Systems and Capability for an Uncertain Future?

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It was clearly by design, rather than chance, that the three themes chosen for this conference should be affordability, support to operations, and systems and capability for an uncertain future. All three are ever present in our daily lives and particularly so for me when dealing with the MOD through Niteworks.

Today is not the occasion to talk about the work of Niteworks in detail, but I will briefly explain what it is we do, as this may help explain my frame of reference and provides insight into what it is that shapes my perspective.

Niteworks provides evidence-based decision support to MOD against 4 priority areas:

- Support to Current Operations
- Support to Capability Development
- Support to Acquisition
- Enabling Net Enabled Capability (NEC) through the Key Systems Advisor (KSA)

Niteworks is a Partnership that today comprises 114 organisations. The MOD itself including Dstl, 12 partner companies that represent the majority but not all of the UK defence industry, and 101 Associate members, comprising global defence players and small-to-medium size enterprises. Our doors are always open to new qualifying members.

We pride ourselves on impartiality and achieve this by bringing subject matter experts together in an environment that blends together military and industrial experience, free thinkers and pragmatists, large corporates and sole traders and everything in between. We are non-advocates, at times delivering tough messages back to our sponsors; messages that are not always well received, as they do not always support the predilection of our sponsor, that is, the person requesting and funding the activity.

We adopt a systems approach to our work. Here I must pay credit to Professor Mike Wilkinson, Niteworks Technical Director, who is the principal architect of the model, known in our parlance as the 'Niteworks Way'.

Comprising 6 primary elements, the model is geared to deliver appropriate challenge to our work and to ensure that what we do, takes account of the complexity of the defence enterprise model. We emphasise value management in our work, recognising the importance of outcomes rather than outputs and focusing on their associated benefits and value. Whilst nobody sets out to generate shelf-ware, I think we all recognise the risk that work that is allegedly 'well-received', can all to quickly become buried in the pending tray of a busy sponsor. To minimise this risk, we ask our teams to consider how their work will be taken forward by their sponsor and to tailor their formats and particularly their visualisations in order to increase the ease with which they can be exploited.

We put equal store into knowledge management, and whilst recognising that we have a long way to go to improve in this challenging area, we at least acknowledge the benefit and strive to build on what has been done before be it as methods, techniques & visualisations, as decision support processes, or subject matter knowledge and know-how.

Inevitably such 'Hard' aspects must be underpinned by 'Soft' elements. Each year Niteworks engages with about 300 unique individuals as it prepares and delivers its output. The vast majority of these join Niteworks on short-term contracts as subject matter experts on specific, time-bound studies. Not included in this number are the large number of customer stakeholders that actively participate or the industrialists that give up their time to peer review our work through workshops and red team panels. It is important therefore that we have a set of principles that can be rapidly understood and assimilated by this transitory population – and more importantly, followed! Our principles place great store on engagement – we listen to the perspectives of others and are prepared to learn from them and moderate our own views. We focus on exploitation – every single piece of our work must be supported by an Exploitation Plan that is generated during the formative part of the team's development, to guide their subsequent thinking. This is not thought of as prescriptive, as it allows for the properties of Emergence to influence its direction.

Inevitably consistency and quality are two important principles that we require our people to follow. Here the role of independent assurance plays is key. Each delivery team is assigned a lead assurer who supports them throughout their study. At first their role is one of guide and tutor and over time this transitions to that of peer reviewer. We describe those selected to work on our sponsors' questions through competition as our best-athletes. In an Olympic year it is perhaps fitting that we describe the assurers as our decathletes, such is their breadth and rounding as systems thinkers. The effective interaction between the best-athletes and decathletes is a key indicator as to the likely quality of the deliverable.

Our last principle is that of impartiality. Whilst we recognise that we are all a product of our conditioning, by bringing together carefully blended groups of individuals and placing them in an environment that has clearly articulated principles and values, along with an ethos of serving defence, we feel able to claim with confidence that our work passes the test of impartiality and non-advocacy. It helps that we also enjoy high-degrees of freedom to quickly eject anyone that does not meet the required standard.

So having set the context of my role I would like to return to the key conference themes of affordability, support to operations, and systems and capability for an uncertain future.

All too often the three requirements are seen as being in conflict with each other, something that needs to be traded, in order to reach a compromise. There is something slightly perverse, or perhaps even sad, in what I have just said. An innocent child might challenge and ask that if all three are important, then why can't you simply have all three? Why accept that compromise is inevitable or indeed necessary?

