. According to renowned psychologist and journalist Daniel Goleman, emotional intelligence comprises five key components:

1) *Self-Awareness*: the ability to recognize and decode one's own moods and emotions as well as their effects on others.

2) *Self-Control*: the ability to control one's own disruptive impulses and irrational behaviour – important aspects of this are integrity, comfort with ambiguity, and openness to change.

3) *Internal Motivation*: a tendency to pursue goals with energy and persistence, driven by internal motivations which transcend external rewards like money and status. Crucial for this are organizational commitment and optimism even in the face of failure.

4) *Empathy*: the ability to understand the feelings and emotions of others and train them accordingly. Hallmarks include cross-cultural savvy and an ability to train and develop talent.

---

124 Ibid., p. 3
125 Ibid. pp. 3-4.
126 Ibid.
127 Ibid., pp. 4-6.
128 Grisogono, Conceptual Framework for Adaptation, p. 36.

5) Social Skills: the ability to manage relationships, build networks and always find a common ground. Important qualities include effectiveness in leading change and persuasiveness. [129]

Developing emotional intelligence is an integral part of the Adaptive Stance because it allows military forces to understand how motives, values and principles shape their decisions. This is of paramount importance if biases are to be avoided and rational, objective decisions are to be taken.[130]

Culture of Disproval – fostering a culture of disproval will be increasingly important to leverage success in the twenty-first century. 'As unintended consequences arise from hidden aspects of the CAS, it is important to identify the earliest possible evidence to suggest a conjecture may be wrong'. Achieving greater organizational diversity is a valuable medium to foster a culture of disproval; by incorporating participants from various disciplines, occupations and professions, military units can overcome groupthink and avoid organizational biases.[131]

As we can see the adaptive process is a) *value-based* because variations are judged by their impact on the operational environment, b) *grounded in reality* because Armed Forces receive objective feedback from the operating environment, c) *incremental* and *cyclic* because it takes many iterative cycles to gain a better picture of the situation and nurture the opposing system to a more desirable outcomes.[132] Adaptation is the iterative execution of a simple cyclic algorithm[133]
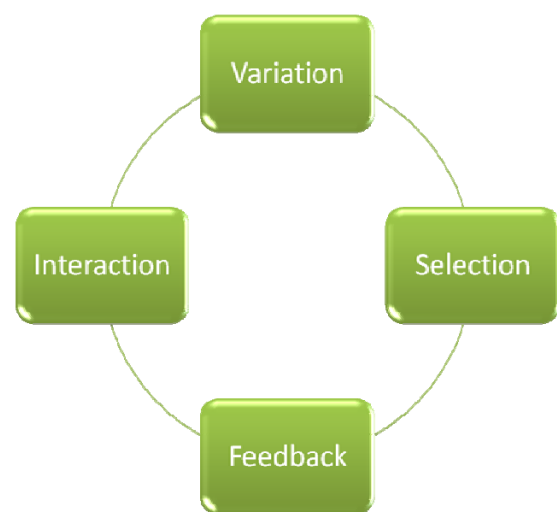
It is only through constant reiterations of the adaptive cycle that military forces can gradually develop a more complete understanding of the problem under consideration.

Studies reveal that by cultivating an Adaptive Stance military forces can greatly improve not only their flexibility and agility in identifying and quickly adopting new strategies to cope with complex challenges, but also their responsiveness to emerging

---

[129] For more detailed information see 'Daniel Goleman's Five Components of Emotional Intelligence', [website], accessed 10 July 2013 [http://www.sonoma.edu/users/s/swijtink/teaching/philosophy_101/paper1/goleman.htm]
[130] Say and Pronk, 'Individual Decision-Making in Complex Environments', p. 130.
[131] Ibid., pp. 132-133.

[132] Grisogono and Radenovic, 'The Adaptive Stance – Steps Towards Teaching More Effective Complex Decision-Making', p. 721.
[133] Ibid.

threats and resilience to damage or shock.
[134]

The adaptive process involves several different stages: during the first phase, military forces take adaptive action using existing capabilities to sense, process information, decide and act.   In the following stage, the focus shifts on improving capabilities themselves, whereas in consecutive phases military forces attempt to improve the adaptation algorithm and the proxies for success and failure so as to enhance their ability to 'read' the feedback and modify their postures accordingly. [135]

3.3 Areas of Focus:

3.3.1 Complex Adaptive Special Operations (CASO)

According to many analysts, the traditional military paradigm of planning, organizing and controlling is reductionist and excessively linear, based on a deterministic cause-and-effect approach which centres on predictive analysis aimed at discovering potential vulnerabilities in the adversary. Nevertheless, there is growing recognition that today's operating environment is inherently unpredictable and that rigidly planned courses of action are unlikely to succeed because they do not take into

account the pace at which the environment changes. Militaries should conceive of war as a complex adaptive system which cannot be controlled, but only nurtured to a more desirable condition.[136] The key for success is the ability to adapt to the changing environment at a faster rate than the enemy. This can only be achieved through a mind-set change in military thinking and planning. Forces on the ground should be able to function themselves as a complex adaptive system with the skills and capabilities to outpace the enemy's adaptive actions.[137] Special Operation Forces would be perfectly suited for such an approach. The next section of the paper provides an overview of Complex Adaptive System Operations (CASO), an operating construct which offers greater understanding of the operating environment, more effective military planning and exposes unorthodox approaches to cope with complexity and uncertainty.[138]

Such concept attempts to leverage success through near-autonomous complex adaptive behaviour, which allows CASO teams to promptly react to changing circumstances and cooperate in a synchronized and concerted manner. Not only can CASO teams adapt in response to the changing operating environment, but they can also influence its dynamics

[134] Grisogono and Radenovic, 'The Adaptive Stance – Steps Towards Teaching More Effective Complex Decision-Making', p. 722.
[135] Ibid., also in Spaans, et al., 'Learning to be Adaptive', 2009, pp. 2-3.

