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Royal United Services Institute
for Defence and Security Studies
Whitehall
London SW1A 2ET
United Kingdom
+44 (0)20 7747 2600
www.rusi.org
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Executive Summary

The Ministry of Defence (MoD) has striven in recent years to become more business-like in the manner in which it choreographs and exercises the various components of defence. Yet the MoD has an observable tendency to underestimate the complexity and importance of its supply base and thus to live with the risks and uncertainties that remain unidentified and not properly assessed. The Whole Force approach has not addressed this issue; indeed, its early focus on personnel policies and management, at the expense of other considerations, has exacerbated this situation.

Based on an analysis of the MoD as both consumer and producer, and drawing on the literature relating to supply-base management and resilience, this paper makes the case that the Whole Force approach needs to develop into more overt portfolio management of the entire defence extended enterprise (DEE). It suggests that the MoD has to properly understand the composition of the UK DEE; consider how it should be managed, assured and refreshed; and develop risk and resilience policies and practices relating to it.

The Defence Extended Enterprise and its Implications for the Ministry of Defence

In the summer and autumn of 2015, the Ministry of Defence (MoD) was engaged in the preparation of the Strategic Defence and Security Review (SDSR), the successor to that published in 2010. Doubtless there will be some important announcements in the 2015 review when it appears before the end of the year, not least with regard to the UK nuclear deterrent and maritime air-patrol capability or multi-role aircraft. Yet commanders and analysts alike will be keen to explore the extent to which the SDSR takes forward the government's commitment to its Whole Force Concept for defence, whereby military personnel, civil servants, reserves, contractors and myriad elements of multiple supply chains merge to deliver the sought-after military effects. This Whole Force approach, or 'enterprise' management stance, is how the UK will exercise defence and security in the years ahead. This paper makes the case that all of its components are not even mapped, let alone properly understood by policy-makers.

The essence of this occasional paper's argument is that the MoD has a tendency to understate the importance of its supply base and thus to live with risks that are not properly appreciated and assessed. The development of the Whole Force approach, with its focus on policies relating to personnel, has exacerbated this situation. We argue for explicit attention to be given to what should be recognised as the defence extended enterprise (DEE) and, to justify this argument, the paper builds a series of points that explore the implications of the MoD's own assertion that it needs to be (more) 'business-like'. Testing what that phrase actually means, this analysis examines the contrasting roles of large manufacturing or capital-intensive service businesses, compares current MoD stances and behaviour with this business-like approach and seeks to unpick where the Whole Force approach sits within this intent. We then offer conclusions and suggested next steps.

The MoD as Buyer/Consumer or Producer

Within much of the business literature there is a clear distinction between commercial entities which are buyers of goods or services – therefore meeting a need, or selling-on into the marketplace – and those which are manufacturing entities that blend raw materials, technologies, production know-how and specific components to generate and, thereafter, support a particular product or service.[1] Based on this distinction, a first step for defence analysts is to consider whether the MoD should be seen primarily as a buyer and user of goods

1. For example, see Mark Saunders, Philip Lewis and Adrian Thornhill, *Research Methods for Business Students*, 2nd edition (Harlow: Pearson, 2000).

and services, akin to the individual consumer, or whether it should be viewed in the guise of a major entity that sources, blends, amends, develops and delivers military products or effects.

When the individual consumer opts to buy a television or even selects a builder for a home extension, he or she does not normally worry about the impact of the choice on supply chains or even how the television manufacturer selects its suppliers. The focus is on the price, performance and reliability of the final product and the consumer holds the brand manufacturer responsible for all the features of the product, regardless of where they came from: should the Toyota-owner ever press the door opener on the key fob and find the car stayed locked, he or she would not observe that Toyota must have chosen a poor lock supplier. Indeed, some officials and political figures associated with defence view the MoD as essentially a purchaser of goods and services from the private sector for deployment to meet defence and security ambitions. In interviews conducted in May to September 2015, a number of MoD officials and service personnel took this initial instinctive position.[2]

A contrasting view underlines that the MoD is responsible for 'producing' things and not just 'using' things. The MoD's own reporting and performance-measurement systems show that it is responsible for the generation of outputs (force elements able to act at varying degrees of notice) and outcomes (deterrence and success on operations).[3] The MoD's central task is to produce UK defence policy and then to direct the generation of military capabilities that support the delivery of that policy. In the event of a government decision to use those capabilities on an operation, it is then the role of the MoD to oversee and even control that use so that it supports political objectives and operates within government-specified constraints.

Under this approach, the MoD, and the armed forces and agencies within it, are significantly analogous to manufacturing organisations, bringing together all the diverse elements required for usable and sustainable defence capability. Some of those elements they generate within the governmental defence sector while (many) others are sourced from outside.

It would be difficult to exaggerate the dependence of UK defence on suppliers in the private sector, where the MoD spends more than half of its money. Most obviously, the MoD obtains all its equipment, spare parts and fuel from the private sector, with the days of the state arsenal being long gone. Moreover, the MoD is remarkably capital intensive, investing around a quarter of its budget each year in the development and production of new equipment. While the valuation of military equipment is clearly problematic in many ways, it is striking that the MoD's 2014/15 Annual Report records the MoD holding property, plant and equipment assets worth £95 billion and intangible assets – mainly reflecting research and development (R&D) spending on equipment – of £25.5 billion,[4] which together represent more than three times the Ministry's annual cash spend.

2. The authors conducted a number of semi-structured interviews with MoD officials and members of the armed forces between May and September 2015.
3. See multiple annual editions of the MoD's Annual Report and Accounts. For the 2014–15 edition, see MoD, *Annual Report and Accounts: 2014–2015*, HC 32 (London: The Stationery Office, 2015).
4. MoD, *Annual Report and Accounts: 2014–2015*.

