



Wartime Logistics in Afghanistan and Beyond

Handling Wicked Problems
and Complex Adaptive Systems

Dave Clemente with Ryan Evans

January 2014



CHATHAM HOUSE

Wartime Logistics in Afghanistan and Beyond

Handling Wicked Problems
and Complex Adaptive Systems

Dave Clemente with Ryan Evans

January 2014



CHATHAM HOUSE

© The Royal Institute of International Affairs, 2014

Chatham House (The Royal Institute of International Affairs) is an independent body which promotes the rigorous study of international questions and does not express opinions of its own. The opinions expressed in this publication are the responsibility of the authors.

All rights reserved. No part of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical including photocopying, recording or any information storage or retrieval system, without the prior written permission of the copyright holder. Please direct all enquiries to the publishers.

Chatham House
10 St James's Square
London SW1Y 4LE
T: +44 (0) 20 7957 5700
F: + 44 (0) 20 7957 5710
www.chathamhouse.org

Charity Registration No. 208223

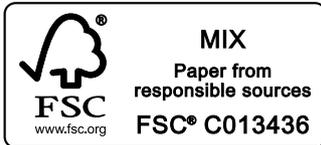
ISBN 978 1 86203 287 3

A catalogue record for this title is available from the British Library.

Cover image: 'Trucks traversing the Kabul River Gorge' © Peretz Partensky (2011), available under an Attribution-Noncommercial-Share Alike 2.0 licence.

Designed and typeset by Soapbox Communications Limited
www.soapbox.co.uk

Printed and bound in Great Britain by Latimer Trend and Co Ltd



Contents

About the Authors	iv
Acknowledgments	v
Executive Summary	vi
1 Introduction	1
2 Decision-making and Wicked Problems	3
3 Complex Adaptive Systems	6
4 Network Theory	9
5 Afghanistan and Complexity	11
6 Logistics and Complexity	17
7 The Ties that Bind? Interactions in a Complex System	22
8 Looking Forward	29
9 Conclusion and Recommendations	31

About the Authors

Dave Clemente is a Senior Research Analyst with the Information Security Forum, and he speaks and publishes extensively on cyber security. He was a Research Associate in the International Security Department at Chatham House, and has worked at the International Institute for Strategic Studies and the Overseas Development Institute. He is the author of *Cyber Security and Global Interdependence: What is Critical?* (Chatham House, 2012) and co-author of *Cyber Security and the UK's Critical National Infrastructure* (Chatham House, 2011) and *On Cyber Warfare* (Chatham House, 2010).

Ryan Evans is the assistant director of the Center for the National Interest and the editor-in-chief of War on the Rocks. He deployed to Helmand Province, Afghanistan from 2010 to 2011 as a social scientist on a US Army Human Terrain Team embedded with the British-led Task Force Helmand. He has worked as a research fellow at the Washington-based Center for National Policy and for the International Centre for the Study of Radicalisation and Political Violence in London. He is a fellow of the Inter-University Seminar on Armed Forces and Society. He has an MA from the War Studies Department at King's College London, where he is also working on his doctorate.

Acknowledgments

The authors thank the UK Defence Science and Technology Laboratory (DSTL) for sponsoring this research project. They are also grateful to those at Chatham House and elsewhere who contributed suggestions and comments to earlier versions of the report. The views expressed are those of the authors, as are any inaccuracies in fact or interpretation.

D.C.
R.E.

Executive Summary

Over the past decade, thousands of military vehicles and tens of thousands of tonnes of supplies and equipment have been moved into Afghanistan in support of NATO operations. In the near future, this matériel will have to be disposed of or moved out of the country. For the UK military this will be the biggest logistics operation since the Second World War. The process of moving supplies into, around and out of Afghanistan is a resource-intensive operation that has already resulted in numerous instances of local and regional corruption, which have often been accepted as a cost of doing business.

This report looks at how these and other problems arise and how the United Kingdom's military supply chain can adapt to deal with them. It makes recommendations for utilizing supply chain resources to serve strategic and operational goals during the build-up and drawdown of forces. It analyses how broader opportunities can, over time, be extracted from managing the military supply chain and its component parts. These include improving local transport infrastructure, supporting reconstruction and development efforts, and delivering influence at local levels. These opportunities could be realized through a variety of means, including increased employment of local workers, targeted resource distribution, and intelligent contracting coupled with robust financial oversight.

Understanding complex problems

The concept of 'wicked problems' is one way of viewing the United Kingdom's management of the Afghan conflict as a whole. It provides a framework for understanding decision-making in situations where multiple stakeholders have conflicting interests. In contrast to 'tame' problems in the scientific or engineering domains that may have definitive answers, wicked problems pose deep challenges to societal and organizational planning and resist rigid definition, structure or solution.

The difficulties surrounding counter-insurgency and counter-terrorism are classic examples of wicked problems, as are dealing with narcotics-trafficking, gang crime, urban planning and climate change. These sorts of problems cannot be solved either in an objective step-by-step manner or definitively, as in building a bridge. They can be made better or worse, however, according to the desired outcome.

This report explores the environment surrounding the military supply chain in Afghanistan and assesses the extent to which it constitutes a complex adaptive system that gives rise to a particularly wicked problem for UK defence planners. The capacity of the various players involved in this system to self-organize makes it extraordinarily adaptive and resilient, while also making it difficult for any single actor to exert long-term influence.

Lessons from Afghanistan

One primary challenge for the UK supply chain in Afghanistan, which passes largely through Kandahar and Helmand provinces, has been understanding how Afghan politics and war are driven by an assortment of ‘micro-conflicts’. These are the localized, enduring conflicts and rivalries, often involving land, that contribute to governmental tensions and help to drive the insurgency.

Over the past decade, the United Kingdom and its NATO allies have struggled to understand these political and economic complexities, and have been slow to use the supply chain as an instrument of influence among the Afghan population. The supply chain is responsible for distributing significant resources, formally and informally, through the Afghan economy and government. This has created local economic benefits but also distortions. The latter has been apparent through significant levels of corruption, often manifested through preferential treatment to contractors and dependence on warlords, tribal militias and Taliban commanders, who regularly permit trucks to pass through their territory in exchange for bribes.

One sobering example comes from 2009, when US military officials in Kabul estimated that a minimum of 10 per cent of the Pentagon’s logistics contracts (equalling hundreds of millions of dollars) consisted of payments to insurgents. Proposals to spend this money on a dedicated NATO protection force went nowhere, with the result that these payments have continued, and logistics resources have benefited many actors whose interests are opposed to those of the United Kingdom.

It has taken a long time to adapt to the realities of operating in the region, yet improvements have been made over the past several years, through initiatives to use the supply chain to aid economic recovery and increase local procurement of goods and service. More attention has been devoted to anti-corruption initiatives. However, the responsibilities of those in charge almost always outweigh their power, making the efforts largely symbolic.

Looking forward, the process of aligning hundreds of civilian contractors with strategic UK goals is difficult under the best of circumstances, and adapting the logistics corps to a ‘big data’-driven future is a huge undertaking. On the eve of departure from Afghanistan, and as UK armed forces are facing significant personnel cuts, an effort must be made to retain institutional memory and identify and learn the hard-won lessons of Afghanistan.

Recommendations

Key recommendations are made with the acknowledgment that the UK logistics system has been stretched by years of continuous deployment, and that there may be little spare capacity to use the supply chain as a tool for influencing local and regional populations. The primary task is to consider where progress can be made given current constraints.

1. **Faster adaptation is essential for developing and enhancing the capabilities of a modern wartime supply chain.** This will require new incentives and new ways of rewarding innovation, and could be done through increasing the attractiveness of logistics in the military career hierarchy, or forming logistics reserves that provide expertise and can be mobilized swiftly.

Cutting-edge technology often tops procurement wish lists, but talent retention will remain a core component of a robust logistics corps. Experienced risk managers will become increasingly valuable as the effects of cuts to defence personnel are felt, and the military supply chain must be willing to compete for this talent with the private sector.

2. **There is a need to align contractors more closely with strategic military interests, and to make contractor management a core logistics competency.** Closer integration of logistics into strategic campaign planning is necessary in order to direct supply chain resources where they can be employed more effectively as instruments of influence.

Contracts could be written with a view to discouraging more strongly the sort of behaviour, such as corruption, that counteracts strategic goals and encouraging behaviour that reinforces these goals, such as strengthening the Afghan economy through local procurement and employment.

There would be real benefits from clarifying and codifying the relationships between the armed forces and contractors. This would facilitate greater insight, in and out of theatre, for military personnel who are managing specific contracts, and could also serve to bolster contracting oversight and transparency mechanisms. Work by the Total Support Force, the organization that provides materiel, personnel and equipment to the UK armed forces, appears to be encouraging development in this area, by writing contracts with prime contractors so that their work supports strategic UK aims.

3. **Greater financial transparency is needed in the military supply chain.** Independently verifiable measures to promote internal and external transparency are needed if the supply chain is to serve as a tool for delivering influence. This could be achieved by appointing a genuinely empowered Special Inspector General for the supply chain, along with independent assessments by an organization such as Transparency International.

Corruption is counter-productive on many levels, and expediency in the supply chain should not be encouraged at the expense of strategic aims. To be transparent and to be seen to be transparent in this area is essential if logistics are to support the mission and be to the benefit of Afghans. Without greater transparency, there is also the risk of a loss of domestic popular and political support for the operation, given that it is UK tax-payers who are supporting military, reconstruction and development efforts in Afghanistan.

4. **Remnants of the NATO wartime supply chain can to be re-tooled to serve as a networked local and regional agricultural transport industry.** The resources invested in the supply chain over the past decade have been substantial. Although the drawdown of the military campaign and supply chain presents risks, there are also significant opportunities to use what remains to build agricultural capacity across Afghanistan.

This expansion in the local transport sector could facilitate the purchase and collection of crops at farms across Helmand and Kandahar provinces, and bring them to markets in urban centres of Afghanistan and into Pakistan, Iran and elsewhere. It has the potential to be a boon for Afghanistan's agricultural industry, benefit its trucking industry by reducing its dependence on wartime commerce, displace key incentives for poppy cultivation, and provide an environment more conducive to stability in rural areas.

5. **More adept management of ‘big data’ is essential in the military logistics environment.** Grappling with the growing abundance of information, in addition to merging legacy logistics systems with cutting-edge technology, will be a huge task not just for the supply chain but also for the UK armed forces as a whole. It will necessitate significant investment in terms of people, process and technology.

Data analysis and visualization tools are needed to peer inside the data-rich networks of a complex logistics system and make the desired correlations and adjustments. This requires sharing data across platforms and between partners. Proprietary systems are often a hindrance in these circumstances. Open standards and commercially available software can provide greater flexibility and scalability, as well as robust access and identity management that can be adapted to encompass supply chain partners.

1 Introduction

This report examines the implications for policy-makers of decision-making in complex situations. It looks at the impact of the reversal and eventual withdrawal of the UK supply chain in Afghanistan, and asks if logistics resources could be used to support wider strategic aims. In order to do this, it considers supply chains and Afghanistan as complex adaptive systems. Characteristics from network theory are used to demonstrate how interactions take place within complex systems, and a ‘wicked problems’ framework is used to shed light on the social complexity of decision-making.

For the purposes of this report, the elements of the supply chain under scrutiny are the people (particularly Afghans and Pakistanis), processes and technologies that are used to procure and/or move supplies into and around Afghanistan. Of particular interest are the resources (i.e. contracts and cash) that are used to keep the supply chain operational, and the positive and negative influences (from a UK perspective) these resources have or could have on local and regional populations.

Supply chain resources should be envisioned as a strategic force multiplier. They can assist with attaining UK objectives in Afghanistan through a variety of methods, including nuanced employment processes, targeted resource distribution, and rigorous contract management. Components of war such as the supply chain are often relegated to the domain of logistics. However, this is about more than logistics. It is about how the logistics processes, networks, relationships and regulations interact with and have a positive and negative effect on the United Kingdom’s wider post-withdrawal aims in Afghanistan.

Elements of the supply chain could, over time, help to improve infrastructure, support reconstruction and development efforts, and be used to deliver influence. The introduction of the NATO supply chain into Afghanistan has created numerous side effects whose long-term impacts (positive or negative) may have been overlooked in order to satisfy short-term requirements.

Some dynamics, such as employment of local residents, may help to alleviate security concerns, while others, such as payments to local power-brokers or militias, may counteract the efforts of security forces. In other words, there may be additional efficiencies that can be extracted from the supply chain and its components. The resources that keep the UK supply chain running could also be used to contribute to the strategic aims of UK and coalition forces.