A typical response to such naivety might be to pat the child on the head and tell them that when they grow up they will all too soon learn that life is all about compromise. Yet to do so would in one stroke, dump a lifetime of behavioural modification onto them. Maybe that child, through their purity of thought, actually knows more than we do with all of our years of life lessons? Is there a risk that as we learn we lose something of even greater value – the ability to think unfettered? Does a lot of analysis reinforce old paradigms rather than open our eyes to the new? Why is it that we all find it so difficult to embrace ideas that come from a perceived competitor or adjacent sector? Is Chesbrough's[i] concept of Open Innovation given sufficient emphasis within Defence?

There is a serious point here, do we spend enough time and effort thinking about how we get everything we want, rather than working out all the reasons why we can't? Does the adoption of a Systems Engineering approach mean that our first instinctive reaction is to disaggregate a problem into its systems elements in order to allow us to research them in the appropriate depth? Should more time be spent using Systems Thinking rather than

Systems Engineering to address the orthogonal interrelationships between the elements that in our case are expressed as the Defence Lines of Development (DLOD)? Probably we need to rebalance both. Personally I believe this should be the case.

In this segment of the conference we will look in more detail at systems and capability for an uncertain future. I would like therefore to spend the rest of my time looking at the three key words of systems, capability and uncertainty.

The argument I make in this presentation is that defence is a system built up of highly interconnected entities with non-linear interdependencies that spans the public, private and third sectors. The interactions between the components form a relationship. The concept of relationship is however both helpful and unhelpful. Helpful in the sense that it reinforces the multilateral nature of the environment, yet unhelpful as it potentially reinforces boundaries and accentuates the divides that exist between parties, thereby placing emphasis on their differences rather than their similarities. I argue that rather than seeing these relationships as linkages between disparate parties, they should be thought of as components of a single enterprise. It follows that our approach to analysis of the system must take this into account.

Nations, Armed Forces and Industry are all examples of complex systems. They all have inputs and outputs, undertake some form of transformation and deploy control-actuation systems to govern their activities. To remain viable, they adapt as their environment changes through a process of innovation. Where they fail to appropriately adapt, they decline and ultimately become extinct.

Systems compete for resources against all of the other systems in the environment. The most successful ones strike the right balance between dominating and being dominated as a mode of survival. As they grow systems divide to create locally manageable entities that focus on specific tasks and the need for inter and intra coordination increases.

Systems are susceptible to their environment; however, this does not necessarily make them powerless within it, as they have the ability to influence its direction. As such they are not Passive Actors, but Agents whose actions and reactions combine to create complex interactions defined by Rittel[ii] and Ackoff[iii] as wicked or messy. The trick is to learn to influence and to be prepared to be influenced.

You will recognise that irrespective of the number of systems there is always only one environment. It cannot be divided into your environment and my environment; it remains the environment. Whilst planners draw system's boundaries around issues to constrain the number of variables, such boundaries are themselves arbitrary. Draw too tight a boundary and the outcome of the change will not be accurately predicted, too broad and the impact of the change may be felt long before any accompanying analysis is complete.

Put another way there are no fences in the environment. By definition therefore there are no sides and no fences to sit on. Indeed in a dynamic environment even doing nothing is in effect doing something, as the environment reacts to the state of inertia.

I would like to expand on the point I raised about the timeliness of analysis using the work of Kondratieff and Schumpeter that gave us Kondratieff Waves and Schumpeter's concept of creative destruction as an example.

Each wave represents an era of technological and economic activity characterised by its content and showed how each wave brought about its own demise as the process of innovation ran its course. The recent recession has brought renewed focus on this work as evidenced by Alan Greenspan's use of Schumpeter's theories in helping to explain what caused the economic bubble to burst - where continuing to do the same thing, as it previously had been successful, in the belief that it will always be successful, will generally

lead to a sticky end – as in Exhibit A – the Fall of the Roman Empire and Exhibit B – the Crab Nebula formed early in the 2nd millennium presumably as a star went supernova.

So far there have been 5 waves of activity that have shaped our world since the Industrial Revolution in the 18th and 19th centuries. What is interesting, and relevant for today's discussion, is that the duration of the waves is constantly reducing. From 60 years for the 1st wave for water power, textiles and iron to a predicted 30 years for the on-going 5th wave of digital networks, software and new media.

