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Five Key Changes for the Management of UK Defence—An Agenda for Research?

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Abstract

This paper is conceptual in nature and reviews five of the key management challenges facing those charged with the management of the UK Defence. It is argued that similar challenges face many Western governments, albeit the solutions are likely to be country-specific. Given the paucity of academic research into the general area of defence management, it is suggested that there is considerable potential for focussed application of ideas and concepts from a broad range of disciplines that will help improve the UK's ability to maintain its peacetime military capability efficiently whilst retaining its capacity to conduct operations effectively. Whilst the paper does not seek to recommend solutions for the issues identified, it does seek to expose the essential features as a means of broadening the understanding of the nature of the challenge—and, hence, to help shape the research agenda.

Introduction

By any dispassionate measure, the management of a major state's defence needs is a hugely complex challenge. People, training, equipment, information, infrastructure and other resources have to be integrated to generate the required operational capability. Some spending makes an immediate and direct contribution to capability, while other investments—most notably in defence research and development—may not produce usable assets for a decade or more (Taylor, 2005). In a basic sense, the outputs of defence spending can be expressed in terms of units of forces at specified rates of readiness (with concomitant levels of manning, equipment, individual and collective training), but this disguises the range of missions for which forces may be expected to be ready. The then-British Prime Minister Tony Blair (2007) and General Sir John Kiszely (2006) have pointed out the challenges of maintaining forces that are ready both for high-intensity combat operations and for peace-support activities. In practice,

things are even more complex—within the area of UK defence planning assumptions, there is a seven-layer taxonomy of military operations from Deliberate Intervention to Evacuation of Non-combatants. Even more importantly, there are, increasingly, no hard and fast geographic or temporal divisions in the operational environment. Hence, as observed by the recently retired NATO Deputy Supreme Allied Commander for Transformation, we have the development of what is becoming known as the "three block war." "In both theatres [Iraq & Afghanistan] we have had high tempo warfighting taking place in the same 50km square and at the same time as peacekeeping and humanitarian aid operations" (Forbes, 2004).

The aim of this paper is, based on the authors' extensive experience of studying and implementing defence management, to consider some of the key managerial challenges that face those who are charged with planning, directing, organising, coordinating, monitoring and improving the use of the resources directed to the defence sector. The paper will not seek to identify any assured route to success; rather, given that a prior condition for any such prescription is awareness of the pitfalls, dilemmas and issues that need to be addressed, this paper offers a view of five of the most important challenges that will be faced by those charged with the higher management of defence. It has a UK focus and illustrates the challenges identified with British examples, but the dilemmas it identifies are of universal application. The paper is, therefore, of interest to a wider audience than just those in the UK.

Any consideration of defence management must take into account contextual factors in addition to the operational and capability issues noted above. In the UK (and in many other states) some important elements are:

> The increasing complexity and capability of military platforms, equipment and information systems that, while bringing clear benefit in the actual prosecution of warfighting, involves extensive acquisition and support costs. These have been estimated by a recent authoritative report to account for 40% of the UK defence budget (MOD, 2006, June)—a figure that could rise by as much as 20% if it were to include the costs of the engineering and support Regiments within the field army, etc. It is unsurprising, therefore, that three of the five challenges considered by the authors lie in the acquisition and support arena.
>
> Shrinking budgets and reducing "headcount" for the Armed Forces (and their civilian support staff). For example, the manpower strength of the Royal Navy has reduced, on average, by 2.25% year on year since 1950. In addition, the recent "Gershon" reforms require a reduction of 11,340 Civil Servants from the UK MOD by 2008 (MOD, 2006, p. 36).

An increasingly critical public which, whilst profoundly supportive of the individual soldier, sailor and airman, is unconvinced that the underpinning managerial structures are "fit for purpose." This was underlined by the survey of external opinion reported in the *MOD Annual Report and Accounts for 2006/7* (MOD, 2007, Table 30)—in which those indicating a "favourable impression" of the Armed Forces was 76%, whereas those with a "favourable impression" of the MOD was just under half at 44%.

Given the breadth and depth of the management challenges in defence, it is surprising that, unlike the study of commercial management that has expanded rapidly since the end of the

Second World War, defence gets comparatively little attention from scholars.[1] This lack of academic interest in the management of defence may simply be because it is significantly different from everything else or because it requires too much specialistic background knowledge for the generic management expert to make sense of it without significant effort. Therefore, this paper, with the five challenges discussed below, is an effort to conceptualise some important defence dilemmas and choices.