[136] Burns, 'Complex Adaptive Special Operations (CASO)', p. 1.
[137] Ibid., p. 1.
[138] Ibid., pp. 1-2.

through proactive adjustments.[139] CASO teams comprise specially selected personnel possessing unique military and non-military capabilities to operate effectively in complex crisis situations and find feasible solutions to what Melvin Webber[140] defines 'wicked problems', unique problems composed of many inter-related dilemmas and issues that make them resilient to resolution.[141] What makes CASO teams truly effective is their ability to take nearly-autonomous decisions, this enables them to adapt to the changing environment at a faster rate than conventional forces. As a decentralized adaptation system, 'CASO generates faster action because it is not impeded by an organizational command and control superstructure designed to support a centralized decision-making process'.[142]

CASO comprises four main components: design, planning, adaptation and action. **Design** is about defining the complex operating environment using a systemic approach, which looks at the whole rather than at the individual parts, with the aim to identify critical vulnerabilities in the adversary system. 'This is an iterative process that considers the interactions between own force complexity, rival force complexity and global complexity within a larger external environment.' By analysing our own systemic environment, we can spot areas of friction and identify potential strengths which could then be 'exploited' to achieve advantage over the enemy. Assessing rival force complexity requires a further effort; Armed Forces cannot develop a full understanding of the rival force unless they 'infiltrate' it, in other words, they need to interact with the rival CAS to get a real insight into its 'iterative complexity' and identify potential vulnerabilities.[143] Arguably, 'the complexities of the modern battlefield are such that it cannot be understood by remote analysis alone'.[144] Detailed situational awareness can only be developed by physically interacting with the opposing CAS and success can only be attained by analysing the response from such interaction and adjusting plans and tactics accordingly. Global complexity refers to external relationships that impact on both own forces and rival ones. Such complexity arises from culture and religion, politics, economics, societal standards and globalization.[145] As previously stated, it is not possible to establish some arbitrary boundaries when dealing with a CAS,

---

139 Ibid., pp. 7-8.

140 Melvin M. Webber was a professor emeritus of city and regional planning at the University of California, Berkeley, and an international authority on city planning and transportation.

141 Robert E. Horn and Robert P. Weber, 'New Tools for Resolving Wicked Problems: Mess Mapping and Resolution Mapping Processes', accessed online on 24th June 2013, http://www.strategykinetics.com/files/New_Tools_For_Res olving_Wicked_Problems.pdf

142 Burns, 'Complex Adaptive Special Operations (CASO)', p. 8.

143 Ibid., pp. 9-11.

144 Directorate of Future Land Warfare, *Adaptive Campaigning*, Department of Defence, Canberra, 2007, p. 13, quoted in Charles Dockery, 'Adaptive Campaigning: One Marine's Perspective', *Australian Army journal*, Vol. V, No. 3, p. 111.

145 Burns, 'Complex Adaptive Special Operations (CASO)', p. 10.

because this would only distort the problem's contours and make military forces more vulnerable to unexpected changes brought about by unknown influences from the outside.[146]

The 'design' component of CASO defines the problem and determines what needs to be done to address it effectively - planning begins immediately afterwards. If design determines *what* should be done, **planning** determines *how* the design should be achieved and which strategies should be implemented to leverage success.[147] By interacting with the rival system and using feedback to refine their plans, Special Forces can achieve 'small improvements and constant adjustments'. CASO teams must be capable of operating within a complex adaptive war construct; this requires great diversity of planners' mental

> *...Forces on the ground should function themselves as a Complex Adaptive System with the skills and capabilities to outpace the enemy's adaptive actions.*

models in order to discover innovative approaches to wicked problems of which they have little or no expertise. Intuition is another fundamental element. Intuition is

not an inborn trait, rather it is developed throughout an individual's life. This means that the greater the number of experiences, the greater the intuitive skills one possesses. Team diversity can only be achieved by selecting those individuals with unique character traits, drawing them not only from Armed Forces but also from other governmental agencies.[148] Through planning, CASO teams can achieve a shared end-state vision; this in turns enables them to act in parallel and 'contribute to the overall objective while concomitantly maintaining near-autonomous adaptive creativity'.[149] The '*adaptation*' component is what renders Complex Adaptive Operations truly unique. CASO forces have the ability to 'change form as the situation dictates' by constantly demonstrating emerging behaviour, they can adapt to the evolving operating environment at a faster rate than any other centrally controlled team. The forces selected for such complex operations must possess theatre-specific skills and competences, including in-depth knowledge of the language and ethnicity. Intuitive skills, mental model diversity and specialist knowledge are the necessary adaptive properties that enable CASO teams to 'survive with protracted endurance despite situational change'.[150] Complex Adaptive Special Operations involve constant interaction with the rival system and *action* is thus an integral part of such

---

146 Grisogono and Radenovic, 'The Adaptive Stance', p. 716.
147 Burns, 'Complex Adaptive Special Operations (CASO)', p. 11.