The report looks at the current environment and asks:

- What are the United Kingdom’s current and post-withdrawal interests and aims in Afghanistan?
- How might the United Kingdom’s supply chain to Afghanistan serve additional purposes such as development aid or encouraging the growth of sustainable industries?

- How might the reversal and elimination of the supply chain affect the post-withdrawal aims that the United Kingdom wishes to achieve in Afghanistan and in the region, including the effect on the local/national economy, jobs and corruption?
- What lessons can be identified for future campaigns?

These complex systems cannot be analysed in an isolated manner, and the wide variety of actors and incentives involved must be taken into account. In order to assist with this analysis and add clarity, the report draws upon two frameworks – wicked problems and network theory. Both frameworks are employed to look at the primary questions, and by doing so to shed light on the technical and socio-technical complexities of wartime logistics endeavours. In other words, the problem is wider than one of moving things from A to B. It is a challenge that interweaves social, political and economic dimensions of significant complexity.

An examination of the conflict in Afghanistan is natural, given that expeditionary campaigns (as opposed to Cold-War-style territorial defence and pre-positioning of forces and supplies) are likely to continue driving the development of Western military supply chains.¹ These frameworks are used to analyse the military supply chain in Afghanistan in three stages: (1) understanding or gaining insight into the system, (2) influencing or attempting to change the system, and (3) adapting to or being influenced by the system.

After a decade of engagement in Afghanistan, UK post-2014 policy towards the country is likely to be guided in part by financial constraints, political fatigue and the desire of the UK public for a peace dividend, in addition to the desire to see a stable, peaceful Afghanistan embarking on a period of economic development. These are issues of strategic concern for senior defence and civilian policy-makers. This topic also has implications for future UK military engagements, where effective logistics are likely to require ever closer cooperation between industry and the armed forces.

1 Jean-Paul Rodrigue and Brian Slack (2002), *Logistics and National Security*, in S.K. Majumdar et al. (eds), *Science, Technology, and National Security* (Pennsylvania Academy of Science), p. 2, http://people.hofstra.edu/jean-paul_rodrigue/downloads/logistics%20and%20national%20security.pdf.

2 Decision-making and Wicked Problems

The concept of wicked problems is useful when attempting to understand issues that contain a highly complex social component. This approach is applicable to many of the social, political and economic challenges faced by NATO forces in Afghanistan. The concept was introduced in the 1970s by Horst Rittel and Melvin Webber as a framework for analysing problems involving multiple stakeholders and conflicting interests. In contrast to the definitive answers of the scientific realm (which they described as ‘tame’ problems), wicked problems are societal and organizational planning problems that resist rigid definition and structure.

Wicked problems tend to expand beyond the initial formulation, with initial analysis leading to discovery of additional, related difficulties and dispute over the very definition of the problem itself. In addition, a proposed solution to one segment of a wicked problem often leads to unforeseen consequences in related segments. This describes nearly every policy problem faced by the public and private sectors, though there are varying levels of intractability among stakeholders.

The search for scientific bases for confronting problems of social policy is bound to fail, because of the nature of these problems. They are ‘wicked’ problems, whereas science has developed to deal with ‘tame’ problems. Policy problems cannot be definitively described. Moreover, in a pluralistic society there is nothing like the undisputable public good; there is no objective definition of equity; policies that respond to social problems cannot be meaningfully correct or false; and it makes no sense to talk about ‘optimal solutions’ to social problems unless severe qualifications are imposed first. Even worse, there are no ‘solutions’ in the sense of definitive and objective answers.²

The difficulties surrounding counter-insurgency and counter-terrorism are classic examples of wicked problems, as are issues including narcotics-trafficking, gang crime, urban planning and climate change. These kinds of problems cannot be solved (a) objectively, given that decision-makers will approach these problems from subjective perspectives, (b) through a process of reduction, given that these problems are dynamic and constantly changing, or (c) definitively like ‘tame’ problems (e.g. engineering projects). However, wicked problems can be made better or worse; for example, urban gang crime can be reduced (though never eradicated), and mitigating efforts such as incarceration may actually facilitate cohesion or criminal professionalization among inmates.

NATO forces in Afghanistan have encountered myriad wicked problems over the past decade. Some of these have been made better and some worse, but the learning curve has been lengthy and laborious and has often entailed a process of trial and error. The framework defined by Rittel and Webber has utility today across the mountains and motorways of Afghanistan.

2 Horst Rittel and Melvin Webber (1973), ‘Dilemmas in a General Theory of Planning’, *Policy Sciences* 4, pp. 155–69, http://www.uctc.net/mwebber/Rittel+Webber+Dilemmas+General_Theory_of_Planning.pdf.

Jeff Conklin has encapsulated some of the primary characteristics of Rittel and Webber's model of wicked problems.³

You do not understand the problem until you have developed a 'solution'.

Every proposed solution exposes a new dimension, widening the scope of the problem (or the number of problems). This makes frequent experimentation essential in order to uncover new dimensions in a rapidly changing environment. In addition, the context within which the problem is framed is crucial to the problem-solving direction, and is further complicated by the number of stakeholders involved in implementing a solution. Everyone will identify the 'problem' (e.g. the root causes of the Afghan insurgency) in a different way, making a certain amount of 'shared understanding' of the problem a vital component for progress.

Wicked problems have no 'stopping rule'.

Because there is no clearly defined problem, there is also no clearly defined solution or point in time when the problem can be definitively ended. The problem-solving process ends when the trouble-shooter runs out of resources, meaning that the problem cannot be 'solved' but could possibly be 'tamed'. For example, unlike a relatively 'tame' problem such as a large-scale engineering project, the problems of terrorism, gang crime and narcotics-trafficking can never be definitively solved, although their frequency and impact can be influenced.

According to Herbert Simon:

*the capacity of the human mind for formulating and solving complex problems is very small compared with the size of the problems whose solution is required for objectively rational behaviour in the real world – or even for a reasonable approximation to such objective rationality.*⁴

The neologism 'satisfice' becomes useful here. It is a term that combines 'satisfy' with 'suffice' and is used to describe how one might act according to cognitive and informational restraints or 'act so as to meet certain criteria that, in the actor's judgment, indicate that a course of action is "good enough"'.⁵

Solutions to wicked problems are not right or wrong.

They are only better/worse, or good enough/not good enough. Proposed solutions are subjective and can vary widely according to each individual stakeholder. For example, what NATO considers the 'right' solution may be the 'wrong' solution from the perspective of the Afghan government, leading to inertia and lack of stakeholder consensus. Because there are no objective answers, gaining buy-in from stakeholders is essential to avoid progress being undermined or sabotaged. Individuals 'do what they think is best for them and not what objectively (i.e. from the viewpoint of a third omniscient person) yields the highest possible benefits'.⁶

Every wicked problem is essentially unique and novel.

Lessons from previous, similar problems can be applied, but each wicked problem is different. Progress is highly context-specific. The insurgencies in Iraq and Afghanistan shared some

3 Jeff Conklin (2005), *Dialogue Mapping: Building Shared Understanding of Wicked Problems* (Chichester: Wiley), <http://cognexus.org/wpf/wickedproblems.pdf>.

4 Herbert Simon (1957), *Models of Man: Social and Rational* (New York: John Wiley).

5 John H. Goldthorpe (1998), 'Rational Action Theory for Sociology', *British Journal of Sociology*, Vol. 29, No. 2.

6 Karl-Deiter Opp (2009), *Theories of Political Protest and Social Movements: A Multidisciplinary Introduction, Critique, and Synthesis* (New York: Routledge), p. 3.

commonalities but were driven in different directions by vastly different actors operating in widely divergent contexts and environments. The appearance of superficial commonalities can be misleading, and applying a solution that worked in another context without fully understanding the salient differences can result in setbacks.

Every solution to a wicked problem is a ‘one-shot operation’.

Each attempt to solve the problem alters the nature of the problem. Each intervention changes the ‘problem space’, reducing the impact of repetitive attempts and placing a premium on creativity and a willingness to experiment. For example, the ‘surges’ in Iraq and Afghanistan changed the fundamental nature of the insurgencies.⁷ They brought out new aspects or properties of the problem, and created additional problems. There are also parallels between wicked problems and Heisenberg’s Uncertainty Principle. Mere observation (e.g. in-theatre data-gathering) can influence interactions between local residents and data-gatherers and affect the political or security dynamics.

Wicked problems have no given alternative solutions.

There is an immense range of options. It is a matter of creativity to devise potential solutions, and a matter of judgment to determine which are valid. As noted by Michael Handel, ‘a fundamental methodological assumption is that war is an art, not a science – that each military problem has many potentially correct solutions (not just a single, optimal solution) which are arrived at through the military leader’s imagination, creativity and intuition.’⁸

The planner has no right to be wrong.

There is an ethical dimension that needs to be considered when attempting to mitigate wicked problems. ‘Planners are liable for the consequences of the actions they generate; the effects can matter a great deal to those people that are touched by those actions.’⁹ This is one of the least-considered categories of wicked problems, yet it serves an essential cautionary function (e.g. for planners of large-scale public works, military campaigns, or national educational or health systems). The ‘messiness’ inherent in these problems means that more powerful analytic tools are needed to make sense of their inherent complexity. It also means that adage of the ‘law of unintended consequences’ (i.e. unforeseen and often undesirable effects are likely when intervening in complex systems) should always be applied.¹⁰

Attempting to address wicked problems at a country-wide level (e.g. insurgency or narcotics-trafficking in Afghanistan) requires a conceptual framework (e.g. that of complex adaptive systems) to provide insight into the kind of complexity that will be encountered.

Wicked problems take root and flourish precisely because they exist in a complex system that adapts to internal and external changes, and therefore wicked problems and complex adaptive systems are complementary frameworks of analysis. The former describes the nature of a particularly difficult problem, and the latter describes the wider landscape that surrounds and influences the problem.

7 See, for example, Theo Farrell and Antonio Giustozzi (2013), ‘The Taliban at War: Inside the Helmand Insurgency, 2004–2012’, *International Affairs*, Vol. 89, No. 4.

8 Matthew Uttley and Christopher Kinsey (2012), ‘The Role of Logistics in War’, in Julian Lindley-French and Yves Boyer (eds), *The Oxford Handbook of War* (Oxford University Press) p. 402.

9 Rittel and Webber, ‘Dilemmas in a General Theory of Planning’, p. 167.

10 Robert K. Merton (1936), ‘The Unanticipated Consequences of Purposive Social Action’, *American Sociological Review*, Vol. 1, No. 6, pp. 894–904.

3 Complex Adaptive Systems

'Complex systems break in complex ways.'

Steven M. Bellovin¹¹

A complex system consists

of many parts (e.g. organizations, processes, technologies, threats) which interact in many different ways with each other and with the outside world. A change or intervention in any one part of the system will create emergent properties that often cannot be foreseen by looking individually at components of the system; they require consideration of the dynamic behaviour of the system as a whole and its relationships to the outside world [...] A complex adaptive system is defined to be one that can change its structure and behaviour over time in response to changes in its environment, including interactions with other systems.¹²

Afghanistan – and indeed any country – can be seen as a complex adaptive system (CAS). A complex system that is 'adaptive' contains 'many components that adapt or learn as they interact'.¹³ The term 'emergent properties' is a way of describing the journey from simplicity to complexity; in other words, how self-organizing 'agents' (living or non-living) create complex structures from myriad simple interactions. This comes from components of the system interacting, combining or collaborating to create something that is more than the sum of their parts.

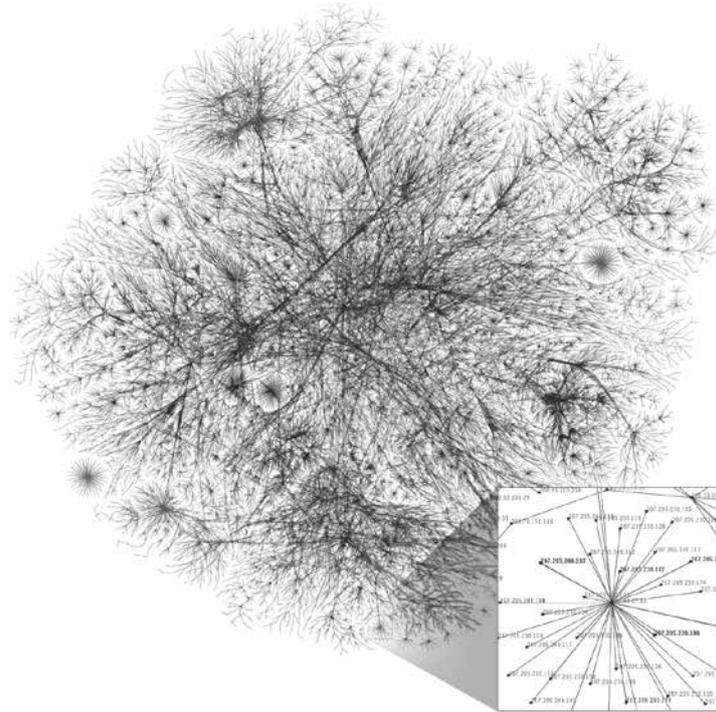
The prevalence of CAS in the world has become more apparent in the last decade. The study of complex systems and networks has been aided by technological advances including the growth of the internet and data aggregation and visualization (see Figure 1). In the cyber domain, these changes have made it easier to identify, map and attach significance to human and non-human connections and interactions (e.g. mapping social networks, or measuring the most important nodes in the internet, determining why connections form). CAS can be seen in other areas where humans interact, such as macroeconomic networks, stock markets or large urban areas. They are present in non-human systems such as the biosphere and the ecosystem, where the interaction between systems creates a level of complexity that is far from fully understood.