Challenge 1—Empowerment versus Coherence

Striking the right balance between achieving conformity without stifling potentially beneficial individualism is a major challenge in many areas of defence management. In wider (and mainly commercial) management thought, the empowering of individuals is seen as a key component of organisational success. As explained by Senge (1992, pp. 287-288), "localness means unleashing people's commitment by giving them the freedom to act, to try out their own idea and be responsible for producing results." He also added that, "localness is especially vital in times of rapid change," when people lower down the organisation need a clearer sense of what is happening to them and how they can best respond. Similarly, Cole (2004, pp. 201-202) observes that, "the best practice is to be found in organisations that use delegation positively as an important employee motivator as well as a means of facilitating effective decision-making throughout the enterprise."

In the operational military context, British Defence Doctrine[2] emphasises the concept of "Mission Command," in which the high-level commander's Strategic Intent is clearly spelled out. Subordinates are then encouraged and empowered to implement this objective as they see fit under the emerging operational circumstances.

A similar theoretical approach has been adopted in the UK's Smart Acquisition[3] (SA) programme, which is designed—against the background of some 800 projects which are being developed through around 100 Integrated Project Teams (IPTs)—to ensure the introduction and support of defence equipment "Faster, Cheaper, Better and More Effectively Integrated." The underlying SA philosophy was designed to "empower" the IPT Leaders (and, indeed, to judge them on their ability) to develop radical solutions to the delivery of military effect within a prescribed Performance, Cost and Time envelope.

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[1] As an illustration, an examination of five major academic journals covering logistics and supply chain management showed that out of 1020 articles published between January 2000 and December 2007, only one discussed issues from a defence perspective.

[2] Doctrine is defined as "the best estimate of the way the UK's Armed Forces […] should go about their military business" (MOD, 2001, p. 3-1). However, as eloquently observed by the eminent historian Sir Michael Howard (1974, p. 7), the MOD cannot conduct experimentation to prove theories of warfare in the same way as a scientist; thus, inevitably, Doctrine represents an "educated guess." He goes on to suggest that success will favour the military force that best develops "the capacity to adapt oneself to the utterly unpredictable, the entirely unknown."

[3] When originally launched in 1999, the programme was called "Smart Procurement." However, its title was changed in 2002 to "Smart Acquisition" as a means of better reflecting the whole-life implications of procurement decisions.

Unfortunately, this focus on the achievement of a successful outcome to an individual project means that IPT Leaders can be inherently reluctant to spend their budgets on managing important interfaces with other projects. It is extremely tempting to conclude that they should always be sorted out by the IPT responsible for the other side of the boundary! Furthermore, attempts to constrain IPT-level solutions in order to ensure that they allow a seamless interface with other IPTs (and virtual constructs such as the Defence Supply Chain) frequently result in an increase in the cost of the proposed solution.

The more complex[4] the battlefield becomes, the more prominent such project interfaces clearly become. For example, in the Army environment, a battle group will consist of the appropriate mixture of infantry, armour, and artillery to meet the threat of the moment; but the grouping is likely to be transient according to the nature of the threat faced. Integrating the logistic support for these so-called "Agile Mission Groups" in such a way that it does not constrain the commander's freedom drives towards a unitary support solution for the operation as a whole—but this is in direct opposition to the Smart Acquisition business drive to deliver unique, optimised support targeted at a particular platform or equipment.

It is also becoming increasingly apparent that the integration problems associated with information systems are even more challenging, not least as the technology refresh rate here is measured in terms of 2-3 years (rather than the decades for, say, the transition from steam to gas turbine as a means of maritime propulsion). The challenge of integrating Information Systems is also exacerbated by both the internal demands of the UK's Network Enabled Capability[5] (NEC) and the desire to link, on the one hand, to US systems and, on the other, to those of our European allies.

In order to resolve this conundrum, a number of concepts have been championed. For example, some look to the expert use of systems engineering techniques (see Stevens, Jackson, Brook & Arnold, 1998); others suggest that a central guidance and lobbying body such as the Integration Authority within the UK's Defence Equipment and Support (DE&S) organisation can make the required impact. A further alternative prescribes defining "open system architectures" to allow easy integration and modification of modules—but none of these approaches has yet to prove entirely satisfactory.

Nevertheless, one procurement choice that is currently gaining attention recommends seeking out companies with generic systems integration expertise, as signalled by the UK selection of W.S. Atkins for the British Future Rapid Effects System (FRES) programme. That said, it has been observed that the Lead Systems Integrator role in the US has driven companies to seek to win contracts only in weapons areas in which they have little specialist expertise (Moon & Schoder, 2005).