148 Ibid., pp. 12-13.
149 Ibid., p. 13.
150 Ibid., pp. 13-14.

construct. During design and planning, action is aimed at acquiring greater systemic understanding; by interacting with the rival CAS, Special Forces can examine feedback and refine their plans to be more effective. Once sufficient understanding of the rival system has been developed, Special Forces can then conduct decisive action to weaken the rival force and nurture it to a more acceptable condition.[151] In order to successfully solve wicked problems, such process must be iterated more and more times until the most desirable conditions are met. CASO action is based on decentralized control and this is arguably the key for success; Special Operation Teams can rapidly adapt to the changing environment because they are near autonomous units and their initiatives are not delayed by central command structures.[152] 'If the natural condition of complex adaptive war is chaos, then attempting to maintain control is like forcing two positive ends of a magnet together increasing internal friction'. Such Special Operations are conducted under conditions of near-autonomous freedom of action with minimalist control by higher headquarters that only guide rather than control action.[153] There is increasing recognition that we cannot continue to conceive of warfare in determinable, linear and mechanist manner – even if rapid

victory could be achieved, long term stability cannot be leveraged unless we fully appreciate the rival system' iterative complexity and learn how to cope with it.[154] The only way success can be achieved is by weakening the rival system from within, in other words, by spotting potential breaking points and exploiting them to reach desired outcomes. To use a metaphor, Special Operation Forces have to operate like a virus within an ecosystem.[155] The Complex Adaptive Special Operations construct offers greater understanding of the strategic environment through holistic design, increased diversity in planning and exposes unorthodox approaches that the conventionally trained military mind cannot envision.[156] This is the only way in which a diffuse unconventional enemy like Al-Qaeda can be defeated.

3.3.2 Urban Operating Environments

It is estimated that by 2015 close to 4 billion people will be leaving in urban areas, with over 75 per cent of them in the developing world.[157] Poverty, overpopulation, ethnic rivalry and environmental stress will undoubtedly sow the seeds of insecurity and instability with a dramatic increase in the number of military

---

[151] Ibid., p. 15.
[152] Ibid., p. 8.
[153] Ibid., p. 15.

[154] Ibid., p. 16.
[155] Ibid.
[156] Ibid.
[157] For more detailed information see Steven R. Rudder, 'Urban Operations: Strategic Imperatives to Operational Methods', USA Army War College, Strategic Research Paper, 2004.

interventions in urban operating theatres. Urban instability will be triggered by three crucial factors:

➤ The presence of diverse ethnic groups competing for power and access to resources. This is particularly true of African cities like Mogadishu, Somalia, where different tribal clans coexist in fragile urban environments.[158]

➤ Excessive pressure on infrastructure – a major concern is the lack of adequate water supplies caused by economic poverty and government instability. Access to clean water will represent a major source of instability in the future; every year, over 3.4 million people die from sanitation and water-related causes, 99 per cent of deaths occurring in the developing world.[159] The projected rise in urban population will further complicate the picture as the vast majority of people leaving rural areas will move to informal urban settlements, better known as 'slums', where no adequate sanitation facilities exist. It is estimated by 2020 over 1.5 million people will be living in slums, amounting to almost 58 per cent of the total urban population.[160]

➤ Rise in organized crime – subversive groups will take advantage of poverty, instability and 'the ease of unopposed operations' to assert power and control over resources and population. Military interventions in urban theatres will require eradicating the plague of organized violence and establishing frameworks for security and the rule of law.[161]

The elements listed above pave the way for failed governing systems, thus creating the perfect conditions for a society 'built upon organized crime and terrorism'. As argued by   Henri Kissinger, '…the urban working and lower middle class becomes a fertile recruiting ground for radical   politics   or   religious fundamentalism'.[162] Urban operations will pose   unprecedented   challenges   to conventional Forces and before intervening, it will be thus necessary to identify three strategic imperatives:

▪ Determine the degree of national interest and public support. 'The complex and brutal nature of urban interventions will challenge national resolve,   moral   norms   and   public opinion'.   In   many   cases,   urban operations   require   long-term interventions which, combined with the

[158] Ibid., p. 2.
[159] Data from water.org, accessed on 19th July 2013, http://water.org/water-crisis/water-facts/water/.
[160] Strategic Foresight Analysis, 2013 Report, Final Draft, NATO Headquarters, Supreme Allied Commander Tranformation, p. 19.

[161] Rudder, 'Urban Operations: Strategic Imperatives to Operational Methods', pp. 2-3.
[162] Henry A Kissinger, *Does America Need a Foreign Policy?: Toward A Diplomacy for the 21st Century* (New York, NY: Simon and Schuster, 2001), 215, quoted in ibid., p. 1.

number of casualties, is hardly acceptable for our nations. Ensuring political support and national interest is thus crucial for deciding whether to intervene or not. [163]

- Understanding the target population is equally important. The requirement for understanding the population goes well beyond traditional military analysis; it is important to examine the population concepts of social identity, democracy, law and human dignity, as well as identifying the root causes of instability.[164] Cultural understanding is the cornerstone for success in urban operational settings because it allows the militaries to get 'to the heart of the problem' and address it in the most effective ways.

- Defining the conditions for urban stability is the third strategic imperative. In order to guarantee a secure and sustainable environment, it is necessary to first achieve acceptable levels of 'violence, corruption and other unresolved issues'. Defining a desirable urban end-state is an extremely complex task because it requires identifying what is best for the population in accordance with local social norms. 'If Western concepts are strategically unfeasible due to a diffuse power base and unwilling population,

intervening forces require alternate and realistic conditions of stability'.[165]

Urban operating theatres will pose unprecedented challenges to traditional military techniques, tactics and procedures (TTPs); this, in turn, will increase the need for military personnel with truly unique competences.[166] Lieutenant Colonel Rudder of the USA Marine Corps suggests that the 'human dimension' encompassing dense non-combatant populations and elusive unconventional enemies will represent the greatest challenge for the militaries. Two major problems exist: on one side, the difficulty of 'chasing' enemy combatants intermixed within the civilian population and on the other, the ease with which opposing combatants can recruit followers to their cause in fragile environments where poverty and disease are endemic. One of the greatest dilemmas facing the militaries is how to confront an adversary that operates in densely crowed areas where the possibilities of friendly fire killing innocent people are extremely high.[167] The strategy employed by the enemy is aimed at attacking the vulnerabilities of Western social norms which prevent Armed Forces from opening fire if civilians might be endangered. Moreover, given the close proximity of combatants and non-combatants, it is much easier for someone to observe tactics,

---

[163] Ibid., p. 4.
[164] Ibid.

