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The Shrivenham Papers

Returning Science To The Social
(Making Sense Of Confusion: A Case For Honest Reflection)

Simon Reay Atkinson

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The Defence Academy of the United Kingdom

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DEFENCE ACADEMY OF THE UNITED KINGDOM

RETURNING SCIENCE TO THE SOCIAL

(MAKING SENSE OF CONFUSION: A CASE FOR HONEST REFLECTION)

BY

SIMON REAY ATKINSON

THE SHRIVENHAM PAPERS

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Contents

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Simon Reay Atkinson is Australian-British. He is a PhD Research (Systems-Design) Engineer in the Engineering Design Centre and a Senior Research Fellow at the United Kingdom Defence Academy (R&AB), where he is also the Lead Adviser to the Asymmetrics Cluster, which he established as Director; broadly defining Asymmetrics to be the *'art of seeing and the science of doing things differently'* (non-symmetrically). His area of expertise is Complex Adaptive Systems, networks and socio/techno System Identification. He is a Royal Navy Officer and has served in the Falklands, Latin America, the United States (DoD), MoD, the Middle East, South West Asia, South East Asia and the Balkans. He designed the successful NAVPAC system for Mine Counter Measure Vessels. In Bosnia, he was attached to General Eric K. Shinseki's initiative group during which time he developed the socio-techno media access pyramid and worked on the redesign of Bosnian terrestrial broadcasting. Commander Atkinson took HMS *Ocean* (the UK's largest aircraft (helicopter) carrier) from build to full operational status as its first systems engineering officer and Head of Department, with full Charge and Command (Systems Engineering) respons-ibilities. He worked on the Strategic Context of the SDR New Chapter and led on the development of NCW and NEC and the subsequent challenge to Effects Basing. He has twice been mentioned in despatches and gazetted the Queens Commendation (QCVS) for Bosnia, 1997, and Sierra-Leone, 2000. Between 2008 and 2009, deployed as part of General Petraeus' Strategic Assessment Team (Command and Control & Knowledge Management); introducing new concepts for Information Capture and Knowledge Exchange (ICKE), Knowledge Management, Communities of Interest and the Three Needs Model (Need-to-Know; Need-to-Share and Need-to-Use).

This paper was first presented at the Cambridge University Centre for the Research in the Arts Social Sciences and Humanities (CRASSH), 'Mars turns to Minerva' Conference, 7-8 July 2009.

Returning Science to the Social
(Making Sense of Confusion: a Case for Honest Reflection)

by

Simon Reay Atkinson
(EurIng BSc MPhil (Cantab) CEng FIET)

Executive Summary

Many contemporary organisations are based upon what has been loosely termed the *'Standard Social Science* [Reference] *Model'*. This model appears to be increasingly divergent from the underlying sciences and technologies that should form and underpin them. If the models are wrong and we are viewing the models through a lens similarly constructed, then our observations are likely, themselves, to be wrong. In place of the Standard Social Science Model, Tooby and Cosmides have proposed the Integrated Causal Model (ICM). The Integrated element of the model refers not to the unification of experiences within an exclusive entity – but the integration of *'natural connections that exists among all branches of science; using them to construct careful analysis of…causal interplay'*. This paper challenges existing models; identifies current weaknesses and seeks to put in place elements that may form an Integrated Causal Model for future assessment.

Returning Science to the Social

Bipolar, Let Alone Multi-Polar

The *'Two Cultures Controversy'* between science and *'the arts'*, as propounded by C.P. Snow in his 1959 Rede lecture and responded to by F.R. Leavis in 1962, remains at issue as Huxley expressed when he posited symmetry between the *'scientism of Snow'* and the *'literalism of Leavis'*. Although the controversy refuses to fall simply along disciplinary lines [Ortolano] and despite the fact that many saw Leavis lecture as *'convincing people of the truth and timeliness of C.P. Snow's Two Cultures thesis'* [Bernal], Leavis was seen then to be the victor. It was the arts and social sciences and the tradition that Leavis espoused that predominated: *'Leavis continues to haunt the* [Arts] *Tripos at Cambridge'* [Ortolano] but few engineers and scientists recall C.P. Snow or the controversy. Why? Part of this was because of *'a shared meritocratic consensus* [that] *emerged as part of a coincident ideological shift from the late 1960s'*. This shift arguably supported the dominant position in British society in favour of the arts over the sciences, as espoused by C.P. Snow, and connected with the discourse of decline prevalent at the time. There may also be other underlying reasons, such as the rise of Post Modernism, which largely rejected causality and the search for underlying truths, and an education establishment increasingly based upon the teaching of method and process (MBAs, for example).