Perhaps the optimum approach is a more modest one, in which separate systems are procured, then integrated through a series of *ad hoc* patches; these may be in the form of software and hardware, or they may involve putting a human in the loop. Indeed, such an approach aligns well with the concept of Incremental Acquisition in which the required capability

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[4] Such complexity arises not only within an environment (e.g., Land, Sea or Air), but because current and future operations increasingly (indeed, probably, inevitably) require the joint effects of two (if not all three) Services.

[5] For a series of short articles dealing with the acquisition of Network Enabled Capability, see (2004, July). *RUSI Defence Systems, 7*(1), pp. 62-85.

is achieved through a number of relatively small (and, thus, from a scientific or engineering perspective, less risky) advances. This has the benefit of allowing adjustments in emphasis to be made as the nature of the threat unfolds, but invariably involves additional expense not provided for in the budgets of individual projects.

The centralisation-delegation pendulum has undoubtedly swung back and forth over the last five years with the initial development of a voluntary "Support Solutions Envelope" designed to curtail the more extreme approaches. However, this is now being modified, and the current trend is clearly towards constraining the IPT Leaders rather than giving them greater discretion, but this of course means that focus on and commitment to achieving the specific project goals may be weakened. Striking the right balance between empowerment of the IPT Leader to develop novel solutions and achieving coherence of support for, say, all the equipment in a Brigade Group is a fascinating, but extremely challenging, balancing act. Furthermore, as indicated earlier, the balance chosen is likely to reflect cultural and other environmental factors; for example, from an external perspective, the US defence machine, in both operational and managerial sectors, often appears more centrally directed and rule-bound than that found in the UK.

Another area in which the Empowerment v Coherence tensions can be readily observed is in the subtle balance between the role of the single Service Commanders-in-Chief and that of the Chief of Joint Operations. Current UK operational thinking, supported by recent experience in several theatres, emphasises the need for "jointery"—but, for good reason, the peacetime programme designed to ensure the maintenance of a particular capability tends to be undertaken on a component (i.e., Navy/Army/Air Force) basis. This leads, not least, to the reinforcement of cultural differences that need to be quickly overcome when a joint force is fielded. The UK is becoming increasingly aware of the need to approach both managerial and operational issues from a joint perspective, but this prescription may not be appropriate to every country. Nevertheless, many, if not all, will need to develop the appropriate mechanism to ensure the coherence of military output without diminishing the essential differences between the components.

Challenge 2—What should the governmental defence sector do for itself, and what should it outsource from others?

Even in the US, in modern times, western governments do not develop and produce all the goods and services that their armed forces need. This is equally true of states such as France, Italy and Turkey, where notwithstanding the presence (even in the early 21st Century) of a large nationalised defence industrial sector, their Ministries of Defence still look to private firms for the provision of the sort of products used by the general population (such as food), as well as those emanating from high-technology sectors (such as electronics and aerospace). However, driven mainly by a belief that private firms working in a competitive environment are more efficient than publicly owned monopolies, some countries (with the UK in the lead) have undertaken a significant programme of privatisation of their state-owned, defence-related industries. For example, over the last two decades, the Royal Dockyards and Royal Ordnance Factories have become fully fledged businesses within the private sector; indeed, even the UK's nuclear weapons plants, whilst still formally owned by the government, are managed and operated for the government by a private contractor.

Furthermore, the UK (along with the US and others) has increasingly outsourced the design, development and production of defence equipment to the private sector. In addition, the

UK Ministry of Defence has not been immune from the general pan-Whitehall drive to implement the government's Private Finance Initiative (PFI) and Public-private Partnerships[6] (PPP). For example, a recent review (RUSI, 2004) indicated that between 1995 and December 2003, the MOD had signed contracts for 45 PFI projects and 6 PPP arrangements—involving some £3.5 billion of capital costs, and with the annual payments representing some 6% of the Defence budget. Furthermore, as an indication of the increasing momentum behind this approach, another 37 projects (worth some £12 billion) were at that time either under consideration or in the process of going to contract.

Unsurprisingly, the areas of business initially transferred out were those providing support services such as cleaning and catering. This was followed by a second wave of projects covering a broad swathe of training functions, including, for example, that for armoured vehicle drivers and for helicopter and fixed-wing aircraft pilots. However, recent initiatives have been significantly more ambitious and are increasingly linked with the overall model for the transition of defence support.