[165] Ibid., p. 5.
[166] Ibid.
[167] Ibid., p. 6.

techniques and procedures and pass them on to other interested parties.[168] 'There is evidence that insurgents are now avoiding firefights and direct attacks on NATO-ISAF/Afghan positions, and are focusing on using roadside bombs and targeted killings instead'.[169] By carefully observing the adversary they have been able to identify its key vulnerabilities and adapt their actions accordingly.

The opposing system will attempt to destroy the population's trust of intervening forces; in this, it possesses a crucial advantage because it belongs to the same culture and language, and it is therefore much easier for it to establish links with the local population. A major example are the Taliban in Afghanistan that over the last years have carried out a sophisticated and extensive propaganda operation aimed at shaping attitudes and molding perceptions among the Afghan population so as to weaken public support in ISAF contributing nations.[170] 'ISAF Forces need a long term, pro-active public information campaign in order to counter

Taliban messages and prevent them from winning the battle of public opinion.[171]

Cultural alienation favours the adversary, constituting a major vulnerability for Western forces. In many cases, forces on the ground lack the cultural and language skills necessary to interact with the local population and understand its values, culture and dynamics.[172] Another crucial problem encountered by the militaries is the impossibility of identifying a clear centre of gravity, defined as 'those characteristics, capabilities and sources of power from which a force derives its freedom of action, physical strength or will to fight'. In many cases, power is dispersed among a myriad of para-military groups that exercise control over different neighbourhoods. Without a clear centre of gravity, Armed Forces will not be able to identify critical vulnerabilities and 'exploit' them to defy the enemy; rather they will need to simultaneously focus on many potential centres of gravity, never developing such an understanding of the opposing system so as to spot 'its Achilles heel'. The operational centre of gravity may encompass a dominant group or more sub-groups of the population as seen in Bosnia, Somalia and Afghanistan.[173] 'These environments suggest the requirement for

[168] Russel W. Glann, 'Visualizing the Elephant Managing Complexity during Military Urban Operations', *Rand,* Arroyo Center, p. 10.

[169] 'Afghanistan Transition: Dangers of a Summer Drawdown', International Council on Security and Development (ICOS), February 2011, p. 14.

[170] Joanna Nathan, 'Selling the Taliban', International Crisis Group, 2009, accessed online on 15th July 2013, http://www.crisisgroup.org/en/regions/asia/south-asia/afghanistan/op-eds/nathan-selling-the-taliban.aspx.

[171] 'NATO Operations: Current Priorities and Lessons Learned', Committee Report, NATO Parliamentary Assembly, 2008 Annual Session, accessed on 10th July 2013, http://www.nato-pa.int/Default.asp?SHORTCUT=1476.

[172] Rudder, 'Urban Operations: Strategic Imperatives to Operational Methods', p. 7-9.

[173] Ibid., p. 6-8.

specific social intelligence to identify the most influential groups while understanding the dynamics of secondary groups'.[174] The only way we can understand population dynamics and identify subversive groups is through enhanced social and cultural intelligence as well as detailed language awareness. There is an increasing requirement for military personnel with organic regional expertise to gain a better understanding of the operating environment and establish communication channels with the local population. In many cases, 'military forces find themselves culturally unprepared for the human dynamics of urban areas'.[175] These flaws can undermine the mission's overall outcome, as commanders and their forces are often unable to understand why the local people act as they do and what are the deep-rooted factors driving their behaviour. Cultural intelligence should constitute an integral part of military intelligence efforts and doctrine because it provides a baseline for designing successful strategies to interact with the local people and it gives personnel on the ground the knowledge to anticipate reactions to selected courses of action.[176]

New operational theatres demand constant interaction with all segments of the local population; this has been most clearly seen in Iraq and Afghanistan, but also in Bosnia,

Kosovo, Haiti, Lebanon, and Somalia. The need for cultural understanding as a cornerstone for success has been stated many times; nevertheless considerable gaps in social and cultural intelligence continue to represent a major obstacle, as demonstrated by Operation Iraqi Freedom (OIF).[177] In an article on cultural intelligence, 'George Smith draws fascinating parallels between Napoleon's campaign in Spain and Operation Iraqi Freedom (OIF). In each conflict, conventional military operations were quickly won, but stabilization operations encountered long and difficult problems due to a lack of proper planning and understanding of the local populations in each country.'[178] The lack of adequate cultural intelligence is also a critical issue in Afghanistan, as argued by Tim Foxley, Researcher in the Armed Conflicts and Conflict Management Programme at the Stockholm International Peace Research Institute, who states:

> *'Even nine years after international intervention in Afghanistan, little is understood about the tribes and ethnic groups that make up the country. How they react, think, feel, and prioritize remain largely unknown quantities, and therefore international attempts to influence*

---

[174] Ibid., p. 8.
[175] Ibid., p. 9.
[176] John P. Coles 'Incorporating Cultural Intelligence Into Joint Doctrine', *Iosphere Joint Information Operations Centre*, 2006, p. 7.