11 John Markoff, 'Killing the computer to save it', *New York Times*, 29 October 2012, <http://www.nytimes.com/2012/10/30/science/rethinking-the-computer-at-80.html?pagewanted=all>.

12 UK MoD Call for Research Proposals, 'Applying New Thinking to Counter-Terrorism: A Complex Systems Approach', 15 March 2011, p. 2.

13 John H. Holland (2006), 'Studying Complex Adaptive Systems', *Journal of Systems Science and Complexity*, Vol. 19, No. 1, <http://deepblue.lib.umich.edu/handle/2027.42/41486>, p. 1.

Figure 1: Partial map of the internet (2006)



Source: Matt Britt, 2006, 'Partial map of the internet', http://en.wikipedia.org/wiki/File:Internet_map_1024_-_transparent.png.

Although the study of CAS is relatively young, it has become apparent that they are numerous and that they interact with each other (e.g. a variety of human behaviours combining to deplete the ozone layer, which in turn alters the behaviour of both systems). The capacity of CAS to self-organize makes them extraordinarily adaptive and resilient (e.g. the capacity of large insect colonies to mobilize and create dwellings).

This introduces another important component of CAS, namely that

*each element in the system is ignorant of the behaviour of the system as a whole, it responds only to information that is available to it locally. This point is vitally important. If each element 'knew' what was happening to the system as a whole, all of the complexity would have to be present in that element.*¹⁴

In other words, no single element has knowledge of the whole system. This is true of the internet, supply chains, stock markets and urban ecosystems. Each system component plays its own role, often ignorant of what others are doing, so that

*a CAS co-evolves to the edge of chaos [...] a CAS reacts to and creates its environment so that as the environment changes it may cause the agents within it to change, which, in turn, cause other changes to the environment.*¹⁵

14 Paul Cilliers (1998), *Complexity and Postmodernism: Understanding Complex Systems* (London: Routledge) pp. 4–5.

15 Surya D. Pathak, Jamison M. Day, Anand Nair, William J. Sawaya and M. Murat Kristal (2007), 'Complexity and Adaptivity in Supply Networks: Building Supply Network Theory Using a Complex Adaptive Systems Perspective', *Decision Sciences*, Vol. 38, No. 4, p. 551, http://www.cob.unt.edu/slides/Pany/Simulation_paper/SP_systemdynamic.pdf.

Given the above criteria, supply chains of a civilian or military nature can be categorized as CAS, making this a useful concept for analysing their dynamic nature. Though both kinds of supply chains operate under different constraints (e.g. just-in-time delivery is unacceptable for many products in a wartime supply chain), they employ myriad independent actors who self-organize to complete discrete tasks. It is likely that no single actor – even at a senior level – has a complete view of the wartime supply chain of which he or she is part.

However this limited perspective does not prevent the continuous cycle of – in logistics parlance – ‘good stuff’ being transported to its destination and ‘broken stuff’ returning home.¹⁶ In addition to the high cost of failure, a wartime supply chain must also cope with political and economic factors at home, as well as in the transit and destination countries. The UK supply chain itself is heavily intertwined with the larger NATO and US supply chains, adding further complexity. Maintaining the continuity of the UK wartime supply chain to Afghanistan continues to present the political and military establishments with numerous challenges. There are opportunities inherent in the supply chain – for the advancement of UK goals in Afghanistan – that may be equally numerous.

4 Network Theory

Networks of all kinds surround us and form an inextricable part of our daily lives. Networks can be defined as

*a set of actors or nodes along with a set of ties of a specified type (such as friendship) that link them. The ties interconnect through shared end points to form paths that indirectly link nodes that are not directly tied.*¹⁷

These two components – actors and the ties that connect them – are the constituent parts of all networks. Growing awareness of the networks that surround us, and the interactions between them, has resulted in a new field of study – network theory. Network theory helps in understanding how networks form and grow, and how interactions between network actors, or nodes, are governed. In these situations, as noted in Section 3, no single actor has an overview of the whole system, and attempting to change the system is liable to produce unintended consequences.

But how does this relate to complex adaptive systems and to the UK supply chain in Afghanistan? First, network theory takes a complex system and examines one slice, or segment. It is analogous to a filter on a camera lens that only allows the desired colours through. It is the study of

*the structure of the relationships between the basic elements that make up a system. [It] reduces a system into a set of [...] nodes and a set of relationships called edges that link the nodes together. This bare bones system representation is then analysed for key structural characteristics that might otherwise be hidden.*¹⁸

These hidden characteristics are key to understanding the dynamics behind wicked problems such as shifting political alliances within the Afghan insurgency, or economic ties in the global narcotics trade.

The complex system that is Afghanistan can be viewed through different filters depending on the network one wishes to examine. For example, human interactions form intricate social, political and economic ties, whose strengths can vary widely. Is the network under examination one of friendship, business or politics? Are the strengths of its ties based on common ethnic or cultural experiences, shared interests, or something else? Network theory 'is allowing scientists to understand how networks produce unexpected kinds of behaviour you wouldn't be able to predict from looking at individual parts, from the remarkable robustness of the Internet to the sudden crash of financial markets.'¹⁹

17 Stephen P. Borgatti and Daniel S. Halgin (2011), 'On Network Theory', *Organization Science, Articles in Advance*, p. 2, <http://www.steveborgatti.com/papers/orsc.1110.0641.pdf>.

18 Commonwealth Scientific and Industrial Research Organisation (CSIRO), 'Network Theory', 16 November 2007, <http://www.csiro.au/en/Organisation-Structure/Divisions/Marine--Atmospheric-Research/Complex-systems-science-2/CNT.aspx>.

19 Carl Zimmer (2010), 'Network Theory: A Key to Unraveling How Nature Works', *Yale Environment*, No. 360, 25 January, <http://e360.yale.edu/content/print.msp?id=2233>.

Second, over the past two decades, advances in the field have given scientists greater insight into the nature of the ties between networks – or ‘why networks network’. One closely studied network is the internet. The links – or interactions – between highly and loosely connected internet nodes are of great interest to researchers seeking to understand better how connections form, grow and change over time.

A rich area of research has long been devoted to understanding how players – whether bodily organs, people, bus stops, companies or countries – connect and interact to create webs called networks. An advance in the late 1990s led to a boom in network science, enabling sophisticated analyses of how networks function and sometimes fail. But more recently investigators have awakened to the idea that it’s not enough to know how isolated networks work; studying how networks interact with one another is just as important. Today, the frontier field is not network science, but the science of networks of networks.²⁰

In the context of this report, the UK military supply chain is a complex system that consists of ‘networks of networks’. Individual networks (e.g. for medical supplies) may serve functions for many clients in many countries. Contributing to the UK supply chain may be just one part of what they do, and NATO or the UK military just one customer out of many.

Using the supply chain to influence these networks and actors, and deliver effect that is more than the sum of its parts (i.e. extracting additional benefits or efficiencies) will require closer analysis both of the interactions within individual networks and of those between multiple networks.

20 Elizabeth Quill, ‘When Networks Network’, *Science News*, 22 September 2012, http://www.sciencenews.org/view/feature/id/343939/title/When_Networks_Network.

5 Afghanistan and Complexity

Afghanistan, like any society, can be likened to a complex adaptive system, and ‘the task is not to ask whether a society is complex but how it is complex.’²¹ This section looks at the historical complexity faced by outsiders in Afghanistan, and demonstrates the extent to which internal conflicts contribute to the current security situation. This is no easy task, as a complex adaptive system ‘cannot be reduced to the “sum of its parts” because the action of some parts is always affecting the action of other parts, so that equilibrium of the entire system is never reached or maintained for very long.’²²

It is therefore necessary to examine the dynamic ties between networks or layers of society (i.e. between self-organizing groups of agents or ‘parts’), as to examine the individual parts in isolation would miss the emergent properties (described in Section 3) that give complex systems their seeming unpredictability. This examination is done specifically in Kandahar and Helmand provinces, through which most of the UK logistics system passes.

Understand – gaining insight into the system

The organizing principle of this section is that politics and war in Helmand are driven by a confusing aggregation of ‘micro-conflicts’ – the localized, enduring conflicts and rivalries driving both politics within the government and the larger insurgency.²³ These are rooted in the factors explored in this section – all of which go to the heart of the complex adaptive system that is Afghanistan.

Southern Afghanistan is a traditional and predominantly rural agricultural society. Together, Kandahar and Helmand are home to approximately 2.4 million people. Most are of the Pashtun ethnicity, but other ethnic groups include the Balochi, concentrated largely in southern and central Helmand, and the Tajiks, who tend to live in and around urban centres in Lashkar Gah and Kandahar City.²⁴

Yet knowledge of these facts alone is insufficient to understand the true complexity of this system.²⁵ The ‘human terrain’ of Helmand must be understood through the lens of its history and

21 Norman Yoffee (2005), *Myths of the Archaic State: Evolution of the Earliest Cities, States, and Civilizations* (New York: Cambridge University Press), p. 167.

22 Ibid.

23 Ryan Evans, ‘The Once and Future Civil War in Afghanistan’, *The AFPAK Channel, Foreign Policy*, 26 July 2012, http://afpak.foreignpolicy.com/posts/2012/07/26/the_once_and_future_civil_war_in_afghanistan.

24 The Pashtuns themselves are divided by tribe and sub-tribe – almost entirely from the Zirak and Panjpai branches of the Durrani Confederation. Between the two provinces, the dominant tribes include the Barakzai, Alikozai, Acekzai, Alizai, Ishaqzai, Popolzai, and Noorzai. In Helmand – the end point of most of UK supplies – the Barakzai are the traditional economic elite and are the largest tribe in the river valley between Gereshk, Helmand’s ‘second city’, and Lashkar Gah.

25 Much of the remainder of this section is adapted from Ryan Evans, ‘The Once and Future Civil War in Afghanistan’, and Ryan Evans, ‘The Micro-Level of Civil War: The Case of Central Helmand Province’ (2012), *CTC Sentinel*, Vol. 5, No. 9.

the effects of major upheavals that continue to reverberate through Helmand today. Two of these will be used to illustrate the range of impacts: the Helmand River Valley Project and the Afghan civil war (commonly known as a series of wars including the Soviet–Afghan war, the Mujahideen civil war and the ongoing Afghan war). These upheavals helped forge Helmand’s modern social and political dynamics. Much that followed (see Box 1) has been defined by the micro-conflicts that emerged from the period in which these two upheavals occurred.

Box 1: Historical perspective: the Afghan civil war

In 1978, the year before the Soviet military intervention, an estimated 40,000 Afghans were killed. The war had already started. The Afghan civil war can be divided into different phases. The first was the nascent period of unorganized rebellion that followed the overthrow of Daud Khan. The second phase witnessed the gradual organization of the rebels into the Peshawar Seven and the introduction of Soviet troops. The third phase came when these troops withdrew in 1989 and the mujahideen parties turned on each other along with various quasi-government militias. The regime of President Najibullah held onto pockets of the country and Kabul. Then the Afghan security forces buckled as Soviet largesse vanished. The fourth phase began when Kabul fell in 1992 and the mujahideen continued to fight each other for supremacy. The fifth phase saw the Taliban – a movement led by mujahideen veterans – storm through the south, take Kabul, and come to a stalemate with the Northern Alliance, a coalition dominated by members of Jamiat-i-Islami. The sixth phase began with Western intervention and the toppling of the Taliban regime in Kabul in response to 9/11. And the seventh and current phase has witnessed a return to rebellion, with the Taliban, Gulbuddin Hekmatyar’s Hizb-i-Islami and Jalaluddin Haqqani’s network battling the American-supported regime. Pakistan’s Inter-Services Intelligence agency has reprised its role in the Soviet–Afghan war, now sponsoring and directing rebellion against an American-led coalition.^a

a Ryan Evans, ‘The Once and Future Civil War in Afghanistan,’ *The AFPak Channel, Foreign Policy*, 26 July 2012, http://afpak.foreignpolicy.com/posts/2012/07/26/the_once_and_future_civil_war_in_afghanistan.