In essence, in developing this policy, the then-UK Chief of Defence Logistics (CDL) believed that in order to improve the reliability of military equipment—with the concomitant beneficial effects in terms of, for example, a reduction in both Through-life Costs and a reduced logistics footprint on operations—it was necessary to engage commerce and industry more closely in the delivery of military effect. The net result has been a developing generation of PFIs that sees the capital cost of military equipment being borne by industry—which also provides ongoing support in the shape of some or all of maintenance, training (of both operators and military engineering staff), management of obsolescence and provision of spare parts. Recent examples of this include the Skynet 5 satellite system, the £600 million contract for the provision of so-called "C" vehicles[7] announced in June 2005, and the Future Strategic Tanker Aircraft (FSTA) which requires industry to raise some £3 billion—making this, by far, the largest UK PFI ever contemplated.

Significantly, the use of contractors for many of these roles is not restricted to home activities, but also extends to deployed operations. As a result, there is now a real debate as to the extent to which governments should rely on Contractors on Deployed Operations (CONDO)[8]. For example, Ukrainian companies have become major suppliers of air transport to the UK defence establishment, while Kellogg, Brown & Route holds an enabling contract (known as "CONLOG") to provide a whole range of services in support of UK operations, and the next generation of air-to-air refuelling aircraft is highly likely to contracted under a CONDO

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[6] Whilst there are financial and accounting distinctions between PFI and PPP programmes, the essence of both is that private (i.e., non-government) funding is used to provide the capital cost of, say, a new building. This is paid back by defence over the long term (typically in excess of 20 years) by means of a stream of rental income. In all probability, the totality of these annual payments will exceed the cost of in-house provision, but this is tolerated not only because of the extent to which "spikes" in capital expenditure (which represents some 25% of the Defence budget) can be reduced, but also because of the beneficial effects on the Public Sector Borrowing Requirement (PSBR) and the reduced headcount that is directly funded from the government's payroll.

[7] Military vehicles can be broken down into generic groups: "A" vehicles include armoured platforms such as tanks. "B" vehicles cover the soft-skin group such as 4x4 vehicles. The "C" vehicle category includes engineering plant such as bulldozers and earthmovers. The final category is known as the "White Fleet," which covers all forms of staff cars and minibuses which are already provided through a PFI contract.

[8] See, for instance, a series of articles in (2004, Summer). *Defence Studies, 4*(2).

arrangement. The leading edge of this generation of CLS initiatives is that of the Heavy Equipment (e.g., Tank) Transporter (HET) fleet, in which 1/3 of the drivers and maintainers are civilians who, as a condition of their employment, must accept Reservist status. The benefit of this approach is that the drivers can, at short notice, be "re-badged" as military personnel with minimal interruption to the level of support provided. A similar approach has recently been agreed for the RAPIER Ground-to-Air missile system; the operationally deployable 2nd Line test and repair facility formerly manned by military technicians is now being provided by the company (MBDA) using the "sponsored reserve" concept.

In pursuing the outsourcing route, the UK MOD is clearly following guidance from the literature of commercial management. For example, writers in this field such as Hamel & Prahalad (1994) and Johnson, Scholes and Whittington (2005) recommend that companies should seek to identify their "core competencies"—i.e., areas in which they excel and, thus, hold competitive advantage. These authors assert that companies should contract with others that have particular expertise for other necessary, but non-core, functions. Unfortunately, what is lacking currently in the UK (and, arguably in most Western nations) is any clear view about what the core competencies of the governmental defence sector are and need to be.

A further implication of outsourcing is that it changes the nature of one of the more significant challenges facing any organisation—namely how to select one's suppliers. There are many prescriptions developed by academics and practitioners, but no sure route to success. Outsourcing should not be used to avoid a difficult problem, and defence, which buys complex products and services, is certainly taking on risk if it entrusts provision to prime contractors without detailed oversight of how those primes will deal with the supply chains below them. In many cases, the UK has little choice regarding a prime, since BAES is the supplier of 90% of land platforms and 80% of fixed-wing aircraft, and so cannot introduce supply chain management as a significant element in a competitive tendering activity.

One area in which the MoD (but not the Government as a whole) has drawn the line is in its refusal to place lethal force in the hands of contractors, though contractors are certainly being placed nearer to the front line.[9] However, it has been reported that the Royal Norwegian Navy's Fridtjoff Nansen class frigates are taking outsourcing to novel territory. They will remain in the ownership of IZAR, their Spanish shipbuilders, who will be not only responsible for the support and maintenance of the ships, but will also provide one third of the crew (Cushway, 2006).