[177] Ibid.
[178] Ibid.

them are perhaps unsurprisingly proving problematic.'[179]

Over the last years, information activities conducted by Taliban groups have hampered the efforts of the international community and the Afghan government to bring stability to the country. The Taliban 'come from the same tribal, cultural and linguistic base' as their target audience and this gives them significant advantage over ISAF Forces, particularly among the Pashtun tribes clustered in Southern and Eastern Afghanistan.[180] ISAF has found it difficult to conduct counter narrative information operations, the main reason for this being a limited knowledge of Afghan culture, language, and customs as well as a poor understanding of how the Taliban conduct IOs, how effective they are and how best to generate reactive and proactive responses.[181] 'In tackling Taliban messaging, the international community should aim to better understand what the Taliban are saying, how they say it, why, and to whom. Only once this process has been adequately completed can appropriate responses be adopted'.[182]

Military organizations need to address shortages of interpreters and cultural specialists within intelligence units because this represents a major obstacle for the successful resolution of complex crisis situations. Military organizations could enhance cultural awareness through a theatre-specific training which focuses on factions' ideologies, local customs and language. As evidenced from operations in Iraq, military forces require 'an increasing number of culturally adaptive personnel for patrolling, check-points and nation building necessary for persistent operations'.[183] The USA Marine Corps provide a great example of military organization transforming to meet the requirements of the new millennium. The intent is to address deficiencies in cultural adaptability by employing a greater number of personnel with linguistic and interpretative skills.[184] In a recent message the Commandant of the Marine Corps stated:

> *'recent operational experience has highlighted the critical importance of foreign language as a war fighting enabler …and the need for a capable cadre of linguistics/interpreters to facilitate situation awareness, intelligence operations, civil affairs and the interaction of the Marines with the local population'.[185]*

[179] Tim Foxley, 'Countering Taliban Information Operations in Afghanistan', *Prism*, Vol. 1, No. 4, p. 79.
[180] Ibid., p. 86.
[181] Ibid.
[182] Ibid., p. 90.

[183] Rudder, 'Urban Operations: Strategic Imperatives to Operational Methods', p. 10.
[184] Ibid.
[185] M.W. Hagee, General, Commandant of the Marine Corps, "Importance of Foreign Language Capabilities" (Washington D.C.: CMC, ALMAR 072/03, December 2003), quoted in Rudder, 'Urban Operations', p. 10.

Deploying culturally adaptive personnel is crucial for success not only in operational theatres like Afghanistan and Iraq, but also in the on-going war against terrorist networks. As mentioned in previous sections of the paper, Special Forces will play a crucial role in the future, as they can infiltrate 'hostile civilian populations' more easily that conventional forces. By developing a greater number of Special Forces with the ability to integrate indigenous organizations, we can negate the asymmetric advantage enjoyed by the adversary. [186] In the future we may also contemplate the possibility of working side-by-side with indigenous forces; the advantages are multiple, most importantly the possibility to operate into tribally based environments to whom Western forces may be negated access. Nevertheless, there are also many risks, including the treat of putting too much trust into organizations pursuing radically different objectives and agendas.[187]

[186] Rudder, 'Urban Operations', p. 11-12.
[187] Ibid., p. 13.

CHAPTER 4 : Civil-Military Cooperation

The challenges posed by the contemporary operating environment are such that they cannot be addressed effectively using military instruments alone. Both the ongoing ISAF mission in Afghanistan and the operations in support of the African Union Mission in Sudan (AMIS) have highlighted the need for paramilitary and civilian capabilities alongside military ones.[188]

As argued by Hans-Jürgen Kasselmann, Director of the Civil-Military Cooperation Centre of Excellence in the Netherlands, 'one-sided approaches have not passed the litmus test of reality. They are ill suited to capture the interdependencies of complex crisis situations and combine them into a synergistic whole'.[189] Undoubtedly, militaries are immensely capable organizations; they 'represent capacity to get practical things done in remote and difficult environments in concrete ways that cause other government entities to pale by comparison'.[190] Nevertheless, while military forces have the training and equipment necessary to bring an end to open violence, arguably 'the concurrent demands for humanitarian aid, police training,

infrastructure reconstruction and reconciliation among the population are simply beyond their scope and ability'.[191] Today's operating environment requires greater synergy and unity of efforts between military organizations and civil actors, including national population and local authorities, as well as international, national and non-governmental organisations and agencies. Since the early 2000's NATO has been working side-by-side with the civil environment and the first time the Alliance developed and applied civil-military cooperation (CIMIC) in its present form was in the context of the Balkan crisis.[192] NATO's current CIMIC concept provides for:

Liaison: military forces liaise with relevant civilian actors, including the local population and local authorities; this represents the first step towards integrating the 'civil dimension' into the planning and conduct of military operations. The aim is to establish clear lines of communication to guarantee the timely exchange of information and thus achieve greater security and stability in the operating environment.[193]

Support: military capabilities can be adjusted to support the civil environment; examples include medical assistance to the

---

[188] NATO Operations: Current Priorities and Lessons Learned, Committee Report, NATO Parliamentary Assembly, 2008 Annual Session, accessed on 10th July 2013, http://www.nato-pa.int/Default.asp?SHORTCUT=1476

[189] Hans-Jürgen Kasselmann , 'Civil-Military Cooperation: A Way to Resolve Complex Crisis Situations', *Prism*, Vol. 4, No 1, p. 18.

[190] Barno, 'Military Adaptation in Complex Operations', p. 31.

[191] Sean Pollick, 'Civil-Military Cooperation: A New Tool for Peacekeepers', *Canadian Military Journal,* Autumn 2000, p. 57.

[192] Kasselmann, 'Civil-Military Cooperation', p. 18.