Within this context, a major influence on defence policy has been the strand of New Public Management[5] thought which asserts that government bodies are generally not as good at the generation of goods and services as the private sector. This, alongside a commitment and preference to reduce the number of civil servants, has left the MoD predisposed to further outsourcing, not least of services. In 2015 the MoD sold the Defence Support Group, formerly an MoD agency, to Babcock, prompting the website Think Defence to establish a review entitled 'What is There Left to Outsource?'[6]

While less significant in overall financial terms, it is striking how much the MoD has passed responsibility for even the generation of innovative ideas and initiatives for change to the private sector. For example, in 2015 in the Defence Equipment and Support (DE&S) organisation, Bechtel and CH2M Hill were advising on project- and programme-management transformation, while PwC was advising on human resources. Even when the MoD sought to manage aspects of the extended enterprise, it needed others to help provide guidance on how to do it. Below is an excerpt from the website of PA Consulting:[7]

> The UK Ministry of Defence (MOD) submarine programme enables the UK to maintain a continuous 'at sea' strategic deterrence and is one of the world's most complex Programmes. The challenge for the MOD is to deliver the programme to time and cost through four sole providers of submarine build, propulsion, support and warhead capabilities, for elements of which the UK can be the only customer.
>
> Without being able to apply normal commercial levers, the MOD saw that managing these suppliers tactically on a project-by-project basis would not be enough. As such, the MOD first asked PA to work with them to design a new strategic supplier management capability. PA led work as part of a joint team to establish this capability through the long-term Submarine Support Partner arrangement ...
>
> [We] established governance structures, supplier strategies, performance monitoring mechanisms and analysis capabilities that have started to deliver results.

The conclusion is clear and overt from a commercial perspective such as this: without external expertise the MoD would be unable to meet its obligations to the nation.

The MoD must be able to both generate capability and then, when called upon, to use it. This means that the MoD requires significant flexibility and agility from its supply chains: defence equipment used on operations generally requires more fuel, spare parts and so on than when it is in a training or standby role. Moreover, many operations since the end of the Cold War (and

5. New Public Management developed in the 1980s and 1990s as a way of championing commercial ideas and practices over what was traditionally held to be 'public.' See Tony Tinker and Tony Puxty, *Policing Accounting Knowledge* (London: Paul Chapman Publishing, 1995).
6. Think Defence, 'What is There Left to Outsource', 4 July 2015, <http://www.thinkdefence.co.uk/2015/07/what-is-there-left-to-outsource/>, accessed 25 August 2015.
7. PA Consulting, 'Enhancing the MOD's Capability to Manage "Monopolistic" Suppliers on a £27 Billion Programme', <http://www.paconsulting.com/our-experience/enhancing-the-mods-capability-to-manage-monopolistic-suppliers-on-a-27-billion-programme-uk-ministry-of-defence/>, accessed 8 June 2015.

before that, the Falklands War) had not been envisaged in long-term defence plans, contained an element of surprise and thus placed special demands on defence suppliers to accelerate production of certain items, to modify equipment for a particular campaign and theatre, and then to come up with novel products.[8] The term Urgent Operational Requirement has become familiar in defence discourse, with UK forces having generated hundreds of these since the end of Cold War.

Thus the MoD can place significant demands on its suppliers, requiring them first to be efficient and effective in delivering their goods and services, and then flexible and agile in terms of being responsive to radical and rapidly changing circumstances. Finally, in defence, where human lives – as well as operations of crucial importance to governments – can be at stake, it should be hoped that supplies to the MoD should be resilient – that is, not excessively vulnerable to shock. Resilience has three dimensions: the capacity to avoid disruptive shock; the mitigation of an immediate response should such a shock occur; and the rapid, as opposed to protracted, recovery from shock.

Large Manufacturing Bodies, their Supply Base and Academic Writing

If there are parallels between the MoD and large manufacturing organisations, how do such bodies behave with regard to their supply base, and what guidance can be derived from contemporary management thought?

Very often, large companies have developed a significant external supply base and focused their internal efforts on a few specific areas. In the commercial world, the concept of core competencies has had a huge influence on the shape of organisations.[9] The idea is that organisations, and their component parts, cannot be expected to excel at more than a few things and that therefore they should focus on what they absolutely can be good at and need to be good at. Things that they need but do not excel in producing should be obtained from those that specialise in those areas. The result has been extensive outsourcing of both support functions, such as catering and facilities management, and the supply of goods and services needed directly for a company's products; in contrast to the days when Ford sought to run its own rubber foundations to supply the raw material for its tyres, Ford no longer specialises in tyre technology but relies on others who do.[10] Nike focuses on design and marketing, and outsources actual manufacture, as do many clothing firms. Apple addresses technological innovation, design and product development, but oversees manufacturing rather than do

8. For illustrations of UK experiences in mobilising the private sector to support military operations since 1991, see Trevor Taylor, John Louth and Henrik Heidenkamp, 'Industry and the Military Instrument', in Adrian L Johnson (ed.), *Wars in Peace: British Military Operations since 1991* (London: RUSI, 2014), pp. 291–320.
9. Arguably, the ground-breaking publication here is Gary Hamel and C K Prahalad, *Breakthrough Strategies for Seizing Control of Your Industry and Creating the Markets of Tomorrow* (Boston, MA: Harvard Business School, 1994).
10. See Michael E Porter, *Competitive Strategy: Techniques for Analyzing Industries and Competitors* (New York: Free Press, 1980).

much itself. In his influential book first published in 1992, Martin Christopher argued that it was more useful to view competition as being among supply chains than simply among lead manufacturers.[11]

In addition, the transport and communications possibilities offered by developing relevant technologies, and the political embrace of more open international trade agreements, have meant that supply chains have become complex and global for many manufactured goods. The components and sub-systems of many familiar products such as automobiles and personal computers are sourced from around the world, and the most complex technologies are now just components within a larger platform, sourced and traded globally.