Source: See Barnett R. Rubin (2002), *The Fragmentation of Afghanistan* (New Haven, CT: Yale University Press).

From the 1950s to the early 1970s, the United States funded a large-scale agricultural development project, the Helmand-Arghandab Valley Authority.²⁶ Modelled on the Tennessee Valley Authority, the project aimed to improve and expand irrigation systems in the Helmand river valley to increase the province’s arable land. From 1952 to 1973, successive waves of migrants from across Afghanistan settled on these new lands, disrupting traditional patterns of land ownership and inter-tribal relations.²⁷ The arrival of these tribally diverse migrants had a long-term destabilizing effect that upset the balance of power among Helmand’s ‘indigenous’ Pashtun tribes, originally granted land there by Ahmad Shah Durrani in the 1700s.²⁸

Helmand’s traditional power brokers – the khans of the ‘indigenous’ tribes – managed to maintain a modicum of stability. Khans were (and, in far fewer cases, remain) elite landholders who served as arbiters of disputes, landlords, providers of ‘social credit,’ political and social leaders, and

26 Richard B. Scott (1980), *Tribal & Ethnic Groups in the Helmand Valley*, The Asia Society Afghanistan Council, <http://scottshelmandvalleyarchives.org/docs/sas-80-01.pdf>.

27 Ibid.

28 Ibid.

patrons of mullahs and religious scholars. They connected the state to the community, interacting with government officials and serving as proxy officials.²⁹

However, war was brewing in Kabul. The Khalq faction of the communist People's Democratic Party of Afghanistan (PDPA) overthrew the regime of President Mohammad Daud Khan in 1978 and instituted a series of far-reaching radical reforms that sparked rebellion across the country. In response – and some say against its better judgment – the Soviet Union took the decision to occupy the country in support of its beleaguered communist ally.³⁰

The action of the USSR inflamed the conflict, which saw seven main mujahideen parties supported by the United States, Saudi Arabia, Pakistan and a host of Arab volunteers pitted against the Soviet Union and the PDPA, which was divided into two factions.³¹ The mujahideen parties fought each other almost as much as they fought the Soviet forces. The 'national' character of these parties was always a screen for multiple local conflicts over water, land, tribe, sect, ethnicity, prestige and power.

Upon the withdrawal of Soviet forces and the later collapse of the Najibullah regime, the province endured a confusing civil war between mujahideen parties and various state-sponsored militias. This war ended shortly after the Harakat-i-Inqilab-i-Islami, led by Sher Mohammad Akhundzada, consolidated control over most of the province. The Taliban swept through the province in late 1994 and early 1995. Many mujahideen fled to Pakistan and Iran, while others joined the Taliban.³²

During the US-led invasion in 2001, the Taliban in Helmand were mainly overthrown by militias led by Akhundzada and his allies. Akhundzada, who had married into the Karzai family, became Helmand's first post-Taliban governor in 2001.³³ He worked to sideline mujahideen and former Khalq rivals until he was fired in 2006 for heroin-trafficking. When he left the governor's office, he was appointed to the upper house of the Afghan parliament and, remarkably, claimed he was sending 3,000 of his own men to fight on the side of the Taliban, his former enemy. Akhundzada was not taking up the Taliban's cause, but rather ensuring that the men in his patronage network would still be paid, thus maintaining his power base in Helmand.

During and since his period of rule, factional disputes have defined violent and non-violent politics in Helmand. It is one of the few provinces where former Khalqis are politically ascendant, occupying key district governor and senior police positions as well as the provincial governor's office. More often than not, these former Khalqis have antagonistic relationships with former mujahideen counterparts. Many of the latter are also in the Afghan National Security Forces (ANSF), but others – and their children – have joined the insurgency. Just as people joined various mujahideen parties or the government to gain allies and resources to pursue their local interests, people join the Taliban movement for the same reasons.³⁴

29 For more on khans, see John W. Anderson (1978), 'There are no Khans Anymore: Economic Development and Social Change in Tribal Afghanistan', *Middle East Journal*, Vol. 32, No. 2, and John W. Anderson (1983) 'Khan and Khel: Dialects of Pakhtun Tribalism', in Richard Tapper (ed.), *The Conflict of Tribe and State in Iran and Afghanistan* (New York: St Martin's Press).

30 Artemy M. Kalinovsky (2011), *A Long Goodbye: The Soviet Withdrawal from Afghanistan* (Cambridge, MA: Harvard University Press).

31 Rubin, *The Fragmentation of Afghanistan*.

32 Anthony Davis (1998), 'How the Taliban Became a Military Force', in William Maley (ed.), *Fundamentalism Reborn? Afghanistan Under the Taliban* (New York: New York University Press); Rubin, *The Fragmentation of Afghanistan*, pp. 245–64.

33 Ryan Evans interviews, Gereshk, Afghanistan, January 2011; Damien McElroy, 'Afghan governor turned 3,000 men over to Taliban', *Daily Telegraph*, 20 November 2009, <http://www.telegraph.co.uk/news/worldnews/asia/afghanistan/6615329/Afghan-governor-turned-3000-men-over-to-Taliban.html>.

34 Ryan Evans interviews, Gereshk, Afghanistan, January–February 2011.

As noted earlier, land, water and local power plays have always driven the micro-conflicts of Helmand.³⁵ According to Conor Foley, ‘if the root cause of the conflicts that wreaked such devastation in Afghanistan could be summarized in a single word, it would probably be “land”’.³⁶ Since Helmand has a predominantly agricultural economy, land is the foundation of all wealth in the province. The alternative is poverty. In the case of Helmand, there are three important land-related problems driving conflict: competing claims, state refusal to recognize land claims, and land usage.

If conflict in Helmand can be primarily attributed to land tenure, the narcotics trade is a close second.³⁷ Poppy is the renewable resource of conflict in Helmand. Although it had long been grown on a smaller scale in Helmand, the Akhundzadas legitimized its broader cultivation in the 1980s and turned it into a province-wide industry. Harakat-i-Inqilab-i-Islami controlled the supply of poppy and Hizb-i-Islami ran the processing centres in an uneasy, often disrupted, balance of power.³⁸

Poppy cultivation was briefly banned by the Taliban in the late 1990s but experienced a resurgence following their overthrow.³⁹ Conflicts between various factions within the government, and between the government and the insurgency, are often driven by competition over access to and control over the narcotics industry. The efficiency and robustness of this industry has been noted. It is complex, durable and effective even under extreme duress, and demonstrates that NATO should not underestimate the ability of Afghans to run an effective supply chain.⁴⁰

Influence – attempting to change the system

The 11-year presence of the International Security Assistance Force (ISAF, later known as NATO/ISAF) in Afghanistan can be viewed as an intensive effort to change this diverse and complex system, restructuring fundamentally selected components in order to bring them in line with Western expectations. The United Kingdom has been a primary actor in this process, and has expended considerable resources – personnel, financial and political – in efforts to create change.

The NATO mission in Afghanistan is trilateral, encompassing actions related to security, reconstruction and development, and governance.⁴¹ The UK motivations for engagement in Afghanistan rhetorically parallel those of NATO. As of March 2011 the United Kingdom expressed four main goals, which ‘are necessary if the Government is to achieve its core objective [...] of preventing the return of al-Qaeda to Afghanistan’:

-
- 35 Khalqi land reforms represented one of several land tenure regimes that have been in place in Helmand since the end of the reign of King Zahir Shah (1933–73). Land reforms were enacted by Mohammad Daud Khan, the PDPA regime, various mujahideen parties in the early 1990s, the Taliban and the current regime. Richard F. Nyrop and Donald M. Seekins (1986), *Afghanistan Country Study* (Washington, DC: American University), pp. 183–89; Richard F. Nyrop and Donald M. Seekins (2001), *Land Tenure and Property Rights in Afghanistan* (Washington, DC: USAID); Liz Alden Wily (2003), *Land Rights in Crisis: Restoring Tenure Security in Afghanistan* (Kabul: Afghanistan Research and Evaluation Unit), pp. 42–50.
- 36 Conor Foley (2009), ‘Housing, Land, and Property Restitution Rights in Afghanistan’, in Scott Leckie (ed.), *Housing, Land, and Property Rights in Post-Conflict United Nations and Other Peace Operations: A Comparative Survey and Proposal for Reform* (Cambridge: Cambridge University Press).
- 37 Ryan Evans (2011), *Counter-Narcotics, Poppy Cultivation, and the People of Central Helmand Province* (Main Operating Base Lashkar Gah: Human Terrain Team AF25, U/FOUO).
- 38 Vanda Felbab-Brown (2009), *Shooting Up: Counterinsurgency and the War on Drugs* (Washington, DC: Brookings Institution).
- 39 Ibid.
- 40 Interview with officer deployed in support of UK forces in Afghanistan, 1 May 2012.
- 41 NATO, ‘About ISAF’, <http://www.isaf.nato.int/mission.html>; NATO, ‘Chicago Summit Declaration on Afghanistan’, 21 May 2012, http://www.nato.int/cps/en/SID-4E45AD78-2F44FA17/natolive/official_texts_87595.htm.

- A more stable and secure Afghanistan;
- The conditions for withdrawal of UK combat troops by 2014, including capable ANSF;
- An Afghan-led political settlement that represents all Afghan people; and
- Regional political and security cooperation that supports a stable Afghanistan.⁴²

In addition to addressing the security situation, the Ministry of Defence (MoD) has stated the United Kingdom is

*working relentlessly on all fronts to help the Afghan Government improve governance, both nationally and locally, tackle corruption and the drugs trade, build up the rule of law, promote economic development – investing in infrastructure, legal alternatives to poppy, jobs – and improve access to education and healthcare.*⁴³

Adapt – being influenced by the system

These goals are ambitious in scope, and levels of progress have varied widely over the past decade. The feedback loop (or the cycle of cause and effect) between the system (Afghanistan) and the dominant ‘change actor’ (NATO) has forced coalition forces to adapt at the strategic, operational and tactical levels. Adaptation in the military supply chain has also taken place in order to accommodate strategic campaign objectives as well as shifting military, economic and political factors at home, in transit and in theatre.

The existence of the Afghan First initiative is one sign that new ways of utilizing supply chain resources are being developed. The objective of the initiative is to aid economic recovery and increase local procurement of goods and services (by NATO forces) including the use of Afghan contractors and employment of Afghan labour.⁴⁴ It was implemented by the United States in late 2009 and adopted by NATO in spring 2010. Initiatives like this have the potential to develop and support sectors including manufacturing, construction and logistics, but they must be adequately adapted to local conditions.

There have been some success stories in low- or semi-skilled manufacturing and construction, but barriers remain. Criticism of the initiative has centred around linguistic barriers, complex contracting regulations, lack of feedback on unsuccessful proposals, and limited access to contracting and finance officers.⁴⁵ These barriers hinder potential Afghan beneficiaries to the advantage of larger, often Western or Western-affiliated organizations.

42 UK House of Commons, ‘Foreign Affairs Committee – Fourth Report: The UK’s Foreign Policy Approach to Afghanistan and Pakistan’, 2 March 2011, <http://www.publications.parliament.uk/pa/cm201011/cmselect/cmfaff/514/51412.htm>.

43 UK Ministry of Defence, ‘Operations in Afghanistan: Why we are there’, <http://www.mod.uk/DefenceInternet/FactSheets/OperationsFactsheets/OperationsInAfghanistanWhyWeAreThere.htm>.

44 NATO, ‘NATO Afghan First Policy’, 23 April 2010, http://www.nato.int/cps/en/natolive/official_texts_62851.htm.

45 Asad Khan, ‘Creating a Level Playing Field for Afghan Businesses While Safeguarding the Future’, *A Battlefield Tourist*, 21 October 2010, <http://www.battlefieldtourist.com/content/2010/10/>; Kate Landry, ‘Tips from the Experts: How to Make Afghan First Work’, *Building Markets Blogs*, 7 July 2010, <http://buildingmarkets.org/blogs/afghanistan/2010/07/07/tips-from-the-experts-how-to-make-afghan-first-work/>.

While it is lamentable that nearly a decade passed before this process was integrated into the NATO bureaucracy, similar initiatives were implemented earlier by individual coalition partners. Two years after introducing the programme, in May 2012, NATO was still attempting to hone it to provide maximum benefit for Afghans. Three proposals under consideration were: (a) increasing the contract threshold from €39,000 to €156,000, (b) limiting competition to Afghan companies, and (c) re-competing for contracts awarded outside the theatre (or re-opening competition for a contract that has ended but for which the services are still needed).⁴⁶

This is where adaptation – particularly in the contracting process – could be improved in order to contribute to strategic aims, including a more stable and secure Afghanistan. The following section extends this analysis, looking at principles of logistics along with additional examples of change and adaptation.