[193] Ibid., pp. 18-19.

population, logistic transportation support and the use of military facilities for numerous civilian purposes, most crucially the implementation of development projects. Among the benefits are a more secure operating environment and an increased acceptance with regard to military action.[194]

Coordination: civil-military coordination is the essential dialogue and interaction aimed at avoiding competition and minimizing inconsistency in complex crisis situations that are simply beyond the mandate and the capability of any single agency, being it civilian or military.[195] Effective coordination of civilian and military activities has become a priority in recent years; it requires overcoming discrepancies and joining efforts to achieve the shared goals of long-term peace and stability in war-torn areas of the world. CIMIC forces 'serve as a point of contact for the population's concerns, complaints, needs, and fears'; their continuous presence on the ground makes them an important source of information for the local people.[196]

It could be argued that civil-military cooperation in complex crisis situations is still a 'work in progress' and that, despite some considerable initial achievements, much room for improvements still exists.

Most humanitarian organizations look at CIMIC with suspicion and categorically reject the involvement of the military in post-conflict stabilization and reconstruction. Effective cooperation relies on a degree of mutual understanding which varies significantly depending on the situation, the potential spectrum ranging from mere coexistence on the ground to a fully harmonized approach involving the share of information, a careful division of tasks and even collaborative planning.[197] 'Humanitarian and military actors have fundamentally different institutional thinking and cultures', they have different mandates, objectives and working methods; many agencies engaged in humanitarian work are present on the ground long before the arrival of military forces and will continue their functions after their departure.[198] Their ultimate objective is what experts define 'conflict transformation', a long-term process which requires a change in the institutions and discourses which reproduce violence as well as in the relationship between conflict parties.[199] 'The implementation of the CIMIC concept within the military sector, too, still suffers from considerable deficits. The basic principles of CIMIC are still not reflected in the general understanding of

[194] Ibid., p.19.

[195] 'Civil-Military Guidelines & Reference for Complex Emergencies', Inter-Agency Standing Committee, United Nations, Office for the Coordination of Humanitarian Affairs, New York, 2008, p. 8.

[196] Kasselmann, 'Civil-Military Cooperation', p. 19.

[197] 'Civil-Military Guidelines & Reference for Complex Emergencies', IASC, p. 7.

[198] Ibid., p. 8.

[199] Oliver Ramsbotham, Tom Woodhouse, and Hugh Miall, *Contemporary Conflict Resolution: the Prevention, Management and Transformation of Deadly Conflicts*, (Cambridge, Polity, 2011), p. 29.

command and control of armed forces'.[200] Troops on the ground should further appreciate the importance of cooperating with civilian actors in complex crisis situations; given their long-term presence in war-torn areas, humanitarian and civilian actors possess greater cultural and language awareness as well as deeper knowledge of the terrain; this, coupled with their expertise and skills in the fields of post-conflict stabilization and reconstruction, makes them crucial 'allies' for the military. Present challenges call for a change in awareness in the military sector, this can only be achieved through greater operational-level integration of CIMIC as a principle of action in the planning and conduct of operations.[201]

Lessons learned in Afghanistan have clearly shown that military instruments alone are not enough to guarantee a sustainable secure environment. This assessment led the Alliance readjust its policy through a comprehensive approach and develop closer links with other international and regional actors, thus "linking its activities in the 'security' dimension with its 'development' activities in an overall algorithm". The Comprehensive Approach is aimed at optimizing cooperation among all actors involved in a neutral environment of consensus[202]; NATO's contribution to such an approach has its origins in a 2004 Danish

initiative intended to promote greater interaction between Danish Armed Forces and the civil environment. It was then elevated to the level of the twenty-eight Allied nations at the 2006 Riga Summit, when the Comprehensive Political Guidance was formally adopted, calling for improved cooperation with external actors and for greater integration of member states' non-military instruments of power. At the 2008 Bucharest Summit the Alliance adopted an Action Plan which has since been used 'to direct transformational projects and measures for the operationalization of the political guiding principles'.[203] Since the issuing of the new Strategic Approach at the 2010 Lisbon Summit, which commits the members of the Alliance to work more closely with international partners, NATO has been particularly involved in strengthening its relationships with the United Nations and with one of the most prominent regional organizations of our times, the European Union. The following section takes a closer look at what has been achieved so far and what can still be done on both sides, military and civilian, to fill existing 'gaps' in cooperation and overcome discrepancies and institutional differences.

4.1 NATO-UN Cooperation

Links with the UN were first developed in the early 1990s, after the end of the Cold War, when the Alliance began to expand its tasks from a wholesale focus on collective

---

[200] Kasselmann, 'Civil-Military Cooperation', p. 21.
[201] Ibid.
[202] Ibid.
[203] Ibid., p. 22.

defence to include crisis management and cooperative security through partnerships.

In September 2008, the Secretaries General of the two organizations signed the NATO-UN Declaration of Cooperation, which paved the way for closer consultation and coordination. NATO's Secretary General Anders Fogh Rasmussen reports regularly to Mr Ban Ki-moon on progress in NATO-led operations as well as on important decisions taken by the North Atlantic Council (NAC) in different areas of activity.[204] In recent years there has been growing recognition that the threats of the present and future decades will be so complex in nature that cooperation will be absolutely essential to counter them in a timely and effective manner. Over the years we have seen real progress in the strengthening of NATO-UN relations not only in terms of practical cooperation in the field, but also in terms of political dialogue and consultation on issues of common concern, such as the combating human trafficking, preventing WMD proliferation, fighting transnational terrorism and organized crime as well as promoting the rights of women and contributing to international peace and security on a wide spectrum.[205] Future decades will be marked by closer cooperation on issues such as information-

sharing, capacity-building, training and education, as well as operations' planning and conduct, always 'taking into account each organization's specific mandate, expertise, procedures ad capabilities'.[206] At the practical level, UN Security Council Resolutions have provided a mandate for NATO's operations in the Western Balkans, Afghanistan and Libya as well as for NATO's training mission in Iraq. Moreover the Alliance has provided support to many UN-sponsored operations, including logistic assistance to the African Union's missions in Sudan and Somalia and support for UN-disaster relief operations in Pakistan after the devastating earthquake of 2005, which claimed at least 86,000 lives. Furthermore, since 2008, NATO is also escorting UN World Food Programme vessels off the coast of Somalia.[207]

4.2 NATO-EU Relations: A Strategic Partnership?

The Lisbon Summit was also crucial in that it laid down the foundations for an expanded consultation and cooperation with the European Union. Since the approval of the new Strategic Concept in 2010, the Alliance has been working side by side with the EU in the fields of crisis management, capability development and political consultation. The relationship between the two regional organizations has been defined 'a strategic partnership' and in

---

[204] 'NATO/topic: NATO's Relations with the United Nations', NATO, accessed online on 23rd July 2013, http://www.nato.int/cps/en/natolive/topics_50321.htm
[205] Ibid.