These trends have significantly increased the importance and domain of supply-chain management as enterprises recognise the need to be aware of not just the current performance but also the medium- and long-term health of those organisations on which they depend. Volkswagen, with 6,000 suppliers in Europe alone, notes that, not least because of the rate of technological change, '[in] future, a key success factor will be a highly efficient global supplier network', and has launched its Future Automotive Supply Tracks (FAST) programme.[12] Companies need also to be sensitive as to what should be the limits of outsourcing: Boeing, for instance, was criticised for having outsourced too much on its 787 project. Also, as both the Airbus A380 and the Boeing 787 experienced delays in entering service and large-scale production, the two prime contractors had to monitor key suppliers lest some went out of business as a result of anticipated revenues from aircraft production not being available.[13]

Reflecting such developments, academic analysts articulate the concept of the 'extended enterprise', comprising the lead company and all those on whom it depends.[14] Supply-chain management emerges as a much broader topic than just checking whether a firm delivered to the right place, at the right time, to the agreed quality, for the agreed price. The best firms look to the future development of their suppliers, helping them to innovate and listening to their ideas. There are two key dimensions of supply-chain management, of which 'understanding' is the first: purchasers need a lot of information about the current and likely future condition of

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11. The book has been regularly updated. See Martin Christopher, *Logistics and Supply Chain Management*, 4th edition (London: Financial Times, 2010) .
12. Comments made by Francisco Javier Garcia Sanz, Volkswagen board member responsible for procurement, as reported in Supply Chain 24/7, 'VW Ready to Transform Automotive Supply Chains', 3 March 2015, <http://www.supplychain247.com/article/vw_ready_to_transform_automotive_supply_chains>, accessed 3 September 2015.
13. 'Boeing also had to pay strategic partners compensation for potential profit losses stemming from the delays in production', for this and wider Boeing problems with supply-chain management and the 787. See Steve Denning, 'What Went Wrong at Boeing?', *Forbes*, 21 January 2013. See also Yasuhiro Monden, *Toyota Production System: An Integrated Approach to Just-in-Time*, 3rd edition (Norcross: Engineering and Management Press, 1998).
14. See James E Post, Lee E Preston and Sybille Sachs, 'Managing the Extended Enterprise: The New Stakeholder View', *California Management Review* (Vol. 45, No. 1, Fall 2002); Dan Jones and Jim Womack, *Seeing the Whole: Mapping the Extended Value Stream* (Cambridge, MA: The Lean Enterprise Institute, 2002); Andrew Humphries and Richard Gibbs, *Enterprise Relationship Management: A Paradigm for Alliance Success*, new edition (Farnham: Gower, 2015).

suppliers that are important to them. Precisely which information should be collected depends on market structures and dynamics so there is no set database for a purchaser to populate. For example, the supply-chain information needs of a company such as BAE Systems – which relies on hi-tech components and, sometimes, volatile raw materials – are significantly different from a firm such as Aldi, the high-street discount store.

Second is the action dimension: purchasers have to select what they are going to do to incentivise and support their suppliers to ensure their survival and, preferably, continual improvement. Moreover, the dominant type of relationship in the extended enterprise has been collaborative rather than adversarial.[15] The objective of the Volkswagen FAST programme noted above is 'to prioritise investments and make efficient use of resources *in closer cooperation with suppliers'* [authors' emphasis].[16]

It also has become clear that risk must be a significant consideration in a firm's decision to rely on complex and global supply chains, as experience shows that misjudgement or neglect of supply-chain management could be catastrophic.[17] There are a number of high-profile cases where firms were severely impacted by supply-chain failure: in 1997, Toyota car production in Japan was halted for several days by a fire in a supplier's small factory producing brake and clutch parts;[18] in 2000, the Ericsson mobile-phone business suffered fatal damage from a small fire in a Philips factory in Albuquerque, New Mexico;[19] and the 9/11 attacks had repercussions well beyond the firms based in the World Trade Center.[20] Thus, leading businesses were drawn to give attention to risk, resilience (the ability to bounce back from shock and damage) and agility throughout the extended enterprise rather than just within their own organisations.

From this short analysis it can be gleaned that four key factors for supply-chain resilience have been asserted: visibility (of the supply chain); collaboration (among the organisations involved); flexibility (the capacity to adapt); and control (mechanisms to ensure that policies are

15. See Jeffrey H Dyer, *Collaborative Advantage: Winning through Extended Enterprise Supplier Networks* (Oxford: Oxford University Press, 2000); Ed Davis and Robert Spekman, *The Extended Enterprise: Gaining Competitive Supply Chains through Collaborative Supply Chains* (Upper Saddle River, NJ: Financial Times, 2004).
16. Supply Chain 24/7, 'VW Ready to Transform Automotive Supply Chains'.
17. See Steve Denning, 'The Boeing Debacle: Seven Lessons Every CEO Must Learn', *Forbes*, 17 January 2013; Donald Waters, *Supply Chain Risk Management: Vulnerability and Resilience in Logistics*, 2nd edition (London: Kogan Page, 2011); Institute of Risk Management, 'Extended Enterprise: Managing Risk in Complex 21st Century Organisations', 2014.
18. Valerie Reitman, 'Toyota Halts Japan Production after Fire Destroys Factory', *Wall Street Journal*, 3 February 1997.
19. See Amit S Mukherjee, *The Spider's Strategy: Creating Networks to Avert Crisis, Create Change, and Really Get Ahead* (New York, NY: FT Press, 2008), chapter 1; Yossi Sheffi, *The Resilient Enterprise: Overcoming Vulnerability for Competitive Advantage* (Cambridge, MA: MIT Press, 2007).
20. According to the *New York Times*, the damage to business caused by the attacks amounted to $123 billion and the total cost including the direct damage and the consequent increased defence and security spending amounted to $3.3 trillion. See Shan Carter and Amanda Cox, 'One 9/11 Tally: $3.3 Trillion', *New York Times*, 8 September 2011.