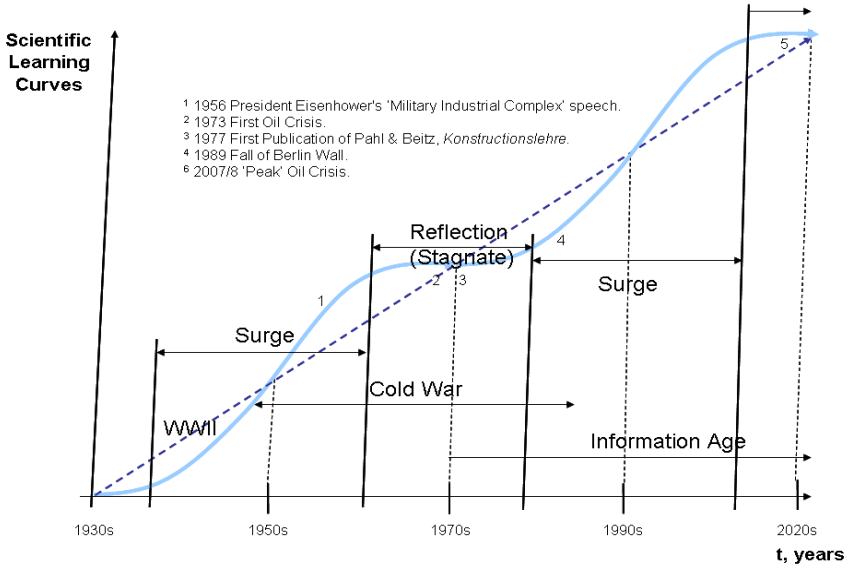

Figure 1: Engineering Sciences Surge-Stagnate: Reflective Learning Curves

Design Science

Jarrett and Clarkson (2002) used as a case study, the first 50 years of evolution of Parsons steam turbine to posit a *'surge-stagnate model/Ebbinghaus learning curve'* (Wozniak) about the development of a science and its associated technologies. Previously, Thomas Kuhn (1996) observed that *'progress in science is not linear'* but that it exhibits periods *'of peaceful interludes punctuated by intellectually violent revolutions'*. Rather than being a period of stagnation, this may be a necessary phase of a complex adaptive system. Not a *'peaceful interlude'* of things *'not happening'* but a time for essential reflection and for absorbing what has been learned. Figure 1 is based largely about the computing and radar sciences that emerged firstly in the 1930s as applied to significant historical events occurring at the time. Engineering Design formally emerges as a science with the publication of *Konstructionslehre* by Pahl and Beitz in 1977.

The role of technology over this same period has been significant. Not only has it been a driving force for change but more recently it appeared, simultaneously, to offer organisations and managers the opportunity for improved efficiency and control over both people and processes. For four main reasons, this combination appears to have prevented change and therefore *adaptation* occurring:

- The rise of a managerial class wedded to its own interests, *'where the "Lords of Things as They Are" protect themselves from hunger, by wealth; from public opinion, by privacy and anonymity; from private criticism, by the laws of libel and the possession of the means of communication;* [so permitting] *ruthlessness to reach its most sublime levels'* (Wiener).

- The implementation of self-preserving type rules with no built in, rigidly specified *telos*, the way Aristotle's organisms were supposed to act *'where randomly occurring fluctuations and un-specified failures are the norm, typified by the dynamic interaction between self-organising systems and the contingencies of their environment'* (Juarro).

- The introduction of methodologies and process that sought to *'triply constrain communication by a) the elimination of the less profitable means in favour of the more profitable; b) placing these means in the hands of a very limited class of powerful* [bodies and process-practitioners]*; and c*) [as one of the chief avenues to political and personal aggrandisement] *attracting, above all, those ambitious for such power'* (Hanappi).

- More and more complicated listing machines, from Cybernetics and Artificial Intelligence onwards that offered senior managers a belief that they could control, optimise, achieve efficiencies and remain effective, all at the same time.