[206] Ibid.
[207] Ibid.

recent years the EU has become 'a unique and essential' ally for NATO.[208] NATO and the EU are willing to play 'complementary and mutually reinforcing roles in supporting international peace and security', this can only be achieved by increasing transparency and enhancing political consultation and practical cooperation throughout the crisis spectrum, from joint planning to mutual support in the field.[209] The 2002 Berlin-Plus arrangements paved the way for closer cooperation in crisis management operations; such arrangements allow the European Union to access NATO's collective assets and capabilities for EU-led operations. The first time the Berlin-Plus arrangements were implemented was in the spring of 2003 when the NATO-led Operation Allied Harmony was replaced by the EU-led Operation Concordia in the Former Yugoslav Republic of Macedonia (FYROM). After the NATO-led Stabilization Force (SFOR) in Bosnia-Herzegovina came to an end in 2004, the EU deployed Operation Althea, again drawing on the Alliance's assets and capabilities as well as planning expertise. [210] Another area of existing cooperation is Kosovo, where the European Union Rule of Law Mission (EULEX), launched in 2008, is assisting local authorities in maintaining good governance

under the rule of law; in doing this, the EU is paying important contributions to NATO's peacekeeping mission, deployed on the ground since 1999. Moreover, since September 2008, NATO and EU naval forces are deployed side by side off the coast of Somalia for counter piracy missions Ocean Shield and EUNAVFOR Atalanta respectively. Despite such remarkable achievements, much still needs to be done to improve coherence between the two organizations, as demonstrated by the lack of joint management in the operations aimed at supporting the African Union's Mission in Darfur, Sudan (AMIS). This was the first time the two organizations worked side-by-side outside of the Berlin-plus framework and, in various occasions, cooperation on the ground constituted an extremely complex and tense process.[211] No agreement on a joint chain of command or planning centre could in fact be reached so that NATO and EU efforts were planned and implemented separately. The lack of joint management led to duplications and confusion, and common member countries faced a difficult dilemma as to which organization to direct their capabilities.[212] Well-known political difficulties between NATO and the EU have also prevented political-level agreement on cooperation between ISAF and the EU Police Mission (EUPOL) in Afghanistan, leading EUPOL to rely solely on bilateral agreements with

[208] 'NATO-Topic: NATO-EU: A Strategic Partnership', NATO, accessed online on 22nd July 2013, http://www.nato.int/cps/en/natolive/topics_49217.htm
[209] Ibid.
[210] Ibid.

[211] NATO Operations: Current Priorities and Lessons Learned, Committee Report, NATO Parliamentary Assembly
[212] Ibid.

ISAF Provincial Reconstruction Teams (PRTs). Launched in June 2007, EUPOL is tasked with mentoring, advising and training higher-level officials in the management of policing, nevertheless, over the last few years, EUPOL has come under fierce criticism 'for its relatively small scale, lack of presence at the district level, staffing and funding problems, and slow deployment' as well as for its strict rules of engagement which deprived the mission of the necessary flexibility to move around, especially out of Kabul.[213]

NATO and the EU have now started to work more closely in the field of capability development; the *EU-NATO Capability Group* was established in 2003 to ensure coherence of efforts, minimize duplication and maximise coast-effectiveness.[214] It also serves as a forum where common capability shortfalls can be addressed*.* The Capability Group meets every 4 to 6 weeks and comprises NATO members and non-NATO EU member states that have a security agreement with NATO. In recent times the Capability Group has been hampered by an increasing EU reticence 'to fully engage without the participation of all its member states'.[215] A source of tensions is in fact represented by the exclusion of Cyprus, a formal EU member, from official NATO-EU

meetings due to the absence of security agreements with the Alliance. The reason for this is the hostility between Greek Cyprus and Turkey. Cyprus blocks Turkey's arrangements with many EU defence institutions; Turkey responds by preventing Cyprus from using NATO's assets, entering the Partnership for Peace Programme and signing security agreements with NATO to acquire classified documents.[216] Hostilities between Cyprus and Turkey are hampering the work of the Capability Group and perhaps solving the Cyprus problem would pave the way for a more constructive NATO-EU relationship.[217] With the formal framework deadlocked, both organizations rely on informal staff-to-staff meetings which, so far, have proved very successful as the recent helicopter initiative aimed at increasing the number of helicopters in Afghanistan demonstrates.[218] Relations between NATO and the EU are also hindered by the reluctance to address the fundamental question of who between the two strategic partners should guarantee European security. One group of countries remain committed to NATO for the foreseeable future, while another group hopes to see a more robust Common Defence and Security Policy as well as the development of purely European military capabilities, without relying on NATO'

[213] Ibid.
[214] Ibid., and Can Buharali, 'Better NATO-EU Relations Require More Sincerity', *Edam*, Discussion Paper Series 2010/1, January 2010, pp. 2-3.
[215] Paul Sturm, 'NATO and the EU: Cooperation?', *European Security Review*, No. 48, ISIS Europe, February 2010, p. 3.