followed).[21] Clearly, though, it is not enough to simply recognise the existence of the extended enterprise. There is a need also actively to manage it by anticipating the future; giving direction; and planning, organising, co-ordinating and monitoring performance.[22] Moreover, responsibility for the extended enterprise must lie with a specific person and group: in a private company that would be the chief executive working with the board. Finally, extended-enterprise management seems to pay off: Theano Liakopoulou of McKinsey told a London audience in May 2015 that those who develop and collaborate well with their suppliers create fifteen times the value of the average relationship.[23] While recognising that such a sum is hard to quantify, Oxford Economics conclude in an analysis of BAE Systems' contribution to the UK economy that collaborative supplier relationships were critical to the company's success.[24]

The MoD and Private-Sector Practice

This thinking is profoundly important and relevant, not just to defence-industrial concerns, but to the MoD itself. While the armed forces clearly are not businesses, if being business-like essentially means being concerned with efficiency and effectiveness, being sensitive to alternative possible uses of money, promoting the careful management of risk and resilience, and taking appropriate account of persuasive management thought and successful commercial practices, an exhortation to be business-like would seem eminently reasonable guidance. However, it implies significant constraints on how the Ministry, as responsible for UK defence as a whole, should transfer responsibilities and risks to other government bodies, including the single services and DE&S, and to the private sector.

The notion of the extended enterprise can and should be applied to the MoD itself given its clear dependence on external suppliers for the provision of key goods and services, including guidance. Thus we refer to the defence extended enterprise, which should be seen as encompassing institutions and entities beyond the MoD, armed forces, broader governmental bodies and the more high-profile defence manufacturers and suppliers. In a sentence, it comprises all those organisations, people and competencies that combine to enable the generation and effective use of national-defence capabilities.

For enterprise management to be effective, it requires a clear-eyed understanding of the elements that lie within its managerial scope and those beyond its borders. This, of itself, is difficult given the obvious tension between what is controllable by government and what lies beyond its influence. Moreover, the national origins of much UK military equipment obviously lie outside the UK. They prominently involve the US, to a lesser extent Western Europe, and supply chains beneath prime contractors that probably extend across the world. This is very important

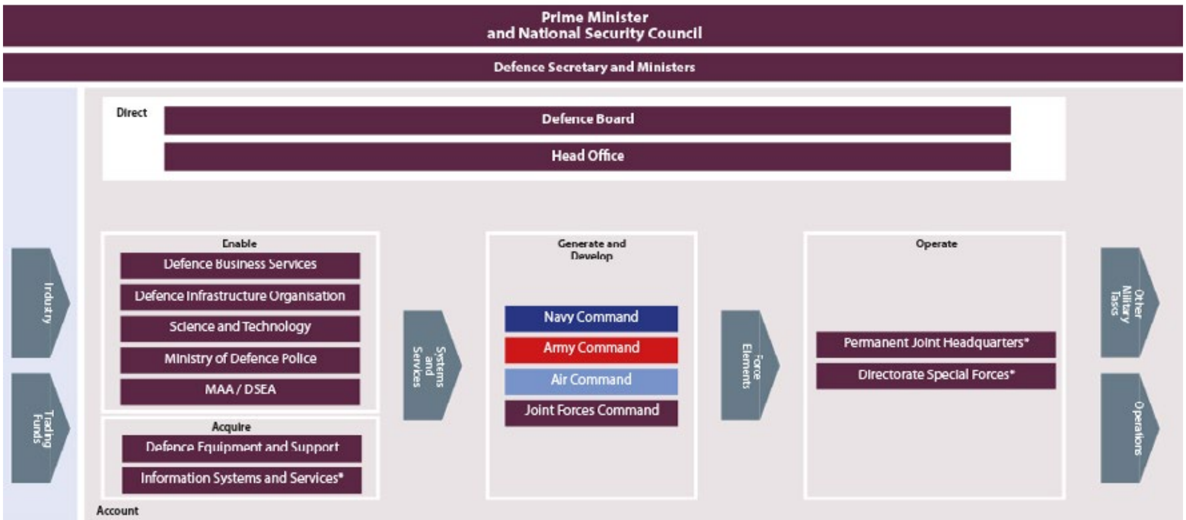
21. Kelly Marchese, Siva Paramasivam and Michael Held, 'Bouncing Back: Supply Chain Risk Management Lessons from Post-Tsunami Japan', *Industry Week*, 9 March 2012.
22. These basic management functions were first articulated in 1916 in Henri Fayol, *Administration industrielle et générale* (Paris: Dunod, 1916).
23. Paul Snell, 'Four Factors that Define Procurement Excellence – Expert', *Supply Management*, 8 May 2015.
24. Oxford Economics, 'The Economic Contribution of BAE Systems to the UK in 2009', 2011.

for defence which requires a further understanding of the components necessary for UK security, such as the technologies that reside beyond the country, the degree of reliance and dependency on non-UK registered businesses, and the assessed and mitigated risks associated with supply.

The MoD and the DEE

To what extent is extended-enterprise management currently reflected in MoD structures and practices? First, the Defence Operating Model, which is included in the MoD's own guide to its workings, 'How Defence Works', does not give any prominence to the role of external suppliers. The model, reproduced in Figure 1, does not indicate that over half the Ministry's money – and therefore hopefully more than half the elements of capability – goes to the private sector.[25] Nor does it signal any awareness of the overall nature (size, location and complexity) of the defence enterprise.

Figure 1: The Ministry of Defence Operating Model.