So what of the next wave? Many argue that it will be driven by nanotechnology. Others believe that the sixth wave will bring a biomedical-hydrogen revolution in which genetic engineering, pharmaceuticals, alternative energy and human-machine connectivity will all play a role. In Defence, my own belief is that the 6th wave will be recognised for the advent of Intelligent Systems that will contribute to and draw upon techniques that extract knowledge from information in the same way that we today extract information from data. Underpinning this will be the enabling technologies drawn from the nano-sciences, energy systems and material sciences that will combine to form tomorrow's intelligent structures.

The key point here however, is not what may or may not form the next wave but the likelihood that the duration of each wave is reducing. Continuing the trend suggests that by 2050 a wave may last in the order of 10 years. How must our approaches to research and analysis adapt in keep pace with this tempo or will the pattern change as Schumpeter's principle of creative destruction brings to an end the apparently irresistible foreshortening of the technology timelines?

Returning to the point I made about systems environments.

My core thesis is that we need to accept that there is only one environment for defence – itself a subset of the national environment driven by the economy. At present it is particularly hostile and needs us – and by us I mean the Ministry of Defence and industry - to work collectively to find the optimum path through. This will require tolerance and understanding, and an acceptance of a superordinate goal that embraces the need for a strong economy, the need for defence, the need for employment, and the need for future skills in a globally competitive world.

As Benjamin Franklin was attributed as saying at the time of the Declaration of Independence, "We must, indeed, all hang together, or assuredly we shall all hang separately." Alternatively for those that reject the notion that we are all in it together, you may prefer another of Franklin's quotations, "Love your enemies, for they tell you your faults."

Either way, irrespective of motive or perspective, both suggests there is clear merit in better understanding the mutual interrelationships that exist between government and industry.
So what does our environment look like?

With UK national debt at over £1 trillion – 65 per cent of GDP and government continuing to borrow what is likely to exceed its targeted £120 billion for this year, it is not surprising that eliminating the structural deficit remains elusive. What would once have been described as astronomical numbers have fallen to earth taking with it the lustre off the economy! The Governor of the Bank of England suggests that we are not even half way through the financial crisis that struck five years ago. According to the Times^{iv} the government borrowed £17.9 billion in May, £3.1 billion more than expected, and £2.7 billion more than the equivalent period last year.

It is no surprise that there are clarion calls for further deficit reduction and stimulus for growth. I am not an economist so I should not add my untutored voice to the fervour; however, intuitively the need to do both is surely, to use the vernacular, a 'no-brainer'.

Closer to home within defence the combination of the Strategic Defence and Security Review, Levene, Materiel Strategy, supporting current operations and preparing for contingency operations creates a medley of change that seeks to achieve restructuring, transformation, efficiency, reskilling and de-risking. For its part industry strives to grow its top line, and where it can't do that, to cut its bottom line to focus on its outputs and preserve capability, whilst striving to maintain the confidence of its investors that watch what was once a sector known for low growth but defensive stock turn into something that is altogether more volatile. It is truly a battle on many fronts.

The MOD's demands for capability are clearly articulated, if not necessarily so clearly prioritised: It is in the midst of restructuring, rewriting its Operating Model and refreshing its approaches and tools. Boundaries are being redrawn and the capability diaspora are preparing to redeploy to their new homes in the Front Line Commands. Overall manpower is being significantly reduced.

The demand is for flexible, agile and simple systems … at low cost… interoperable, readily extensible; designed with open architectures to enable innovation from primes and SMEs alike. By so doing it wishes to avoid lock-ins and demands lower cost of ownership through the portfolio management of maintenance, overhauls, modifications and upgrades. COTS are preferable, and where MOTS are necessary, global supply will be sought. Domestic industry is encouraged to invest to have products on the shelf and to increase exports to prevent domestic dependency. MOD wants to buy only what it needs to buy, only when it is needed, preferring to commit at the latest possible point and for the least possible time. It wants to reduce risk, and to transfer what risk remains through contracts that do not make it the bank of first resort when things go wrong. It wants to be organisationally more agile, better skilled, to be more capable of rapidly rising to the challenges of the next conflict, whilst not forgetting the lessons of the past. It plans to place a greater reliance on reserve forces as an integral element of the fighting force, and to build a closer reliance on industry as part of the Whole Force Concept. It wants to be an attractive employer, capable of recruiting and retaining its best during a predicted demographic trough, whilst recognising that a new relationship is needed with industry to provide niche specialisations in disciplines as disparate as surgeons, cyber and infrastructure. To be an attractive employer it must continue to carry the trust of the general public and of those that influence public opinion. It needs to be revered at home, feared by its adversaries, valued by its partners and trusted everywhere. Whilst it does this, it needs to maintain focus on Current Operations whilst preparing for Contingency. Truly an agenda that would keep any Board busy for the foreseeable future!