This increasing use of CONDO underlines two challenges. First, there is a need to ensure the integration of the output of potentially disparate groups of contractors to provide "joined up" logistics in support of the front-line troops. This requires greater imposition of common standards in many areas—including information systems, health and safety, and welfare/discipline, etc. Secondly, and perhaps even more importantly, it raises the question of how the services that they are delivering will be provided if a previously benign area becomes markedly more dangerous. This is a difficult balancing act in this era of asymmetric warfare—particularly if the UK follows the US lead and, for example, deploys contractors in direct support of armoured vehicles. This approach is used to support its Stryker Brigade, in which

[9] Interestingly, the US Department of Defense (DoD) has gone even further by accepting that private military companies can arm their personnel for such tasks as guarding oil fields and associated facilities such as pumping installations, etc. Indeed, there may be as many as 20,000 armed guards in Iraq under US contracts—albeit many are not of American or Iraqi nationality.

> "Approximately 120 specialized contractors are an integral part of the Stryker Brigade Combat Teams' (SCBTs) highly complex systems maintenance, sustainment and technical support. […] many contractors are actually operating in the forward areas of the SBCT" (Alderete, 2005; GAO, 2003, June).

A decision to outsource requires not just the confidence that an external supplier should be able to provide a capability or service more effectively and efficiently. There must be confidence that the contractor can be incentivised to perform reliably, even when the physical and/or political environment has become challenging. This is obviously most relevant in the military operational context, but there must also be a viable procurement strategy available that will give the outsourcing authority confidence that value can be obtained. This is increasingly leading to the development of "Partnering" solutions that combine elements of both PPP/PFI and Outsourcing.

Challenge 3—How should support for equipment be arranged in a time of frequent and surprising operations?

Across the broad swathe of UK military commentators, there is a clear recognition that the current defence supply chain model needs to be significantly developed from that originally created to support the British Army when facing a potential Soviet threat on the plains of Northern Germany. In considering how it should be improved, planners are faced with exhortations that supply chains should be "lean" and use a "just-in-time" approach modelled on commercial operations such as those providing fast-moving consumer goods (FCMG). Such a prescription is potentially attractive, not least as it is believed that it will enable a reduction in the existing stockpiles and, hence, reduce financial overheads. However, the Armed Forces, whose lives depend on stocks of ammunition and spare parts being replenished promptly, have traditionally preferred a "just-in-case" approach. This feeling is well captured by the then-US Assistant Secretary for Defense who observed that, "In the absence of rock solid information regarding the availability of materiel, the warfighter will always buy readiness insurance in the form of excess local stocks" (Kaminski, 1996). On the other hand, carelessness or mismanagement can also lead to stocks being held for contingencies that have long become unthinkable. For instance, the establishment of the UK's Defence Logistics Organisation (DLO) in 2000 led to the discovery of jigs and tools that would have supported the re-launched production of 2nd World War-type aircraft!

From an academic perspective, the reluctance to embrace the "just-in-time" (JIT) model is entirely logical, as this concept operates best when demand is relatively stable and, hence, predictable (Towill & Christopher, 2002). This, unsurprisingly, sits uncomfortably with the doubly unpredictable nature of warfare, in which we cannot be confident about the timing and location of military operations, or about precisely how they will unfold once they have begun. Thus, the alternative "Agile" supply chain management model would appear more promising in a military context as it recognises that all forecasts are inherently imperfect and is, therefore, designed "to thrive and prosper in an environment of constant and unpredictable change" (Maskell, 2001).

The conflicts in Iraq and Afghanistan are exceptional and, since 1945, the requirement for the UK's Armed Forces to prosecute the Queen's enemies has been applied infrequently. Certainly, large numbers of UK troops are often engaged in hazardous missions, but the periods of time in which they are fighting in a major conflict (as distinct from Peace Support or Peace Enforcement Operations) are relatively short—perhaps for some six months during a ten-year

window. Therefore, use of an efficient business model makes good sense in peacetime when the armed forces are, typically, engaged in routine training in order to ensure that they develop and maintain their expertise. The consequences of a vehicle breakdown, and any delay to its repair or replacement, may result in a waste of valuable resources and be very frustrating for all concerned—but rarely is life put at risk. Contrast this with the operational situation in which supply chain failures can, and regrettably do, lead directly or indirectly to death or injury. Thus, the operational supply chain must be optimised towards effectiveness (with its certainty of supply) rather than efficiency.