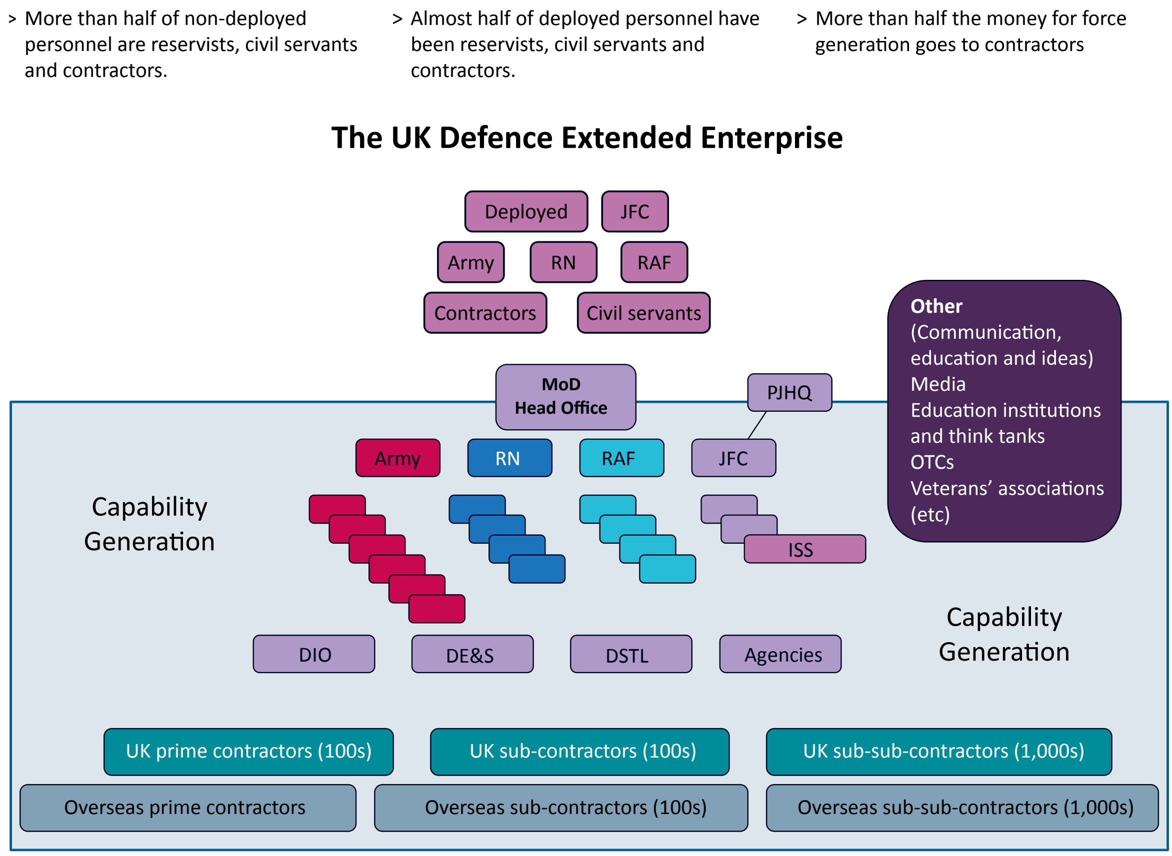


Source: MoD, 'How Defence Works', version 4.1, September 2014.

Figure 2 offers an alternative and very different picture of how defence works from the extended-enterprise perspective developed in this paper. It shows the multi-faceted elements of the defence enterprise and how components potentially relate to one another.

25. MoD, 'How Defence Works', version 4.1, September 2014.

Figure 2: The Defence Extended Enterprise.



Source: The authors.

Second, in top-level formal documentation on acquisition, which covers the procurement of goods and services (the Defence Equipment and Support: Framework Document; the Acquisition System Operating Model; and Defence Acquisition System) attention is focused on the interaction of the four commands with DE&S (a 'bespoke trading entity' with an arms-length relationship with its military customers and a 'hard boundary' between itself and the MoD).[26] The sorts of concerns noted above found in the business world about understanding and working with suppliers, and supply agility, risk and resilience, cannot be discerned. The perspective is very much that of the MoD as buyer/user/consumer.[27]

This is not to say that the MoD pays no attention to its suppliers: chaired by the secretary of state, the Defence Suppliers Forum meets twice a year and has sub-committees for topics such as small and medium-sized enterprises and defence exports. The Ministry knows the list of companies with whom it contracts directly and how much it spends with each. Within individual

26. MoD, 'DE&S Transformation: The Freedom to Change Ed 3', unpublished document, September 2015.
27. See Defence Equipment and Support, 'Defence Equipment and Support: Framework Document', version 1.0, May 2014.

DE&S groups and teams, there is knowledge of and concern about their contractors and their suppliers.[28] The government is also keen to increase the role of small and medium enterprises in UK defence, not least through the Centre for Defence Enterprise.[29] Moreover, the UK, along with many other states, seeks to influence (rather than manage) its defence-industrial suppliers by a combination of sponsorship, purchasing and regulation; individual initiatives including the Defence Growth Partnership are part of this approach.[30] However, defence-industrial structures and capabilities are shaped primarily by contractual commitments, as opposed to high-level policy statements, and the predominant feature of UK defence procurement choices since 2011 has been buying from overseas – including the C-17 Airseeker (Rivet Joint), Chinook and the F-35. With the decision in 2015 to upgrade the Reaper,[31] and choices apparently imminent on the Apache upgrade or replacement, an improved maritime airborne-patrol capability and an E-3D Sentry upgrade, the pattern seems set to continue. As outlined in the 2012 'National Security through Technology' document, the UK policy commitment to national defence-industrial capabilities is less than that of other major states. In the context of the wider world, the UK is strikingly out of step in paying such limited policy attention to its supply base and national defence-industrial sector.[32]