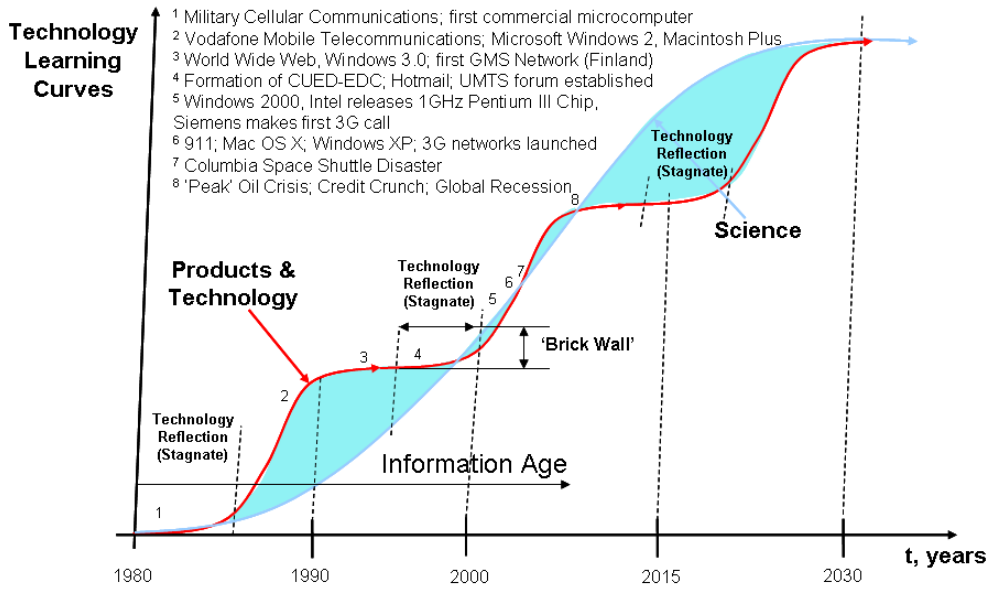

Figure 2: Technology and Science (Surge-Reflect) Learning Curves

The *'significant detail' in the history of* (Parsons) *work is that for most of the intervening time, when Parsons experimented with No.1, trying myriad alternative designs to assess their efficiency, there was no real change in performance. Indeed, between 1885 and 1888 he wrestled with the problem of how to reduce tip leakage flows'* (Jarrett). Essentially, Parsons was experimenting with different technologies to get the science right. It was not until he got the science right that he got the technology right. Combining the science about a technology curve of 15 years, Figure 2 suggests that technology, by the early 1980s, was driving the science – as the information revolution began to gather pace. Empirical evidence suggests that the engineering, design, planning and network sciences that emerged, as connected research paths in the mid 1980s – linked through computation – hit a period of *'disillusionment/a brick wall''* [Bracewell, in discussion Oct 07] towards the end of the 1990s. At this stage, the science began to close the knowledge gap; emerging more strongly into the new millennium. Aligning to the *'science learning curve'*, this suggests we may be at an interesting moment, as the science begins to reassert itself and the technology – exacerbated by the turn-down of the Global

Recession – potentially enters its third cycle; commencing with its third period of reflection.

Delivering Process – or Delivery?

Pahl and Beitz argue, after Dixon and Penny, for the positioning of engineering design '*at the centre of two intersecting cultural and technical streams'*, see Figure 3.