Thus, the Defence Supply Chain sits firmly on the horns of a dilemma: whether to reduce inventories in order to reap the peacetime efficiency benefits, or to continue to pay this "insurance" cost in order to help ensure the effectiveness essential for successful operations. In theory, there will be an optimum level of "leanness" (Christopher & Rutherford, 2004)—but ascertaining this for each of 1.7 million SKUs,[10] in the face of the uncertain future demand pattern that is the inevitable consequence of the uncertain nature of future warfare, may well be beyond even a significant investment in sophisticated modelling. Hence, it is unsurprising that the military response to a combination of uncertain demand and long-lead time supply characteristics is likely to continue to result in significant stockpiling—but it is just such stockpiling that then becomes a target for challenge in subsequent spending rounds.

To the stresses between JIT and Agile must be added the dimension of resilience: that supply chains should be able to avoid or absorb shock. Arguably, defence needs to take evaluate risks to effective supply, including reliance on single plants that may be destroyed in fires or other accidents. Stocks in different locations can clearly enhance resilience, but such strength rarely comes without cost. Costs must always be weighed against the perceived risks—but persuading those who control the defence purse strings of the merits of these observations generally remains an unmastered challenge.

Overall, however, the response of the UK MOD has been to enhance the importance of potential operations in the planning and management of the DE&S organisation. The UK also is giving increased recognition to security of supply in times of crisis—for instance in the 1998 *Letter of Intent* with European States[11] and the 2000 *Declaration of Principles* with the United States. Perhaps significantly, Switzerland—a relatively friendly country—placed an embargo on the export of grenades to the UK as a reflection of its government's disapproval of the 2003 Iraq War (NAO, 2003). Fortunately, this had no tangible effect on the outcome as sufficient had been stockpiled, but it was a salutary lesson for planners.

> It is suggested that the keys to the MOD's difficulty here are threefold. Firstly, there has been a solid record of recent operational success. It is argued, therefore, that "warts and all," the current system which, whilst clearly not perfect, may be just about as good as it will get given the variables in play. This "do nothing" (other than to continue to tune the system) approach clearly has advantages for those within the MOD and industry whose interests are well served by it. Challenging these power bases without a clear

[10] SKUs = Stock Keeping Units. The UK's defence inventory should be compared with the 20-30,000 SKUs that might be found in a typical supermarket outlet (Fernie & Sparks, 1999).

[11] It is planned that this Letter of Intent will be developed through the introduction of *EU Code of Conduct on Defence Procurement* (MOD, 2005, p. 7).

idea of what the successor system will look like is a career-threatening move in any arena!

Secondly, the lead time for a significant volume of materiel support is long and, in many cases, growing. This is generally the result of the niche-status of defence engineering (both mechanical and electronic) and its relative lack of players (as discussed above). Given that defence is generally recognised as not following the normal economists' model of a perfect market, there is only limited pressure that can be placed on those remaining companies to improve their performance—especially in the time dimension. This exacerbates the pressure on individual IPTs to take the easy (and generally risk-free) option of developing stockpiles rather than seeking more agile solutions. But as the move towards partnering takes greater hold with its metrics based around delivering an agreed-upon level of equipment availability, this decision is transferred to the industrial partner that must increasingly make such stock-level decisions. Experience to date would indicate that such partners are up to this task, but there is a large and diverse body of academic literature that raises fundamental concerns over the effectiveness of such collaboration arrangements (Kampstra, Ashayeri & Gattorna, 2006). Thus, the inevitable nervousness of operational commanders over this fundamental transference of risk may yet prove well-placed.

The final point is that the capability-based approach is rare, perhaps even unique to Defence. No other organisation spends almost the totality of its budget in the development of a capability (across equipment, communications, personnel, training, infrastructure, operational planning, etc) and then returns to its shareholders (in the MOD's case the Treasury) for additional finance when they are actually required to employ this capability. Even major public-sector ventures such as hospitals and schools aim to balance the supply (of operating theatres, nurses, classrooms, teachers) against steady state demand. Peaks can be accommodated through a number of mechanisms (geographic dispersion of the requirement, building temporary facilities, hiring agency staff) in relatively short order. Thus, unlike the MOD with its massive equipment lead times, the risk from adopting a surge (rather than a stockpile) model is relatively containable.

As a result, the MOD has no obvious commercial comparators against which it can benchmark its activities and is generally constrained by the extremely coarse level of public expenditure. That said, there is an implicit recognition that a country cannot undertake major military operations without the support of a capable industry. But, generally, there is a reluctance to confront too squarely the additional costs that have to be incurred in peacetime to ensure that sustainability can be assured in war.

Challenge 4—In an era of rapid progress in civil technology, how does a Ministry of Defence assure its optimum inclusion into defence systems?