Significantly, the US government has traditionally been very concerned to sustain its defence-industrial capabilities, and the current Secretary of Defense has observed that 'Industry is part of our force structure. We are dependent on industry to perform and, if we don't have a healthy industry, we don't have a healthy force'.[33] Intriguingly in that country, the defence enterprise is becoming part of the government discourse on defence.[34] Yet in the UK, neither the MoD nor the Department of Business, Innovation and Skills can even offer a figure for UK defence imports in which it has confidence, suggesting that the value and volume of supplier contribution to defence remains a contingent debate.[35]

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28. MoD, 'Finance and Economics Annual Bulletin: Trade, Industry and Contracts Statistics 2015', August 2015.
29. The Centre for Defence Enterprise is established to apply emerging research and development to known defence requirements.
30. See Henrik Heidenkamp, John Louth and Trevor Taylor, *The Defence Industrial Triptych: Government as Customer, Sponsor, and Regulator*, RUSI Whitehall Paper 81 (London: Taylor and Francis, 2013).
31. Beth Stevenson, 'MoD Reveals Reaper Derivative Will be Chosen for Preditor', Flightglobal, 7 October 2015, <https://www.flightglobal.com>, accessed 12 October 2015.
32. See Jacques S Gansler, *Democracy's Arsenal: Creating a Twenty-First-Century Defense Industry* (Cambridge, MA: MIT Press, 2011). In chapter 8, the author reviews the defence industrial policies of a number of states.
33. Frank Kendall, speech given at the Center for Strategic and International Studies, Washington, DC, 7 November 2013.
34. See Secretary of Defense Chuck Hagel's summary of the Defense Innovation Initiative and other DoD reform efforts in 'Towards a Strong and Sustainable Defense Enterprise', *Military Review*, January–February 2015, pp. 8–14; Department of Defense, 'Independent Review of the Department of Defense Nuclear Enterprise', June 2014.
35. Author interview with retired UK defence minister, September 2015.

The MoD does seek to manage some equipment elements of the extended enterprise, particularly those related to the nuclear deterrent (submarines, submarine propulsion and warheads), although it relies on the US for missiles and their maintenance. Also, what was first announced in 2005 as Team Complex Weapons in the Defence Industrial Strategy of that year should also be viewed as a success to date. This initiative allowed the firms involved to maintain a capability in the UK to design, develop, produce and support a range of non-ballistic missiles that have come in on budget and performed well in operations. The implementation of the terms-of-business arrangement with BAE Systems covering shipbuilding is succeeding in allowing the company to keep a capacity to design and build warships in the UK, although the costs of *Queen Elizabeth*-class carriers and the planned Type 26 frigates have proved difficult to control in the context of evolving requirements.

But the overall official MoD guidance does not suggest that supply-chain management should be a major concern. When the MoD advertised for a chief executive for the DE&S, attention was solely on responsibility for the delivery of projects on time and to cost, and to the performance and the efficient internal operations of DE&S. The former Directorate of Supplier Relations, formerly with a role in key supplier management,[36] is no longer in the DE&S structure. The DE&S Commercial Awareness Guide of June 2015, presenting the organisation's commercial role in the MoD, mentions supply-chain analysis, but only as part of encouraging competition and the identification and management of commercial risk. In short, there is simply not the emphasis on supply chains and the extended enterprise that would be found in a major private-sector manufacturing company.

In its drive to transfer maximum responsibility for the development and production of equipment to the private sector, the MoD has frequently appointed 'prime contractors' to deliver goods and services without insisting on understanding in-depth how the supply base of these firms operates. This was underlined by the minister for defence procurement, Philip Dunne, in a written answer to a question on contracts associated with the Scout armoured vehicle:[37]

> The contract for the manufacturing phase of the Scout Specialist Vehicle (SV) programme was awarded to General Dynamics UK Limited (GD UK) in September 2014. GD UK, as the prime contractor, is responsible for the selection and management of its supply chain. Its detailed breakdown of GD UK's subcontractors, including contract values and end dates, is commercially sensitive and not held by the Department.

By not possessing this level of visibility and oversight, the MoD potentially carries a range of non-assessed resilience and agility risks associated with its supply chains.

36. Directorate of Supplier Relations, 'MoD Key Supplier Management, MoD Developments in Acquisition – Update', January 2008.
37. Philip Dunne, answer to 'Armoured Fighting Vehicles: Written Question – 2857', House of Commons, 23 June 2015.

Finally, insofar as the MoD has endeavoured to bring a wider approach through the articulation and exploration of the Whole Force Concept, it has focused only on the people dimension of the components of defence as discussed below.

The Whole Force Approach

The MoD has recognised that a significant aspect of its supply base, as far as military operations are concerned, is formed of people. The MoD's Whole Force approach is the label applied to the (re)structuring of the UK's defence forces. It reflects a changing understanding of the armed forces: from being solely composed of a volunteer (and reserve), professional army, navy and air force – wholly within the governmental sector – alongside directly employed civil servants, to instead being a partnered arrangement of regular military, regular reserves, volunteer reserves, sponsored reserves, civil servants and private-sector contractors. These are employed under 'standing' contracts and 'responsive' contracts to deliver military capabilities and outcomes.