46 Afghan Vendor's Conference, Kabul Serena Hotel, 31 May 2012, slide 11, cdn-prod.afghanfirst.org/files/3d4caf5f8cd544eead2aad97d1f0a0ba.

6 Logistics and Complexity

'Everything should be made as simple as possible, but not one bit simpler.'

Attributed to Albert Einstein

The characteristics of a complex adaptive system also apply to a wartime supply chain and its constituent parts. As noted, no single actor has a total overview of the supply chain, and myriad self-organizing 'agents' from around the world interact and cooperate under fluid circumstances to serve their own self-interests.

In this way, the extension of a supply chain into a new theatre of conflict can be viewed as integrating one CAS into the ecosystem of another, far more diverse CAS. The extent to which this integration is successful depends on a number of factors including access points and distribution routes, which are themselves made accessible through force or political agreement. Guiding this integration are several core criteria, by which planners organize the defence logistics system.

These criteria are laid out by Matthew Uttley and Christopher Kinsey, who argue that, while the character of defence logistics has changed in the post-Cold War environment, its nature has largely remained the same. They echo the UK military's Joint Doctrine Publication 4-00 (JDP 4-00) 'Logistics for Joint Operations'. Both describe evolving challenges for 21st-century defence planners through the *principles of logistics*.⁴⁷

- *Foresight* is particularly challenging given 'the vagueness of the threat and the uncertainty that dominates the logistician's environment'. Unexpected changes occur in variables such as mission types, force structures, stakeholder management and political and economic considerations (at home and abroad). Full integration of logistics into the earliest stages of campaign planning is essential.⁴⁸
- *Efficiency* in the post-Cold War environment has been driven largely from the adoption of best practices from the private sector and greater support from civilian contractors. This has been beneficial for both the public and private sectors, and private-sector capabilities and contractors have become embedded firmly into most modern expeditionary military forces.
- *Cooperation and simplicity* are crucial to facilitate the complex coordination required between the wide array of state and non-state actors (from armed national or multinational forces to private actors and NGOs) that are present in modern conflict environments. This

47 'Logistics for Joint Operations, Joint Doctrine Publication 4-00' (JDP 4-00), April 2007 (3rd edition), Development, Concepts and Doctrine Centre, <http://ids.nic.in/UK%20Doctrine/UK%20%2811%29.pdf>, pp. 1-6-1-8; and Uttley and Kinsey, 'The Role of Logistics in War', p. 402.

48 Uttley and Kinsey, 'The Role of Logistics in War', p. 402.

includes the use of delegated authority and common processes and procedures, which are encouraged in order to facilitate coordination among actors.

- *Agility* is required to adapt to rapidly changing circumstances, many of which are influenced by an intelligent and adaptive adversary. Logisticians must be able to look at the supply chain environment in a holistic manner, and be comfortable operating with a measure of uncertainty.

Managing people

The growth of contractor support in military supply chains is particularly relevant to the discussion of complexity. This proliferation of actors has increased efficiency in many areas, but has also raised the required level of central coordination and oversight. In the span of little more than a decade this has become ever more evident: “The ratio of military personnel to logistics contractors was 10:1 in Iraq during 2003, compared to a ratio of 100:1 in the 1991 Gulf War.”⁴⁹

In contrast, as of October 2012, the US Department of Defense (US DoD) contractor-to-military ratio was 1.13:1 in Afghanistan (based on 84,200 troops).⁵⁰ The ratio of contract personnel to US troops has risen in the past decade, with local nationals alone regularly outnumbering troops.⁵¹ Many of these contractors are stationed on military bases and rarely, if ever, leave. But others, such as truck drivers moving back and forth between Pakistan and Afghanistan, have regular and sustained contact with the local population.

Clever contracting here could be used to good effect, to influence Afghans who in turn come into contact with many other Afghans. US military guidance has noted that

*contracting with local nationals is an important element in counterinsurgency strategy. Employing local nationals injects money into the local economy, provides job training, builds support among local nationals, and can give [us] a more sophisticated understanding of the local landscape.*⁵²

The scale of yearly supply shipping suggests that there is some scope for influence here too:

*In 2010, the United Kingdom Ministry of Defence sent 130,300 individual deliveries into Afghanistan using two main routes: 31% of supplies by tonnage were flown direct from the United Kingdom to Camp Bastion in Afghanistan, with the remaining 69% transported by surface routes, usually via Pakistan.*⁵³

49 Ibid., p. 410.

50 CENTCOM, ‘CENTCOM – Quarterly Contractor Census Reports’, October 2012, http://www.acq.osd.mil/log/PS/CENTCOM_reports.html.

51 Moshe Schwartz and Joyprada Swain (2011), ‘Department of Defense Contractors in Afghanistan and Iraq: Background and Analysis’, US Congressional Research Service, 13 May, p. 29, <http://www.fas.org/sgp/crs/natsec/R40764.pdf>. This is in contrast to Iraq, where troop levels outnumbered total contractors (and far outnumbered local contractors) for most of the campaign. In June 2008 total contractors in Iraq numbered 162,428 (including base support, translation, construction, security, etc.), which exceeded – for approximately six months – the 153,000 US combat troops in theatre at that time. Ibid., p. 2.

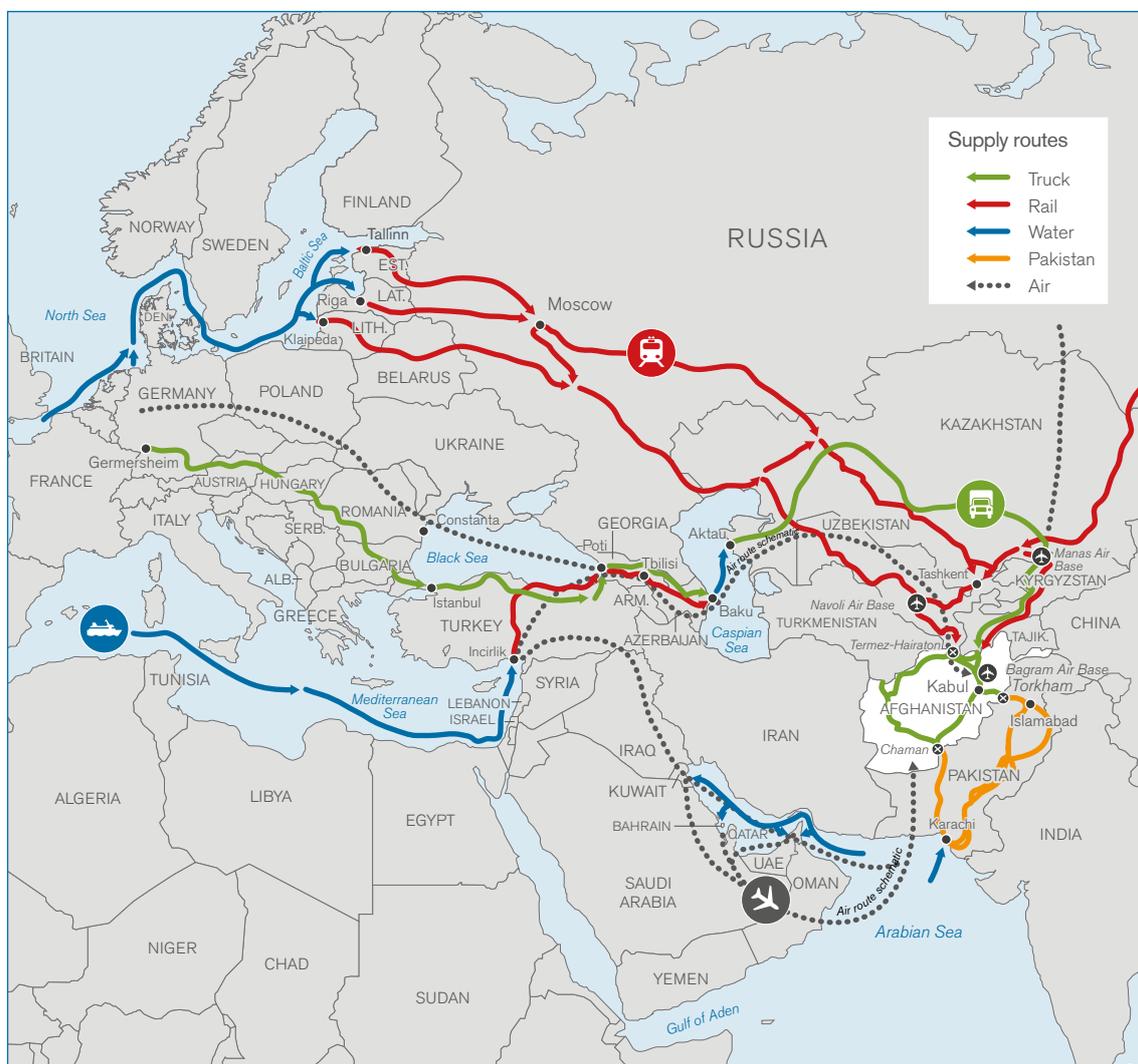
52 ‘In January 2009, General Raymond Odierno issued a memorandum to this effect, stating that “employment of Iraqis not only saves money but it also strengthens the Iraqi economy and helps eliminate the root causes of the insurgency – poverty and lack of economic opportunity.” The memorandum set forth a goal of increasing the percentage of local national contractors. Despite this policy, DOD has trended away from using local nationals as contractor personnel in Afghanistan and Iraq. The percentage of contractors who were local nationals in both countries dropped from 49% in December 2009 to 36% in March 2011.’ Ibid., p. 8.

53 UK House of Commons Committee of Public Accounts (2011), *The Use of Information to Manage the Defence Logistics Supply Chain: Forty-third Report of Session 2010–12*, 18 July, p. 7, <http://www.publications.parliament.uk/pa/cm201012/cmselect/cmpubacc/1202/1202.pdf>.

The United States has worked towards expanding the Northern Distribution Network (NDN) as an alternative to the increasingly unpredictable route through Afghanistan (see Figure 2). It is not cheap, however, and

estimates for April–September 2011 put the average cost of shipping a standard 20-foot container by truck and rail via the NDN at \$12,367 compared with \$6,700 by truck via the Pakistan Ground Lines of Communication (PGLOC). These costs have been compounded by the increased volume switched from the PGLOC to the NDN, so that by January 2012 the Pentagon was paying six times more to get its supplies to Afghanistan (\$104 million per month, compared to \$17 million per month).⁵⁴

Figure 2: US military supply routes into Afghanistan



Source: Based on USTRANSCOM 2011 Annual Report, p. 28, http://www.transcom.mil/documents/annual_reports/FY2011_USTRANSCOM_Annual_Report.pdf.

54 Derek Gregory, 'Supplying War in Afghanistan: The Frictions of Distance', *openDemocracy*, 11 June 2012, <http://www.opendemocracy.net/print/66271>.

These shifting resource flows create opportunities for influence as well as inefficiency and waste. Consideration should be given to the potential for a 'distortion field created by troops on the ground,' where workers 'set up shop around a military base' to profit from new economic opportunities.⁵⁵ One interviewee noted that 'if the United Kingdom wanted to use the supply chain to deliver influence, they would probably do things differently than now. It is currently a highly transactional relationship.'⁵⁶

Managing information

Managing a supply chain's information ecosystem has always been a significant obstacle to achieving satisfactory results across the four principles listed above. This is not a particularly novel challenge, and holds as true in the various conflicts in history described by Martin van Creveld as it does in conflicts of the 21st century.⁵⁷ What has changed, however, is the scope and scale of the information that must now be collected, analysed and interpreted.⁵⁸ One defining characteristic of the information age is that it is centred on the management of abundance – not scarcity.⁵⁹ The sea of data is constantly growing as new sources of information become available. In many cases the tools to make sense of this environment are inadequate, and the logistics profession is no exception.

As more data are gathered from more actors, greater effort is required to analyse and act upon it in a timely and efficient manner. A 2011 report from the UK National Audit Office found several areas in which the UK MoD faces particular challenges in the collection and use of supply chain information:

- *Many data systems are old and have limited functionality.* Some systems have been in service for over 30 years.
- *Links between these systems are often incomplete, or data systems are incompatible.* Data are often spread across multiple systems. There is no single point of contact for various types of data.⁶⁰
- *Data accuracy is questionable and often contradictory across multiple systems.* This causes loss of confidence in data, and can create inefficiencies through over- or under-ordering.
- *The MoD does not have total visibility of assets, either in its stores or in transit to theatre.* Items are not tracked accurately while in transit, and are not consistently receipted upon arrival.⁶¹

55 Interview with officer 2 deployed in support of UK forces in Afghanistan, 1 May 2012.

56 Interview with officer 1 deployed in support of UK forces in Afghanistan, 1 May 2012.

57 Martin van Creveld (2004 [1977]), *Supplying War: Logistics from Wallenstein to Patton* (Cambridge University Press, 2nd edition).