Forty years ago, research and development in the West was dominated by military spending. Today, this is no longer the case; technological advance in many sectors, including computing and IT and biotechnology, is almost entirely driven by civil spending. Even in the UK, where defence Research and Development (R&D) is comparatively important compared with other EU members (except France), defence accounts for only 11% of the national R&D effort (National Statistics, 2005). This increasing focus on the R&D requirements of commerce and industry raises the fundamental question of how defence can minimise the chances that it will not miss out on opportunities that may arise in the civilian context.

As part of its response to this challenge, the UK MOD devotes some time and resources simply to tracking progress in civil technology across the board and across the world. It also operates a small organisation within the DE&S (the Defence Suppliers' Service) that familiarises businesses seeking work in the defence sector with the contractual and other processes of the Ministry of Defence and, in this way, tries to ease the path of firms that wish to become suppliers. On the other hand, the US Department of Defense has particular accounting demands that it places on its suppliers; this has led to concerns that some generators of "civil" technology do not promote it in the defence sector simply because they do not want the trouble of complying with these accounting systems.

Little in this area is easy. Much contemporary technology—especially that which relies heavily on electronics—has a very short lifecycle and is kept in production for only a limited time. Culturally and procedurally, the UK MOD has developed an increasingly robust process for the careful assessment of equipment investment that is able to handle programmes with a planned lifetime of two or three decades (albeit many, with subsequent life extension programmes, have the period from Concept to Disposal often exceeding 50 years (DEG, 2005)). The Investment Approvals Board[12] (IAB) is, therefore, not accustomed to hearing that a piece of kit will be disposed of after perhaps three or four years—which is frequently shorter than the approvals process itself!

Furthermore, the building of modern computing and information technology into complex larger systems also raises questions about whether and how that technology can be updated without significant disruption to the system as a whole. For example, modern combat aircraft such as the F22 and the Eurofighter Typhoon contain several thousand obsolescent parts, but changing a 486 processor for a modern Pentium version is a risky business in such complex systems. To date, the UK Defence Ministry's answer to this issue has been twofold. In some cases, a lifetime supply of an item is bought at the time of procurement so that a failed component can be simply replaced from existing stock. However, this has the obvious downsides of the both the cost of maintaining such a stockpile (particularly when its usage rates may prove to be far lower than estimated at the pre-production stage), and also its vulnerability to the sort of obsolescence issues outline above.

The alternative (and increasingly common) approach is to develop a support arrangement with a contractor who is obliged both to maintain the system and to update its elements under a so-called "Contracting for Availability" approach. This is particularly useful in the procurement of information systems and services and, as a result, the contractor shoulders the risk of difficulties associated with the introduction of new technology. Given that the contractor is usually the original equipment supplier, he should (in theory) understand the system better than anyone else. But, with the increasing importance accorded to the electronic dimension of a platform such as a tank, ship or aircraft, it is not surprising that that some commentators have gone so far as to suggest that the electronics should lead the design: "In future, we will invite contractors to design C4ISTAR architectures and integrate platforms into them" (Blackham, 2003[13]).

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[12] As its name implies, the IAB is the committee that sanctions proposals for major investment on behalf of the UK's Defence Management Board.

[13] Vice Admiral Sir Jeremy Blackham was, until 2003, the officer responsible for the development of future equipment capability—the so-called "Customer 1," whose role included the development of the User Requirements Document (URD) against which new platforms and equipment are procured.

Challenge 5—Development of a whole-life and pan-organisation cost mentality

In an overall "system of systems" as complex as Defence (which is designed to operate successfully at some distance from its home base in the most challenging and life-threatening of environments), it is inevitable that there will be overlaps and interfaces between those charged with the management, development and operation of each individual component. Thus, for example, the introduction of an improved equipment design is likely, whilst reducing the direct cost (of operation and/or spares provision), to incur additional costs in terms of infrastructure (e.g., more sophisticated diagnostic equipment) and in personnel (training of maintenance engineers to higher skill levels).

Indeed, in the UK, the military has recognized eight so-called Defence Lines of Development[14] (LoDs) as a means of helping ensure that the implications of equipment changes are well understood. The simplest approach sees equipment, at least after the signature of a development contract with a company, as the independent variable from which other LoDs follow: their management requires their timely and appropriate provision. A more complex line of thought presents the LoDs as interacting throughout the development process; for instance, a computer programme could be developed expensively with few training needs or more cheaply with extensive training needs. However, viewing the LoDs in this way presents significant challenges in the development of robust and meaningful contracts with industry. Intriguingly, as recognised by the UK's Chartered Institute for Logistics and Transport, the LoD approach does seem to commend itself as a model in other areas—for example, in planning responses to Humanitarian Disasters in which the integration of many strands of support (against the backdrop of uncertainty, potentially devastated infrastructure and limited communications) has clear parallels with the military scenario.