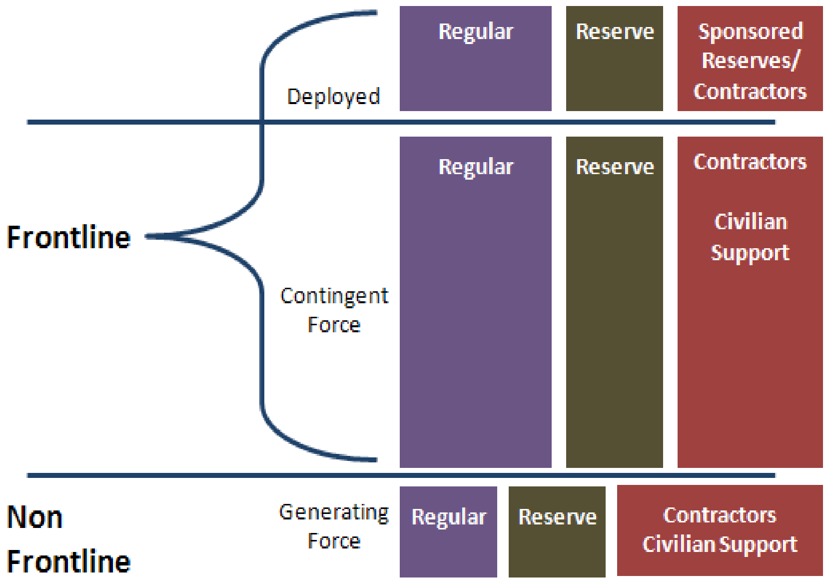
Of course, none of this is new: contractors, reservists and civil servants are part of the modern lexicon of defence. However, the strategic context for the development of the Whole Force Concept stemmed from a combination of factors: a reduction in real terms to the defence budget of about 7.5 percent over four years;[38] significant force reductions for the army, fleet and RAF; the scrapping of systems such as Nimrod MRA4, Harrier and Sentinel; and the planned mothballing (since revoked) of one of two new aircraft carriers. It also reflected the reality of how the UK deployed and used military capability in Iraq after 2003 and Afghanistan from 2006, which required the introduction of large numbers of personnel from the private sector to support both equipment and people.[39]

In 2011, the Deputy Chief of the Defence Staff (Personnel and Training) captured emerging thinking on the Whole Force Concept, which was portrayed as a comprehensive approach to optimising effects on the front line by providing a blend of civilian, MoD civil-service and contractor personnel, deployed in harmony with the regular reserve, the volunteer reserve and the regular armed forces.[40] The trade-off for the optimum force mix was between readiness

38. HM Treasury, *Budget 2010*, HC 61(London: The Stationery Office, 2010).
39. There is an extensive literature on the roles and numbers of contractors in US and UK forces deployed on operations. See Christopher Kinsey, *Private Contractors and the Reconstruction of Iraq: Transforming Military Logistics* (London: Routledge, 2012); Christopher Kinsey and Malcolm Hugh Patterson (eds), *Contractors and War: The Transformation of US Expeditionary Operations* (Stanford, CA: Stanford University Press, 2012); H-Diplo, The International Security Studies Forum, 'Forum on "Contemporary Military Contracting and the Future: Teeth, Tails, and Concerns"', 13 March 2015, <http://issforum.org/forums/contemporary-military-contracting>, accessed 1 September 2015; Trevor Taylor, 'Private Security Companies in Iraq and Beyond', review article, *International Affairs* (Vol. 87, No. 2, March 2011); Henrik Heidenkamp, 'Sustaining the UK's Defence Effort: Contractor Support to Operations Market Dynamics', RUSI Whitehall Report 2-12, 2012.
40. Dan Hill, 'What is the "Whole Force" Concept?', presentation given at RUSI, London, 21 March 2011.

levels and the duration of operations. A pictorial representation of the Whole Force Concept is given in Figure 3.

Figure 3: The Whole Force Concept Mix.



Source: Ministry of Defence, 2011.

This vision of this Whole Force rests heavily upon two developments. First, there is the intellectual case for seamless partnership and partnering between the military, retired military personnel with reserve obligations, defence businesses (under contract and as repositories of sponsored reserves) and individual volunteer reservists. Second, the value and benefits of much of contemporary (and, somewhat, conventional) management thinking has to be applied to the military effort. In other words, defence utility is now an exercise in the development of internal and external markets and effective portfolio management.

As well as the broad concept of the Whole Force, there is recognised concern at Head-Office level about at least one particular issue: the services cannot easily recruit and retain the number of engineers and technical staff needed by modern forces. Accordingly, the MoD is investigating the introduction of novel career offerings in which people will be able to move between the full-time uniformed military and employment in the governmental or private sector. However, the driving concern here seems to be the need of the governmental defence sector, especially the military, rather than the issue of scientists and technologists for the UK defence enterprise as a whole.

While increased recognition for the range of people associated with deployed defence capability is welcome, we argue that the needs of equipment and other goods and services should also be taken into account. The DEE comprises a much broader group than the constituents of the Whole Force outlined in Figure 3 and its detailed mapping would mean a more sophisticated and nuanced articulation of strategic assets than currently exists in MoD literature, at least to our knowledge. It is patently inadequate just to consider traditional prime contractors and systems integrators responsible for the delivery of goods or services. The supply chains, their sources of personnel, training and competence levels, as well as financial health, all need to be understood along with constraints upon, and risks to, ongoing commercial operations.

Clearly, not all elements of the defence enterprise are of equal sensitivity: those parts that supply consumables, such as non-specialist clothing, and for which there are a significant number of potential alternative suppliers, clearly merit less attention. Those firms in sectors where there are only a few potential suppliers and where entry barriers for potential new entrants are very high need extensive attention. Sectors such as maritime, aerospace and physical protection from chemical and bio-hazards, for example, fall into this category.

Conclusion and Next Steps

If the MoD recognises itself as a producer of capability rather than simply a purchaser/consumer, and if it aspires to be business-like, it should endeavour to define and manage its extended enterprise.