58 Ben Rooney, 'U.K. Military Failing to Tackle Big Data', *Wall Street Journal*, 23 September 2013, <http://blogs.wsj.com/tech-europe/2013/09/23/u-k-military-failing-to-tackle-big-data/>.

59 John Naughton (2012), *From Gutenberg to Zuckerberg: What You Really Need to Know About the Internet*, (London: Quercus), p. 112.

60 'The Joint Asset Management and Engineering Solutions system, for example, can only transfer data between systems using a memory stick, which introduces a significant risk of data loss and error, because funding for more advanced functionality was not approved.'

UK National Audit Office (2011) *Report by the Comptroller and Auditor General – Ministry of Defence: The Use of Information to Manage the Logistics Supply Chain*, UK House of Commons, 31 March, p. 36, http://www.nao.org.uk/publications/1011/logistics_supply_chain.aspx.

61 *Ibid.*, pp. 24–28.

The report notes that a variety of activities are under way to update or replace legacy systems, and to improve the quality of logistics information. Funding for sustained upgrades is likely to remain a significant challenge, driven in large part by financial cuts and related reductions across armed forces personnel.⁶² However, the United Kingdom is not alone in its efforts to rationalize legacy systems and extract greater efficiencies. This remains a challenge for the US DoD which, relative to the United Kingdom, has a substantially larger logistics system to manage. In late 2012 the US Assistant Secretary of Defense for Logistics and Materiel Readiness, Alan Estevez, acknowledged that 'from an [enterprise resource planning] perspective and an IT perspective, the [US DoD] does not do IT well.'⁶³

62 Thomas Harding, 'British Army will have to rely on civilian drivers, reserves and foreign armies', *Daily Telegraph*, 19 May 2012, <http://www.telegraph.co.uk/news/uknews/defence/9275812/British-Army-will-have-to-rely-on-civilian-drivers-reserves-and-foreign-armies.html>.

63 'I wish we would do it better. Each of the Services has made some major investments in ERPs over the last 10 years. Most of those are going to come into fruition in the next couple of years. Some of them are already operating.' 'In Person – Assistant Secretary of Defense (L&MR) Alan F. Estevez', Defense AT&L, September–October 2012, p. 11, http://www.dau.mil/pubscats/ATL%20Docs/Sep_Oct_2012/DATL_Sep_Oct_2012.pdf.

7 The Ties that Bind?

Interactions in a Complex System

One implication of attempting to influence a complex system is that minor disruptions can lead to major changes in social, political and economic structures.⁶⁴ Although the supply chain is just one element of a complex system, it has the ability to alter the local ecosystem in Afghanistan as well as the security situation. It provides more jobs for local residents, but also increased opportunities for corruption.

To understand these dynamics, one must understand why actors within the system – in this case the military supply chain – behave in the way they do. These actors include farmers, trucking consortiums, narcotics cartels, government officials, tribal and traditional leaders, mullahs and ulema (religious scholars), security forces (e.g. Afghan National Police, Afghan Border Police, Afghan Community Order Police, National Directorate of Security, Afghan National Army) and others.

Distortions in the system

The largest portion of the NATO supply chain as of 2010 was called the Host Nation Trucking (HNT) programme – a \$2.16-billion contract involving Afghan, US and Middle Eastern logistics and trucking companies.⁶⁵ In December 2009 testimony before the US Senate Foreign Relations Committee, Secretary of State Hillary Clinton said that

when we are so dependent upon long supply lines, as in Afghanistan, where everything has to be imported, it's much more difficult than it was in Iraq, where we had Kuwait as a staging ground to go into Iraq. You offload a ship in Karachi and by the time whatever it is [...] gets to where we're headed, it goes through a lot of hands. And one of the major sources of funding for the Taliban is the protection money.⁶⁶

It is common knowledge that NATO operations create distortions in the Afghan economy, but it is important to understand the complex ways in which the military supply chain distorts the economy. For example, the supply chain has created and continues to create a powerful consortium of trucking companies that cross the Pashtun south and east and into Pakistan. This traffic feeds money formally and informally into the Afghan economy and government.

64 'Network theory tells scientists that subtle changes to complex networks can trigger sudden changes. Financial markets, for example, can wobble up and down before collapsing. It may be possible to monitor ecosystems for early warning signals of collapse as well.' Zimmer, 'Network Theory' (see note 19 above).

65 US House of Representative Subcommittee on National Security and Foreign Affairs, Committee on Oversight and Government Reform (2010), *Warlord, Inc.: Extortion and Corruption Along the U.S. Supply Chain in Afghanistan*, Washington, DC, June, http://www.cbsnews.com/htdocs/pdf/HNT_Report.pdf.

66 Hillary Clinton, Testimony, US Senate Foreign Relations Committee, 3 December 2009, http://www.globalsecurity.org/military/library/congress/2010_rpt/warlord-inc_100622.htm#exec.

Looming over local and regional contracting initiatives, and more generally over the military supply chain through Afghanistan and its neighbours, are endemic issues of corruption. This is often manifested through preferential treatment to contractors and payments to warlords and tribal militias. Insurgents and Taliban commanders also permit trucks to pass through their territory in exchange for bribes. In 2009 it was reported that, 'US military officials in Kabul estimate that a minimum of 10 per cent of the Pentagon's logistics contracts – hundreds of millions of dollars – consists of payments to insurgents'.⁶⁷

A report issued by a US congressional subcommittee details how Afghan private security companies escort supply convoys along Afghanistan's perilous roads and lays out the unintended consequences of this effort, including warlordism, extortion, corruption and funding for insurgent networks. Insurgents and warlords are paid off by the private security companies to ensure safe passage.⁶⁸

The scale of evident, and suspected, corruption provided impetus for the 2010 contracting guidelines issued by General David Petraeus, the commander of NATO-ISAF forces. 'With proper oversight, contracting can spur economic development and support the Afghan government and NATO's campaign objectives,' one observer noted at the time, but with insufficient oversight 'it is likely that some of those funds will unintentionally fuel corruption, finance insurgent organizations, strengthen criminal patronage networks, and undermine our efforts in Afghanistan'.⁶⁹

At that time, an estimated \$14 billion per year was being paid to contractors in Afghanistan, which was a threefold increase from 2008.⁷⁰ As of 2010, Afghan dependence on 'international assistance amounted to roughly 97 per cent of the country's gross domestic product, according to a commonly cited World Bank estimate'.⁷¹ Unless attention is given to the transition phase, the economic bubble that has grown over the past decade could burst when NATO forces depart. Logistics has a role to play in this phase as the supply chain goes into reverse and a decade's worth of military equipment is transported or otherwise disposed of.

Leaving Afghanistan will be a more significant logistical effort than the withdrawal from Iraq. In the latter, it was possible to leave behind a greater amount of matériel for the more technically capable Iraqi Security Forces. The ANSF do not have the ability to use NATO artillery systems, armour or vehicles. To compound this problem, the United States decided years ago to train these forces on mostly Russian and former Soviet equipment. Even if the ANSF had higher technical capabilities and literacy rates, they would still be unable to operate NATO systems.

The argument can be made that the NATO supply chain bolsters the two greatest ills that plague Afghanistan – the same two factors that NATO's governance and security lines of operation are meant to combat: the insurgency and corruption. It also empowers trucking companies and consortiums, establishing a business 'lobby' that relies heavily on war to sustain itself, and creates perverse incentives. Moreover, the supply chain has distorted local economies, displacing self-sustaining and lawful economic activity.

67 Aram Roston, 'How the US funds the Taliban', *The Nation*, 11 November 2009, <http://www.thenation.com/article/how-us-funds-taliban?page=full>.

68 US House of Representative Subcommittee (2010), *Warlord, Inc.*

69 Deb Reichmann, 'NATO revises contract award process', 13 September 2010, *boston.com*, http://www.boston.com/news/world/asia/articles/2010/09/13/nato_revises_contract_award_process/?camp=pm.

70 Ibid.

71 Graham Bowley, 'Afghans fear downturn as foreigners withdraw', *New York Times*, 31 January 2012, http://www.nytimes.com/2012/02/01/world/asia/afghans-fear-economic-downturn-as-foreigners-leave.html?_r=1.&pagewanted=all; The World Bank, *Afghanistan in Transition: Looking Beyond 2014 – Volume 2: Main Report*, May 2012, p. 47, <http://siteresources.worldbank.org/AFGHANISTANEXTN/Images/305983-1334954629964/AFTransition2014Vol2.pdf>.

The Afghan National Directorate of Security reportedly

*delivered 'very detailed' reports to the Americans explaining how the Taliban are profiting from protecting convoys of US supplies. The Afghan intelligence service even offered a solution: what if the US was to take the tens of millions paid to security contractors and instead set up a dedicated and professional convoy support unit to guard its logistics lines? The suggestion went nowhere.*⁷²

The nascent Afghan Public Protection Force (APPF), formed in early 2012, may fill this gap. It is a government-controlled security force meant to replace private security companies in Afghanistan. 'In return for contract payments, the APPF will provide security to aid projects, company offices, and convoys transporting supplies for NATO-led international security forces.'⁷³ However, evidence in other areas (e.g. finance) suggests that waste and abuse in the supply chain are unlikely to decrease under a government-led programme.⁷⁴

The counter-productive nature of these network interactions cannot be over-estimated. Although route security may improve in a system where parties on all sides of the conflict have interest in maintaining freedom of movement, the fact remains that insurgents and warlords receive bribes from private security companies that receive payment from NATO. This rent-seeking behaviour between supply chain actors serves to undermine NATO's strategic aims. At the very least, efforts to use an 'enhanced' supply chain as a tool of influence could begin with a Hippocratic Oath to 'first, do no harm'. It gives rise to questions regarding the side effects and unexpected consequences that may emerge from the drawdown of the NATO supply chain.

Emergent behaviour

It is crucial to understand the side effects and emergent behaviour that result when the UK supply chain – as well as other complex adaptive systems – interacts with local communities. As Gregory Possehl explains,

*we see that virtually all parts (institutions and individuals) of the vast interconnected, largely seamless web of sociocultural systems are surely involved in the dynamic of change, as agents of both effect and affect [...] Once change has started there occurs a kind of 'domino effect,' [...] a complex set of positive and negative 'feedback' exchanges that sustain the process.*⁷⁵

As noted earlier, despite the negatives of the HNT programme, there are some positives. It did increase route security by creating a system in which major actors have an interest in maintaining freedom of movement on main routes. Insurgents and warlords receive bribes from private security companies that receive contracts from NATO. What will happen as the NATO supply chain draws down between now and the end of 2014, and those that remain in Afghanistan contend over much-reduced contracts?

72 Aram Roston, 'How the US funds the Taliban'.

73 Abubakar Siddique, 'Explainer: The Afghan Public Protection Force', Radio Free Europe/Radio Liberty, 21 March 2012, http://www.rferl.org/content/explainer_afghan_public_protection_force/24522571.html.

74 Rob Taylor and Abdul Aziz Ibrahim, 'Afghan Finance Minister Faces Corruption Investigation', Reuters, 2 August 2012, <http://in.reuters.com/article/2012/08/02/afghanistan-corruption-idINDEE87106520120802>.

75 Gregory Possehl (1990), 'Revolution in the Urban Revolution: The Emergence of Indus Urbanization', *Annual Review of Anthropology*, Vol. 19, pp. 261–82.

As the NATO supply chain fades away, local economies that once reaped benefits of goods and services moving through their areas will suffer as a result. In Helmand, this will increase the already substantial positive incentives for relying on poppy cultivation, transport and processing. Further, as the supply chain draws down, so will the system of bribes that helped ensure route security and freedom of movement. This may make Afghanistan's already dangerous roads even more perilous for Afghan civilians, government officials and security forces. This can easily cascade into a domino effect that sees the Afghan government unable to maintain its authority key southern provinces, such as Helmand and Kandahar, after the drawdown, owing to the loss not only of direct security provided by NATO forces, but also of incentives created by the NATO supply chain.