Is this meant to be a gloomy prognosis? Far from it! For defence is resilient, it is determined and it is populated by highly motivated individuals, the overwhelming majority of whom are committed to doing the right thing, balancing their fiduciary duties with the desire to support the Armed Forces whom they serve.

So all is rosy then? No it isn't that either! MOD has outlined a significant change agenda that is both complicated and challenging. It has many risks and uncertainties, but so too does it have many opportunities, and as befits my nature, I prefer to see good rather than gloom.

I have a personal adage to which I try to adhere: don't focus too much effort on always trying to take the right decision, be prepared to take a decision, and work hard to make it right.

So what will make the situation right for government and industry?

As we all know successful transformation requires more than just organisational change. It also requires cultural change. In previous speeches with MOD colleagues, I reinforce this point by stating that "organisations simply restructure: it is the people that actually have to change." People are after all a key DLOD and whilst it is true that re-skilling and cultural training are recognised as important strands of future activity, I harbour doubts that this will generate the quantum of change that is needed. Experience shows that changing culture is the hardest component of any transformation and takes a considerable amount of time and resources.

And this leads us on to the last component of uncertainty. Will the cultural changes happen, if so, when and in what form? To deliver change requires organisational agility however the very absence of agility is a phrase that is often banded around about large organisations. Super tankers are of course the de rigueur metaphor for exemplifying the inability to change course (despite the paradox that stability is arguably a far more important feature) whilst modern fighter aircraft make a virtue out of designs that favour aerodynamic instability in order to make them capable of changing direction at the pilot's whim. Were it not for the bank of flight control computers working in the background they would be unmanageable.

The point here is that agility is a relative term that needs to be appropriately applied. It should be remembered that agility directly correlates with instability – the more of one, as likely you will have more of the other. Providing agility therefore requires the successful management of instability, and the successful management of instability requires an organisational design and culture that is capable of handling it.

These are points recognised in the DE&S Materiel Strategy and has led to the examination of the alternative models for defence acquisition including the GOCO model. It will be a while before we know whether the model will be introduced and even longer before we know whether it will have the desired effect. Until then we must learn to continue to build capability despite the uncertainty.

But what of the government-defence industry relationship? Can it be made to work as one despite the movement of the tectonic plates undermining the footings?

Convention argues that the defence industry and the armed forces are two sides of the same coin, symbiotically linked and interdependent, yet clearly stamped on opposing sides. Both rely upon each other in a similar way to farmers and supermarkets, energy providers and consumers, landlords and tenants. As with all these couplings, tensions arise as the equilibrium of the relationship ebbs and flows in response to the changing environment.

The same is true for the government – industry relationship. Followers of Keynesian economics speak of the need for a mixed economy – a blend of private and public enterprise, which pitched right, delivers a balance between avarice and benevolence and promoting fairness. In this model the private sector earns the wealth and pay dues to the government to be reinvested on behalf of the nation to create the conditions for future wealth creation. It all sounds so simple, yet we all know, it is anything but. Getting the right balance is an age old conundrum: the only thing that changes is the people that are entrusted to manage the situation. The incumbent generation should take heed as the road to good intention is littered with the unintended consequences of ill-informed change.

Take for example, and here I am referencing the system dynamics work of John Morecroft[v], as he discusses attempts to reduce crime in areas of high drug dependency. In this scenario residents demand that the police address the high levels of burglary that take place to fund the purchase of drugs. The police target the drug dealers and seize drugs. As a result the supply of drugs is reduced, but because demand fuelled by addiction remains the same, the prices of the drugs go up, not down. As a result the very attempt to reduce crime actually leads to its increase as more burglaries are committed to pay the increased price.

The moral of the story is to ensure you have a full understanding of all of the stakeholder positions before you contemplate change or it is likely to have unexpected, and generally unwelcome consequence. Have we really thought through the full consequences of the decisions that impact across the government-industry boundary?