Most obviously, the Defence Operating Model, which has its origins in Lord Levene's reforms and is a key element in the MoD publication 'How Defence Works', needs serious review. Currently it is focused on what goes on within the public sector; the contribution of the private sector appears in only a minor way. Its direction reflects management thinking from the 1950s on the multi-divisional form of the corporation which minimises the role of the centre except as a source of capital and oversight.[41] This can be contrasted with the way that Volkswagen centrally addresses procurement, the standardisation of parts across multiple brands and transport.[42] With some partial exceptions, the Ministry appears reluctant to address supply-chain management. Insofar as it occurs, supply-chain responsibility is passed to prime contractors on individual programmes. The MoD's main traditional focus has been on the extent

41. Wikipedia provides a succinct and clear statement on this topic: 'Multi-divisional forms simply means that there is one parent company, and that parent company owns smaller companies that use its brand and name. The whole organization is ultimately controlled by central management, but most decisions are left to autonomous divisions. Generally, a parent company will own all of the smaller companies and the smaller companies will provide one service. The multidivisional form (M-form) is a particular organizational structure in which a firm is divided into semi-autonomous divisions that have their own unitary structures. The firm is essentially divided into sub-firms, with each sub-firm being responsible for its own production and maximizing its own profit. However, the M-form still has a central office that overlooks the other divisions but the central office's main responsibility is to develop overall strategies for the business, not to be responsible for each division's operations. Thus, the M-form proved to be the best strategy for large firms that wished to expand their diversification and appeal to a wider consumer base'. See Wikipedia, 'Multi-Divisional Form' <https://en.wikipedia.org/wiki/Multi-divisional_form>, accessed 1 September 2015.
42. See Automotive Supply Chain, 'The Ins and Outs of Volkswagen Group Supply', 15 October 2014, <http://www.automotivesupplychain.org/features/279/62/The-ins-and-outs-of-Volkswagen-Group-supply/>, accessed 3 September 2014.

of competition in the prime contractor's sub-contracting arrangements in the belief that this will help with cost control.

Ideally, responsibility for the overall management of the DEE should lie with a specific individual working at Defence Board level. It would not, however, be a role easily accommodated within the current responsibilities of either the permanent secretary or the chief of the Defence Staff. More broadly, the DEE management perspective requires the MoD Head Office, as it likes to be called, to generate and use portfolio-management capabilities which enables choices to be assessed in terms of their overall impact both across defence and over time rather than just with regard to a specific project. In a forthcoming publication, we plan to write about some choices with regard to a major sub-system on an armoured vehicle.

The Whole Force Concept, while welcome, is too narrow since it deals currently only with people. The concept needs to be broadened; if it does not, it can be expected to flounder. If further significant elements of the national defence enterprise must disappear as a result of defence resource restrictions (or even an improving security situation), the enterprise and risk perspective requires asking what would be the most demanding components to re-constitute in the event of deterioration in the British security context. It may be easier and quicker to reconstitute from line-fighting capabilities than the industrial, technological and management capabilities needed to generate the equipment that uniformed people would need.

The Apache attack-helicopter capability presents a useful example of a DEE perspective: the UK's initial intention to keep its Apache fleet in service until 2030 had to be abandoned because of the US decision to abandon its Apache D fleet before the end of the decade. If the UK moves to the Apache E variant direct from Boeing's production line, or if it opts for another anglicised version of Apache built in the UK, its current fleet will have to be dismantled and only some components will be re-usable. Significantly, in 2015 the UK secured agreement from the US for the supply of fifty AH-64Es at a cost of $3 billion (£2 billion) when the UK's original buy was of sixty-seven aircraft.[43]

On what timescales should the defence enterprise be addressed? Within the EU's security of supply agenda, recognised by the British government as pertinent, future concerns include access to rare metals and raw materials, and to sources of energy including oil and gas. Clearly the DEE perspective highlights questions about the roles of allies on a bilateral and a multilateral institutionalised basis.

In exploring the DEE perspective in a business-like fashion, the department could embrace a research agenda that would include the following issues:

- What comprises the UK DEE?
    - How much is generated in the UK and what is the value and nature of UK defence imports?

43. Think Defence, 'UK AH-64E Apache Guardian', 28 August 2015, <http://www.thinkdefence.co.uk/2015/08/uk-ah-64e-apache-guardian/>, accessed 13 October 2015.

  - In the case of defence imports, what comes from allied countries in a relationship of interdependence with the UK, and what comes from countries with whom the UK is in a position of dependence?
  - In what respects does UK defence have a reliance on personnel who are not UK citizens?

- How should the UK DEE be managed and assured?
  - What are the implications of the DEE concept for organisational structures within the MoD?
  - Can the practices of other developed states offer useful guidance?
  - How should the practices of large manufacturing organisations inform the enterprise?
  - Which elements of the UK DEE should be retained within government and which others within the UK? Has the UK MoD outsourced too much? What should be regarded as an inherently governmental task?

- Should and could a risk register for the UK DEE be developed?
  - How should the resilience of UK defence capabilities be approached and measured?
  - How agile has the UK DEE proved since the end of the Cold War and how was that agility achieved?
  - How can the risks of reliance on non-UK sources best be treated, including consideration of the role to be given to treaties and other international agreements addressing the security of supply issue?

These questions go to the heart of the UK's desire to be an internationally significant country with effective and affordable capabilities (in the right number) that are resilient, agile and scalable. How they are answered should be relevant for any security and defence review. At least in the short term, we would not be surprised if the arguments raised go into both the 'too difficult' and 'too inconvenient' boxes.

About the Authors

Professor John Louth is director of the Defence, Industries and Society research group and a senior research fellow at RUSI. He teaches at the University of Roehampton Business School, is a non-executive adviser to NDI Ltd and a specialist adviser to the House of Commons Defence Select Committee. John spent sixteen years in the Royal Air Force and subsequently worked extensively throughout the defence and energy sectors in the UK, Middle East and US.

Professor Trevor Taylor is a professorial fellow within the Defence, Industries and Society research group at RUSI, and emeritus professor at Cranfield University, where he teaches at the Defence Academy. He also teaches at the Naval Postgraduate School in Monterey, CA and was head of the International Security Programme at the Royal Institute of International Affairs.