Agility and adaptation

As noted in Section 2, 'planners are liable for the consequences of the actions they generate.' Advance preparation for unintended consequences is essential, and can be viewed as the due diligence component of a campaign plan. One example of potential unintended consequences is the logistics programme being launched in southwest and west Afghanistan. Known as the Afghan Transportation Network (ATN), this began as a proof-of-concept in 2011 and as of 2013 is in use theatre-wide for all of NATO.⁷⁶

The ATN concept seems designed to maintain the positive effects of the HNT programme while eliminating the negatives. It seeks to establish a confederation of locally owned trucking companies to decrease reliance on private security companies. However, the end of the HNT programme and the implementation of the ATN may only further empower warlords – many of whom run trucking companies – by removing the middleman role previously filled by private security companies. Counter-intuitively, it may strengthen the political power of the warlords and further hobble efforts to create effective sub-national governance.⁷⁷

The motivation behind the ATN can be understood in the context both of the US congressional report detailed above which criticizes the HNT programme and of President Hamid Karzai's banning of private security companies earlier in 2012.⁷⁸ The Afghan Ministry of the Interior established the APPF to take on the duties once in the remit of private security companies, including convoy protection, but there are serious concerns over its capacity and long-term durability.⁷⁹

One US logistics officer explained that the ATN aims to 'promote cohesion and trust among tribes, provide a method for the regional command to strengthen key regional tribal leaders and to decrease or eliminate the reliance on private security companies' while facilitating 'the development of locally-owned trucking industries'.⁸⁰

76 '298th to 365th Transfer of Authority Ceremony', *Logfire Ledger Farewell Edition*, 8 January 2012, http://static.dvidshub.net/media/pubs/pdf_9984.pdf.

77 See Frances Brown (2012), 'Bureaucracy Does Its Thing, Again', *The American Interest*, Vol. 8, No. 2, November/December, and Frances Brown (2012), *The U.S. Surge and Afghan Local Governance*, US Institute of Peace, September.

78 'Afghanistan security firm ban stirs Western fears', BBC News, 20 March 2012, <http://www.bbc.co.uk/news/world-asia-17430998>.

79 Ibid.

80 'Va. battalion helps establish Afghan Transportation Network', *Virginia National Guard, The Commonwealth's Guardian*, 28 January 2011, http://vko.van.gb.army.mil/virginiaguard/newsletter/CGNewsletter2011/VaGuard2011Newsletter_02.pdf.

The US Joint Sustainment Command – Afghanistan (JSC-A), manages much of the NATO supply chain. In 2012 alone, it ‘coordinated more than 100,000 truck convoys [...] mostly using Afghan trucking contractors.’⁸¹ As part of the ATN, the JSC-A has approved a network of trucking companies known as Elder Owned Companies (EOCs) that ‘provide secure and reliable means of distributing reconstruction material, security equipment, fuel, miscellaneous dry cargo, and life support assets and equipment throughout the Combined/Joint Operations Area [...] *without the use of convoy security*’ [emphasis added].⁸²

To do this, the ATN seeks to use ‘the influence of Afghan leaders as part of Afghan-owned and operated transportation companies’ in order to ‘improve the security and freedom of movement of coalition sustainment convoys while relieving Coalition Forces (CF) from convoy duties and reducing the reliance on PSC and APPF security services’ – an ever-pressing need as NATO conducts its drawdown between now and 2014.⁸³

This provides a salient example of one complex adaptive system (the supply chain as coordinated by JSC-A) interacting with and seeking to influence another (Afghan society). This is being done in order to achieve a first-order effect (route security) to alleviate the burden on ISAF and ANSF forces without fully understanding second- and third-order effects for Afghanistan of influencing and potentially empowering Afghan leaders – many of whom hail from different factions and different sides of the ‘micro-conflicts’ described above and are outside the government’s control.⁸⁴

Precedent – tribal sheikhs in Iraq

There is a precedent that suggests influence programmes centred on logistics, such as the ATN, can produce results. The ATN ‘is reportedly modelled after a similar programme in Iraq that utilized significant sheiks within Iraqi tribes to form companies providing trucking services for US operations.’⁸⁵

This programme, known as the Iraqi Transportation Network (ITN), was designed in 2007 and built around engagement with a specific network – Iraqi tribal sheikhs. According to US DoD officials, these influential leaders ‘demonstrated their potential to deliver with protection of ITN trucks – no attacks – and quick action of issues that arise through tribal channels.’⁸⁶ Table 1, although rather simplistic in its calculations, provides one estimate of the economic benefits of the ITN.

81 Chris Kenning, ‘Fort Knox unit In Afghanistan packing it up’, *Louisville Courier-Journal*, 7 October 2012, <http://214.14.134.30/ebird2/ebfiles/e20121009908606.html>.

82 Joint Sustainment Command – Afghanistan (2012), ‘Afghanistan Transportation Network (ATN) – Southwest/West, Performance Work Statement’, 8 March, p. 1, <http://cryptocomb.org/Buying%20Hearts%20and%20Minds%20in%20Afghanistan.pdf>.

83 ‘To achieve mission requirements, JSC-A relies on a variety of transportation contract instruments, including the National Afghan Trucking (NAT) multiple award contract suite(s) and the Afghan Transportation Network (ATN) regional contract(s). While the NAT contracts provide transportation services throughout Afghanistan for both short and long haul missions relying heavily on the use of private security companies, Afghan Public Protection Force (APPF), or U.S. Government security services to provide convoy security.’ *Ibid.*, p. 1.

84 The only risks and threats identified in the Performance Work Statement are theft and pilferage.

85 Public Intelligence (2012), ‘U.S. Military Program Preferentially Awards Contracts to Companies Owned by Afghan Tribal Elders’, 30 April, <http://publicintelligence.net/u-s-military-awards-contracts-to-afghan-tribal-elders/>.

86 Jon Watson (2009), ‘Tribal Engagement in the Iraqi Transportation Network’, *The Navy Supply Corps Newsletter*, September/October, <http://www.navsup.navy.mil/scnewsletter/2009/sep-oct/cover3>.

Table 1: Iraqi employment with ITN

Number of truckers	Dependents	Economic multiplier effect	Total employment	Total impact
1	11.4	3.5	3.5	40
2	22.8	3.5	7	80
5	57	3.5	17.5	200
10	114	3.5	35	399
25	285	3.5	87.5	998
35	399	3.5	122.5	1,397
45	513	3.5	157.5	1,796
50	570	3.5	175	1,995
75	855	3.5	262.5	2,993
100	1,140	3.5	350	3,990
250	2,850	3.5	875	9,975
500	5,700	3.5	1,750	19,950
1,000	11,400	3.5	3,500	39,900

Source: Jon Watson (2009). 'Tribal Engagement in the Iraqi Transportation Network', *The Navy Supply Corps Newsletter*, September/October, <http://www.navsup.navy.mil/scnewsletter/2009/sep-oct/cover3>.

The Iraqi programme was meant to benefit not just the truck drivers but also their dependents, and to continue after US forces left the country. In this way the foundations would be laid for the growth of private-sector logistics companies in Iraq. The US DoD stated: 'The goal is that, after a couple of years, their revenue will come from commercial services, not military. Hopefully it will end up driving a lot of jobs, and it'll be a factor for economic prosperity in Iraq.'⁸⁷

The long-term goal was for the ITN to 'link local markets to the distribution chain, provide a more balanced import and export market, and promote business growth'. By the end of 2009, 'ITN drivers [had] completed more than 5,900 missions, without incident or loss of cargo.'⁸⁸

Planning for the unexpected

The Iraqi logistics network demonstrates the benefits of agility and adaptation, but more time may be needed before the effects of this project become clear. Returning to the Afghan context, the JSC-A has identified some second- and third-order effects, but all are positive opportunities: 'economic expansion, entrepreneurship, and skills training for the people of Afghanistan.'⁸⁹

87 Andrea Merritt (2008), 'Private Trucking Companies Improve Iraqi Economy', *American Forces Press Service*, 24 July, <http://www.defense.gov/news/newsarticle.aspx?id=50590>.

88 Michael J. Falk (2009), 'Iraqi Transportation Network', *Army Sustainment*, November/December, Vol. 41, No. 6, http://www.almc.army.mil/alog/issues/NovDec09/transpo_network.html.

89 Joint Sustainment Command – Afghanistan, 'Afghanistan Transportation Network (ATN)'.

The document further asserts:

The ATN business model provides a deterrent to insurgent activities by utilizing Afghan Leaders' influence to enhance the security environment for the movement of ISAF cargo, creating a mutual benefit between ISAF and the Afghan citizens/communities to create local economic opportunities which promotes regional security, resulting in the increased freedom of movement along identified routes for ISAF sustainment missions and the local Afghan communities.⁹⁰

These potential positive outcomes may materialize. Just as with any military campaign or operation, success is possible. But so is failure. Nowhere does the JCS-A identify threats and risks, which should be a central component of any planning process, civilian or military. Indeed, the JSC-A itself will not be running the ATN, and instead will contract it out to private industry.

According to Derek Gregory,

It took more than a year – until August 2011 – for the Host Nation Trucking contract to be cancelled and replaced by a new National Afghan Trucking contract. Yet more than half of the 20 contractors involved in the new scheme had been prime or subcontractors under the previous contract, and convoy security was still in the hands of private contractors. John Tierney, the Democrat chair of the original congressional inquiry, was exasperated: ‘We are right back to the same people that were involved in the problem that instigated the investigation.’⁹¹

The ATN concept itself may not be unsound, but it would seem that assessing second- and third-order effects in the context of the complexity of Afghanistan would be prudent. In the absence of due diligence in this area, NATO risks setting up an unstable coalition of highway militias that could have incentives to restrict rather than ensure freedom of movement for competing Afghan civilian commerce and even Afghan security forces. Of particular concern is how these EOCs would interact with Afghan Local Police units and if the JSC-A's efforts are being coordinated with Village Stability Operations.

Moreover, the JCS-A provides the physical location and contact information of the approved EOCs in an unclassified, open source document, which puts the operators and employees of these companies at risk from competing companies and other, potentially violent, actors in the insurgency or government.

An alternative outcome to the one envisioned by the JSC-A would see major chunks of southern and western Afghanistan's main supply routes come under the dominance of competing warlords and unstable local militias that collectively contribute to the recurrence of civil war. The ATN concept does not adequately balance the potential positives and negatives, and therefore it does not address the root problems identified by the US congressional report on the Host Nation Trucking Programme.

90 Ibid., p. 2.

91 Gregory, 'Supplying War in Afghanistan' (see note 54 above).

8 Looking Forward

'Nature is an existence proof that complexity is not the enemy of life, but complexity is the enemy of stasis.'

Dan Geer⁹²

The task ahead is large, and the logistical scale of the military withdrawal is significant. In February 2012, while in Kazakhstan working to secure transit agreements, UK Defence Secretary Philip Hammond noted that 'we have a major logistical operation to undertake to get around 11,000 containers and around 3,000 armoured vehicles back from Afghanistan and we will need to work with our partners in the region to do so.'⁹³ US troops are also scheduled to leave by the end of 2014, 'but not before crating gear, closing bases and moving out 50,000 vehicles and 100,000 shipping containers.'⁹⁴

The NATO demand for trucks and drivers will increase over the next two years before dissipating at the end of 2014, and what will be left in its place is uncertain. What will happen to the logistics initiatives described earlier, along with their beneficiaries, when the withdrawal is complete?⁹⁵ What will happen to the trucks, the drivers and the wider logistics networks? Given that the decade-long influx of foreign funds has made up a significant proportion of Afghan GDP, what kind of market will exist for Afghan contractors and truckers when foreign money slows to a trickle and eventually disappears? Will development aid fill that gap?

One Afghan, who contributes seven trucks to a cooperative with five other owners, noted that 'we worry about our fate when NATO leaves, because the Taliban also call us the infidels. For them, we are not just the enemy, but also traitors.'⁹⁶ He also expressed concern that independent truckers (i.e. those who do not work for the largest companies) are forced to rely on brokers and middlemen who pocket up to 50 per cent of the contract funds. For that businessman, at least, the elimination of the military supply chain will negatively affect his livelihood, and perhaps endanger his life.

The UK armed forces recognize that contractor support to military operations 'is now used across the spectrum of support activities', and 'over 6,000 contractors and civilians are deployed

92 Dan Geer, 'Keynote, Source Boston Conference', 13 March 2008, <http://www.sourceconference.com/publications/bos08pubs/dan-geer-keynote.html>.

93 UK Ministry of Defence (2012), 'Defence Ministers visit central Asian countries', 28 February, <http://www.mod.uk/DefenceInternet/DefenceNews/DefencePolicyAndBusiness/DefenceMinistersVisitCentralAsianCountries.htm>.