Russell Ackoff[vi], the well-known systems thinker spoke to such dilemmas. Speaking at the age of 80 he thwarted convention with the challenge to deny the obvious. He argued that the obvious is not what needs no proof, but what people do not want to prove. Reinforcing his point he challenged three particular conventions:

Convention 1: "Improving the performance of the parts of a system taken separately will necessarily improve the performance of the whole."

Here he uses the example of the motor car where fitting a supposedly better engine does not necessarily mean that the car's overall perform will be any better, indeed it might get worse.

Convention 2: "The best thing that can be done to a problem is to solve it."

No he argues, the best thing that can be done is to redesign the system to stop the problem occurring in the first place. Blindingly obvious, perhaps? Yet how often do we feel the need to manage situations by solving the here and now rather than addressing their systemic roots.

Convention 3: "Problems are disciplinary in nature."

Ackoff argues that effective research to address problems is trans-disciplinary. It follows that you cannot understand the whole by simply understanding all of its parts separately; the whole can only be understood by viewing it from all perspectives simultaneously.

I believe that we will all be able to find examples within the defence enterprise where Ackoff's challenge of convention rings true. Within Niteworks we are on occasion asked to look at programme coherence across MOD looking for gaps and overlaps and areas of improvement that have not taken into account the wider systems implications. I don't think we should be surprised by this and would anticipate the same is true in any complex entity.

The temptation to view the world from your own perspective is compelling and it is a sign of great personal and organisational maturity when you are able to truly embrace the perspectives of others and see this as an advantage rather than a weakness. Arguably it represents the transition from management to leadership.

I referred to the temptation to fix problems rather than to resolve them through systemic action. Here I am encouraged by the MOD's reluctance to find an immediate tool solution to its capability management challenge, preferring to design and test before deciding on how to proceed. I know that this is frustrating for parts of industry and understandably so, but how can it be otherwise?

Inevitably however, over the years, MOD and industry, like all large organisations, have implemented a patchwork of fixes and work-arounds, both explicit and implicit, which will take a long time to deconstruct and redesign. Yet ultimately doing just that, not in isolation, but together could lead to considerable efficiencies being unlocked and should therefore be seen as an opportunity.

For me Ackoff's observation about the trans-disciplinary nature of problems and the need for holism is perhaps the most daunting. This suggests the need to understand the whole in order to understand the parts; something that goes against our inclination to segment and delineate into bite size chunks as a way of creating manageable entities? Given MOD's

chosen devolved operating model this suggests the need to maintain the ability to aggregate enterprise issues to properly inform and take inter-organisational decisions.

So let's bring this to a close. Over a decade ago I was asked to give a speech to the Parliament of the Western European Union on the role of the defence industry in the defence of Europe. Speaking in the Spanish Parliament and recognising I was speaking to a gathering of politicians I thought I should make my speech of relevance to them. So, slowing my delivery I proffered, "There is politics in defence… There will always be politics in defence… but there should never be politics instead of defence." My speech ended with a roar of approval from the British Parliamentary contingent and the waving of order papers, but sadly little else, as here we are years later still discussing the same issues.

So if parliamentarians are not going to solve our Nation's problems what can the UK's OR and OA communities do – I end on three observations:

1. Analysis must be conducted with cognisance of the enterprise model and recognise the role of holism in their thinking. Think outcomes not outputs.

2. We should encourage mechanisms that address problems collectively and openly, bringing those with experience of the problem space and the solution space together to share their wisdom.

3. Consideration should be given to methods that accelerate the delivery of decision support and advice. What takes a day today should be conducted in less than an hour. A week should take a day and a month within a week.

The rest is plain sailing!

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[i] Chesbrough, H., (2003), Open Innovation: The New Imperative for creating and profiting from technology, Harvard University Press
[ii] Rittel, H.W.J (1973), Policy Sciences magazine, Springer
[iii] Ackoff, R.L (1974) Systems, messes and interactive planning, *Redefining the future*, New York/London, Wiley
[iv] Watson, R., Pank, P., Coates, Sam. (2012) , Osbourne's fuel U-turn, The Times 27 June 2012, News International Limited (On-line edition)
[v] Morecroft, J. (1997) in Systems Approaches to Managing Change: A Practical Guide, Springer, p.40
[vi] Ackoff, R. (1999) A lifetime of systems thinking, in Leverage Points Issue 115, Pegasus Communications Inc.