[216] Trline Flockhart, 'NATO-EU: Towards a Constructive Relationship?', *Think Global Act European*, p. 308, accessed online on 22nd July 2013, http://www.notre-europe.eu/media/tgae20117bflockhart.pdf?pdf=ok
[217] Ibid.
[218] Paul Sturm, 'NATO and the EU: Cooperation?', p. 3.

ones.[219] Another source of tension are divergent views among common member countries about the nature that NATO-EU cooperation should take in the future.[220]

Nowadays, the two organizations work side by side on issues like counterterrorism and counter WMD proliferation by exchanging information and cooperating in the field of civil emergency planning. Moreover, new potential areas of cooperation have emerged including energy security and cyber defence which are likely to constitute two of the most serious threats the international community will face in future decades.[221] Strengthening the strategic partnership with the EU is a core priority for the Alliance but this can only be achieved if 'underlying strategic differences over the future of European security are resolved'.[222]

---

[219] Ibid., p. 4.

[220] Ibid.

[221] 'NATO-Topic: NATO-EU: A Strategic Partnership', NATO.

[222] Ibid., p. 1.

Conclusions

This paper sought to provide an overview of the contemporary security environment, drawing attention to the inherent uncertainty and ambiguity of today's complex endeavors, which require military forces to be effective against an increasingly elusive, diffuse and dynamic enemy, while simultaneously accomplishing a wide range of tasks, most of them transcending the traditional area of military expertise. The paper argued that contemporary models of military decision-making are no longer adequate to address present and future challenges as linear, ordered approaches are still being used in the effort to predict the unpredictable and make sense of increasingly nonlinear dynamics. The paper explored the interdisciplinary field of Complex Systems Science as an alternative lens through which military forces can develop an understanding of the operating environment and design appropriate courses of action to achieve and maintain competitive edge over an unconventional enemy that constantly adapts to emerging technologies and to the changing contours of the surrounding environment. By acknowledging the fact that the unfolding of events is inherently difficult to predict and that 'chaos' is an intrinsic feature of the operating environment, military planners can channel their efforts into carefully observing the operating theatre, sensing changes and quickly adapting to the adversary system by fostering crucial cognitive and interpersonal skills such as openness, flexibility, mental agility, and critical thinking. Of paramount importance is also cultural awareness and cross-cultural savvy which enable personnel in the field to develop full understanding of the operating environment, the actors within it and the nature of interrelations among them.

Created in the mid twentieth century to defend Western European nations from the threat posed by the Soviet Union, NATO is the only organization founded during the Cold War which survived the collapse of the Soviet bloc and transformed itself to meet the requirements of the last decades. Over the years, the Alliance has expanded its core tasks to include out-of-area operations and co-operative security through partnerships. In the future, the Alliance 'could again be challenged to transform itself to maintain its appeal as a relevant defense and security organization'[223] by ensuring that is has the policies, capabilities and structures required to address emerging challenges. While collective defence will undoubtedly remain a number-one priority, in the future the Alliance may be required increasingly to perform peace-support, humanitarian assistance and reconstruction and

---

[223] Strategic Foresight Analysis, 2013 Report', NATO Headquarters Supreme Allied Commander Transformation, p. 11.

stabilization operations in fragile environments which will expose its forces to greater asymmetric threats.[224] Future challenges will require combined forces to be increasingly effective, integrated, deployable and sustainable. Military modernization will represent a top priority for the Alliance and the concept of Smart Defence, based on the 'pooling and sharing' of military assets and capabilities, may become an imperative in future decades. Moreover as the world becomes increasingly polycentric, new global partnerships remain on the agenda and in future decades it will be paramount to find a thread-off between further enlarging the Alliance while maintaining a shared sense of purpose and overall consensus.

As a global leader in multinational military education and individual training, the NATO School Oberammergau, has a great potential to lead the Alliance's military transformation: in the future the NATO School could create more education and training programmes designed to foster crucial skills like adaptability and flexibility, which allow military forces to maintain competitive edge over an elusive and dynamic enemy. The NATO School Expeditionary Intelligence Training Program (EITP) is already leading change by acknowledging the crucial importance of cultural and situational awareness to leverage success in today's complex

endeavors. EITP is undertaking language courses to familiarize military personnel with key words and phrases in the Dari language as well as with Afghan tribal customs.[225] In the future, training could be further enhanced so as to enable military personnel to develop in-depth language and cultural awareness to interact with all segments of society, establish clear communication channels and thus prevent the enemy from exploiting its linguistic and cultural advantage to mold perceptions among the population and shape attitudes.

The NATO School EITP is also preparing military personnel for the complexities of future urban operating environments by training them to recognize the centre of gravity, attack enemy networks and synchronize their Intelligence, Surveillance and Reconnaissance efforts.[226] As the number of urban interventions increases, in the future training could be further improved by quickly incorporating useful feedback and lessons from the field and adjusting training accordingly. Moreover, the NATO School could enrich its training and education programmes by placing more emphasis on Full Spectrum Operations (FSO), essential to prepare combined forces to operate across the full spectrum of conflict, as well as on Special Operations Forces (SOF), as these are set to play a major role in future operating theatres.

---

[224] Ibid., p. 20.

[225] NATO School, Academic Course Guide 2013.
[226] Ibid.

The School has already opened many of its courses to other regional and international partners and joint NATO-EU training is taking place both at the operational and strategic level. The NATO School is thus playing a major role in fostering civil-military interaction through combined training; in the future the School could open its courses to a broader range of partners so as to foster an environment that further encourages cooperation between military and civilian structures and provides a forum for dialogue and exchange of opinion and information.