94 Kenning, 'Fort Knox unit In Afghanistan packing it up'.

95 Ainsley Butler, 'The Painful Story of Contracting in Afghanistan: I know a guy ...!', Business Fights Poverty, 14 June 2012, <http://www.businessfightspoverty.org/profiles/blogs/the-painful-story-of-contracting-in-afghanistan-i-know-a-guy>.

96 Rob Taylor and Hamid Shalizi, 'Afghan truckers a forgotten front in a war growing deadlier by the day', *The Star*, 29 July 2012, http://thestar.com.my/news/story.asp?file=/2012/7/29/worldupdates/2012-07-29T043027Z_1_BRE86S01W_RTROPTT_0_UK-AFGHANISTAN-CONVOYS&sec=Worldupdates.

in direct support of the UK on Operation Herrick.⁹⁷ Not only is contractor support to operations 'wider than logistics and incorporates support activity in its widest sense', but 'MoD management of contracts and contractors lacks coherence and consistency'.⁹⁸ There is acknowledgment that, given this high degree of interaction, the relationship with contractors is in need of enhanced and sustained scrutiny, and reviews have been under way for several years to address these issues. The Total Support Force concept is one result that aims for a more effective integration between the MoD and contractors.⁹⁹

This is where lessons can be identified for future campaigns. If NATO forces had planned for a five-year campaign (let alone a decade), would logistics have been configured differently? Would more emphasis have been placed on using the supply chain to deliver influence as well as supplies? And would more thought have been given to local and regional economic distortions caused by the influx of supply chain money? If so, what could have been done differently and better?

There is no 'stopping rule' to these wicked problems, and no point at which a conclusive solution will be reached. Every theatre of operations brings unique problems. The law of unintended consequences (as seen in the 2003 de-Ba'athification of the Iraqi Army by US authorities) should give planners pause for reflection when attempting to influence a complex system. Integrating complex military and contractor supply chain systems will always remain difficult, but pursuing greater efficiency – while remaining mindful of the ethical dimension of decision-making – remains imperative. Efforts to understand better the complex system that is being influenced, such as Afghanistan, are absolutely essential. Pursuing greater strategic efficiency is possible, in this case through structuring the supply chain as an instrument of influence.

97 'Contractor Support to Operations: Tiger Team Final Report', 16 March 2010, Report written by a joint team including personnel from the UK Ministry of Defence, the Foreign and Commonwealth Office and the private military and security industry, pp. 4 and 13, http://psm.du.edu/media/documents/national_regulations/countries/europe/united_kingdom/united_kingdom_ministry_of_defence_tiger_team_report_2010.pdf.

98 *Ibid.*, pp. 10 and 13.

99 'Supporting current and future operations', *The British Army Journal 2011*, <http://army.newsdeskmedia.com/supporting-operations>.

9 Conclusion and Recommendations

This report has shown that there are opportunities to use the UK and wider NATO military supply chain more effectively to influence local and regional populations, and to further UK objectives. This applies to the conflict in Afghanistan as well as future expeditionary campaigns.

The report has applied the concept of wicked problems to demonstrate the fiendish difficulty of dealing with socio-technical problems. The framework of complex adaptive systems shows how components of a system can learn through interaction, and by doing so become far more complex. Network theory helps the analyst make sense of one part of a complex adaptive system, be it social, political, economic or military.

These supply chains increasingly require interconnected services and myriad actors to cope with the problems they encounter. Highly context-specific measures are often necessary, given that every wicked problem is essentially unique and novel. Current efforts to calibrate the NATO supply chain in Afghanistan for maximum effect have taken many years to implement. Without sustained focus, any influence it may already have on local and regional populations is likely to dissipate as NATO forces withdraw.

The recent military campaigns in Iraq and Afghanistan presented very different logistics challenges, and paying attention to local and regional nuances is essential.¹⁰⁰ Recognizing and acknowledging the relevancy of internal 'micro-conflicts' to the bigger picture pay dividends in the long run, as does knowing when the solution is 'good enough'. Closer interaction between primary supply chain contractors (e.g. the MoD), economists, and cultural and social anthropologists could identify more accurately areas where supply chain resources can move things from A to B as well as building sustainable economic and political capacity.

The introduction of one complex system (the NATO supply chain) into another (Afghanistan) has created numerous side effects whose long-term impacts may have been overlooked in order to satisfy short-term requirements. Employment of local residents produces immediate economic benefit, but may disappear along with coalition forces. And payments to local power brokers along transit routes may provide immediate security but fund actors and actions that counteract the United Kingdom's strategic goals in Afghanistan.

The assumptions and considerations underpinning these decisions need to be examined, and new ways of developing coherent strategy and delivering influence need to be explored. This report makes the following primary recommendations.

¹⁰⁰ 'The security situation in Northern Ireland is a good example of understanding local nuances. Many of the supply chain questions could also be asked about Northern Ireland, but it is not a popular subject to talk about.' Interview with officer 1 deployed in support of UK forces in Afghanistan, 1 May 2012.

Faster adaptation is essential for developing and enhancing the capabilities of a modern wartime supply chain.

There is a need to assess more regularly the wider military supply chain for suitability in uncertain environments. Remaining competitive in this environment will require new incentives, and new ways of rewarding adaptation. This could come through increasing the attractiveness of logistics in the military career hierarchy, or forming logistics reserves (in the public or private sectors) that provide expertise and can be mobilized swiftly.

The relative predictability of Cold War military logistics is unlikely to return. In its place are the messy, sometimes protracted, and always highly dynamic battlefields of the 21st century. The UK armed forces are still adapting to this new reality and its implications for defence procurement, training of increasingly specialized personnel, and management of logistics in an information-saturated supply chain and battle space.

It is nice to have cutting edge-technology, but retaining talent will remain a core component of a robust logistics corp. Experienced risk managers are always in short supply, but they will become increasingly valuable as the effects are felt from cuts to defence personnel. The military supply chain must be willing to compete for this talent with the private sector.

There is a need to align contractors more closely with strategic military interests, and to make contractor management a core logistics competency.

Intelligent management of the contracting ecosystem is necessary at all stages of the supply chain. Progress can come through closer alignment of contractors with strategic military interests. Contracts could be written with a view to more strongly discouraging behaviour that counteracts strategic goals (e.g. corruption) and incentivizing behaviour that reinforces strategic goals (e.g. strengthening the Afghan economy through local procurement and employment). In this way corruption would be further discouraged not only because it wastes taxpayer money, but also because it is counter-productive to UK strategic aims in Afghanistan.

This is particularly challenging in environments where 'corruption' is not perceived as such, but rather is a way of doing business. The opportunity for the UK armed forces is to use the contracting process to encourage a change in norms of commercial behaviour. This will be easiest to do with companies that operate internationally (or have aspirations to do so) and that are more likely to adhere to financial best practices.

This includes gaining greater clarity, in and out of theatre, over who is managing specific contracts. In some areas this intelligence is in ready supply, though opacity, waste and corruption in the supply chain tend to increase with proximity to the battlefield. Some of this can be attributed to the 'fog of war', or to the challenges that contractors from developed states face when trying to manage a supply chain in less developed (or even failed/failing) states. But some of it is due to the demands of meeting targets set in a narrow organizational spectrum, with little incentive to look at the long-term effects this may have on strategic aims.

There is a broader need to clarify and codify the relationships between the armed forces and contractors. The Total Support Force process appears to be encouraging development in this area, by writing contracts with prime contractors so that their work supports strategic UK

aims.¹⁰¹ Cuts to the armed forces will place a premium on close interaction between the military and contractors, as well as shared understanding of problems. Closer integration of logistics into strategic campaign *planning* will also allow supply chain resources to be more effectively employed as instruments of influence in theatre.

Greater financial transparency is needed in the military supply chain.

Independently verifiable internal and external logistics transparency measures are needed to support the supply chain as a tool for delivering influence. To be transparent and to be seen to be transparent in this area is essential not only for the benefit of Afghans but also for citizens of countries that are supporting military, reconstruction or development efforts in Afghanistan. This could take the form of a genuinely empowered Special Inspector General for the supply chain, along with independent assessments by an organization such as Transparency International.

Corruption is counter-productive on many levels, and expediency in the supply chain should not be encouraged at the expense of strategic aims. Ignoring or otherwise permitting warlords and militias to extract protection money from the supply chain damages the legitimacy of coalition forces and the Afghan government, and can erode or counteract progress on other strategic goals. This is also an area where Afghans make little distinction between coalition forces. One coalition member turning a blind eye to corruption in the supply chain can compromise the efforts of others.

The scale of contracting corruption (in the past decade) identified by US Special Inspectors General in Iraq and Afghanistan exceeds the GDP of many small nations. One of their recent Afghanistan reports noted that corruption is endemic in the public sector, with the logistics sector being particularly susceptible.¹⁰² Attempting to influence a complex system requires careful consideration of unintended consequences. A motto to ‘first, do no harm’ – from a strategic perspective – would be an appropriate starting point for using supply chain resources as tools of influence, but this must be supported with tangible measures such as robust and independent transparency measures.

Remnants of the NATO wartime supply chain can to be re-tooled to serve as a networked local and regional agricultural transport industry.

There is potential for the remnants of the NATO wartime supply chain to be re-tooled to serve as a networked local and regional agricultural transport industry. The resources invested in the supply chain over the past decade have been substantial. The drawdown of the military campaign and supply chain presents risks, some of which have been explored in depth in this report. However, it also represents opportunities. Southern Afghanistan is as troubled and violent as key eastern districts of Paktia, Paktika and Khost. The agricultural sector represents by far the largest segment of the licit and illicit economies of the southern districts of Kandahar and Helmand.

Poppy cultivation, processing and transportation enable and drive instability in the short term and hinder the development of the Afghan economy in the long term.¹⁰³ There are numerous incentives for farmers to grow poppy: it is a hardy crop, its market price is higher than other

101 Interview with officer 1 deployed in support of UK forces in Afghanistan, 1 May 2012.

102 Emma Graham-Harrison, ‘Afghanistan security forces report raises fears over long-term stability’, *The Guardian*, 1 November 2012, <http://www.guardian.co.uk/world/2012/nov/01/afghanistan-security-forces-report-fears>.

103 Ryan Evans (2012), ‘The Micro-Level of Civil War’, *Afghanistan Opium Survey*, April (New York: UN Office of Drugs and Crime).

options, and it can be grown with ease on low-quality land. Unlike other crops, poppy buyers will come directly to the farmer for collection. This saves the farmer an expensive and dangerous trip to the nearest market, which can be hours away by vehicle – a luxury that most farmers in Helmand do not enjoy. The UK Department for International Development and the United States Agency for International Development have worked with little success to develop agricultural co-ops that could increase the incentives to grow legal crops, and the transport issue is even more difficult to address.

This agricultural transport industry would facilitate the purchase and collection of crops at farms across Helmand and Kandahar, and transport them to markets in urban centres of Afghanistan and into Pakistan, Iran and elsewhere. If executed properly, this has the potential to be a boon for Afghanistan's agricultural industry, benefit the Afghan trucking industry and remove its dependence on wartime commerce, displace key incentives for poppy cultivation, and provide an environment more conducive to stability in rural areas.

More adept management of 'big data' is essential in the military logistics environment.

Complex systems and interactions between disparate and often conflicting networks are increasingly prevalent in modern conflict, and dealing with this challenges both the public- and private-sector elements of the supply chain. Understanding this environment will require more adept management of the growing sea of information known as 'big data'. This refers to data sets of structured and unstructured information, which are increasing in volume, variety and velocity (in terms of collection and processing of data).

Data analysis and visualization tools are needed to peer inside the data-rich networks of a complex logistics system, using whichever lens is desired, and to make the desired correlations and adjustments. This requires sharing data across platforms and between partners. Proprietary systems are often a hindrance in these circumstances. Open standards and commercially available software can provide greater flexibility and scalability, as well as robust access and identity management that can be adapted to encompass supply chain partners.

Grappling with the abundance of this information, in addition to merging legacy logistics systems with cutting-edge technology, will be a huge task not just for the supply chain but also for the UK armed forces as a whole. It will necessitate significant investment – in terms of people, process and technology – to address the first principle of logistics: *foresight*.

Finally, there is need for a volume to update Martin van Creveld's *Supplying War* (1977) and address comprehensively the challenges of wartime logistics in the modern, globalized world. Although the cultural, bureaucratic and organizational challenges he described remain familiar, the scale and complexity of military supply chains have grown by orders of magnitude. Adaptability and agility are competencies of the highest order, and will remain indispensable for logisticians and strategists in the 21st century.



Chatham House, 10 St James's Square, London SW1Y 4LE
T: +44 (0)20 7957 5700 E: contact@chathamhouse.org
F: +44 (0)20 7957 5710 www.chathamhouse.org
Charity Registration Number: 208223