A further twist to this multi-faceted integration problem is the increasing recognition that resource-expenditure decisions should be considered on a Whole-life cost[15] (WLC) basis. In many ways, it would seem to be entirely perverse not to approach such decisions from this perspective; however, there are many examples of procurement projects in defence in which the capital cost would appear to have been deliberately reduced without formally recognising the implications for the ongoing costs of support, and in the hope that the latter will be "lost in the noise" or that the corporate memory will have forgotten the original basis for the decision when it crystallises 20 years later.

It is fully accepted that Whole-life costing is an acknowledged challenge in many areas of commerce and industry, but the complexity of military equipment and the breadth of operational circumstances in which it can be (and is) used, make cost forecasting a particular challenge. As an example, many items of defence equipment are designed for use in one environment but, due to changed political or military circumstances, are actually operated in a markedly different way.[16] This complexity is exacerbated by the extent to which organisational

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[14] Known by the acronym "TEPIDOIL," these encompass Training, Equipment, Personnel, Infrastructure, Doctrine & Concepts, Organisation, Information and Logistics.

[15] A very useful and concise exploration of some of the key issues surrounding the development of robust WLC models is to be found in the Kirkpatrick (2000).

[16] A particularly clear example is the Royal Navy's Type 23 Frigates that were designed for anti-submarine patrols to be conducted at slow (and, therefore, quiet) speed in the waters between

structures influence the potential for "tribal" behaviour. Thus, in the UK MOD, there has been a clear separation between those who are charged with the procurement of new equipment, those who maintain it, and those who operate it in combat. Particularly in relation to the first two protagonists, this schism has reinforced the suspicion that—not least in the face of sustained criticism by the House of Commons Public Accounts and Defence Committees—misleading trade-offs between capital and support costs may be presented to scrutineers.

The merger during 2007 of the Defence Procurement Agency and the Defence Logistics Organisation—as well as wider responsibilities placed on the Equipment Capability Customer organisation—is meant to support the early adoption of realistic whole-life cost calculations. Robust methods for capturing and allocating such costs, however, will need further refinement. Nevertheless, to the extent that the need for Whole-life Costing across all the Defence LoDs has been recognised and will lead to greater attention, the Defence Industrial Strategy must be applauded.

Conclusion

This paper has sought to review, from a largely UK perspective, some of the key challenges currently facing the management of defence and, in doing so, has addressed five inter-related questions to which there are no easy or final answers. But, this study has also suggested that the current relative paucity of academic endeavour presents a tremendous opportunity both for new insights, and also for the development and application of prescriptions that have been tried and tested in the commercial arena. Furthermore, whilst it is not appropriate to speak of a crisis in defence management, there is little doubt that major shortcomings in existing ways of doing business (competitive tendering, outsourcing, and relying on rather autonomous Integrated Project Teams in acquisition) are becoming ever clearer.

Finally, the authors are well aware that our selection does not cover all of the management challenges facing the UK MOD. For instance, it is not clear whether the benefits gained from the introduction of Resource Accounting and Budgeting (RAB) have exceeded the considerable implementation costs involved. That said, there is no doubt that the MOD has much to do if it is to better understand its own costs (on a Whole-life basis and across all aspects such as personnel, training, support and infrastructure) as a means of improving the significant balance of investment decisions that it faces. Also, the prevalence and successful achievement of Urgent Operational Requirements (UORs) before the Iraq War has raised questions about the actual outputs and outcomes of the peacetime defence budget, as well as the procurement process as a whole—how can the latter meet the demands of UORs but singularly fail to do so in regular procurements (especially in the absence of any clear price inflation)?

Hopefully, the issues raised in some detail will prompt some interest in the management challenges facing the defence community. They might even generate some sympathy for those charged with running a country's defence machine.

Greenland, Iceland and Northern Scotland. Thus, given the predicted ambient temperatures, the air conditioning systems (for both equipment and crew) were limited, as was the endurance—reflecting a concept of operations that saw the vessels being accompanied by an oiler/stores support ship. Following the end of the Cold War, the ships are now seen as "General Purpose" frigates and have required expensive retrofitting to enable them to operate effectively in, say, the Persian Gulf.

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