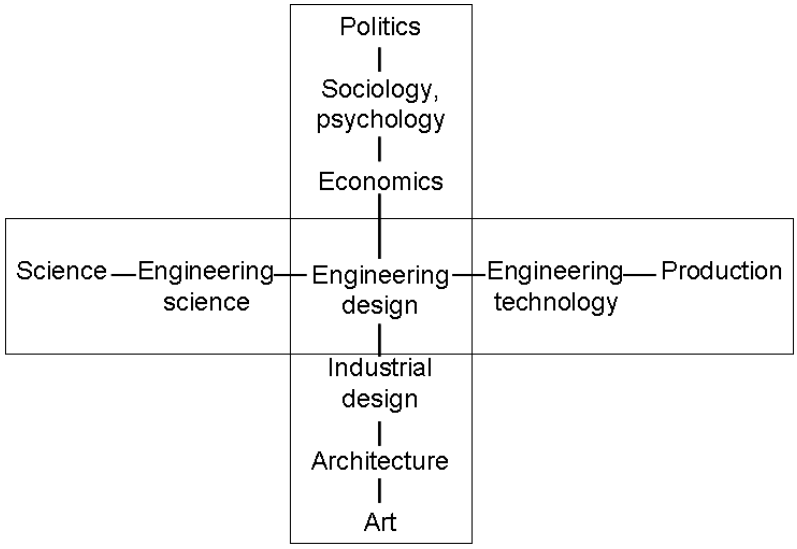

Figure 3: The Central Activity of Engineering Design, after Dixon and Penny

The model is an abstraction but, one senses, opens more questions than it poses answers. For example, is engineering central; does *economics* include finances; is art separable from science and, more importantly, do science and art interact, compete or simply overlap? Certain other issues appear unresolved by this model, including the underlying philosophy and theories to be applied and abstractions made and the processes and methodologies necessary for technology and production and so delivery. As worrying, is that the sciences and the social sciences or arts are orthogonal and so appear non-interactive: can/ does engineering design combine them?

Interpreting the model in these ways, potentially gave rise to what has been loosely termed by Cosmides and Tooby as the '*Standard Social Science* [Reference] *Model (S3M)'*. This model, with its emphasis on studying overly

complicated *'chaotic and unordered phenomena'* [Tooby], appears not to be working. Moreover, the model seems increasingly divergent from the underlying sciences and technologies, see Figure 2, which should form and underpin it. In place of the S3M, Tooby and Cosmides proposed the Integrated Causal Model (ICM). Significantly, Tooby considers culture *'not as part of an exclusive social-behavioural science, to be studied separately'*, but as part of an *'inclusive human experience of complex variability'*. The Integrated element of the model refers not to the unification of experiences within an *'exclusive model'* – but the integration of *'natural connections that exists among all branches of science; using them to construct careful analysis of…causal interplay'* [Tooby]. This model connects the social sciences to the rest of science by recognising information processing, adaptation, problem solving, and functional specialisation as part of the human experience.

Effect to Cause or Cause to Effect – A MoD Transgression?

From the early 1990s and the *'peace dividend'* onwards, Defence expenditure in the UK has been in decline – from 5% of GDP in the mid 1980s to 2.2% in 2009. Given a combination of: a reducing research base (with the privatisation of defence research (divided between QinetiQ and Dstl (in 2003)); reducing numbers of experts; the closure/reduction of in-service BSc education programmes (such as the Royal Naval Engineering College, Manadon) and increased operational pressures (Balkans 1992–2008; Sierra Leone 2000; Afghanistan 2002–; Iraq, 2003–) the process was no longer affordable. Nor, more significantly, was it politically acceptable. Following the 1998 Strategic Defence Review, the procurement process was replaced by the MoD Acquisition cycle, *'often referred to as CADMID'* (MoD Acquisition Handbook: 2005) and *'Smart Acquisition'* (MoD Acquisition Handbook: 2004):

As an abstraction of a complex process, CADMID was, perhaps, a *'reduction too far'*. It explicitly failed, for example, to recognise the role of politics, economics, science, engineering or design and chose, instead, to delegate accountability, without responsibility (for contracting), to newly Joint (as opposed to single) Service commands at the production level. In 1989, the MoD Chief Scientific Adviser defined risk to be *'a function of both the probability of an adverse event occurring and its impact'* (MoD: 1989). By reducing the MoD acquisition process to the right hand cross of the engineering-design-process, Figure 3, the MoD was actually taking significant and unquantifiable risk without actually recognising that it no longer had *insitu* the people (individuals), processes (underlying models) or bodies (organisations) capable of conceptualising and advising on the probability of adverse events, let alone their impact. *'There is a certain lack of focus by the senior management of MoD that does not help* [and] *there is still a question of whether or not the MoD invests*

enough time [reflection] *in de-risking before making major capital investments'* (Weiss).

In many regards, the DoD Acquisition Framework and the MoD CADMID process had parallels and overlaps. Nevertheless, in comparison with the Dixon and Penny Engineering Design Process, Figure 3, none of these frameworks or processes appeared to cover the whole or important areas of research (into the engineering sciences and arts). Nor did they take into account the underlying politics, processes, psychology and sociology or the economics of financing and supporting these types of programmes (beyond milestones and decision reviews). As significantly, the processes also tended to concentrate on methodology and technology at the expense of research and science:

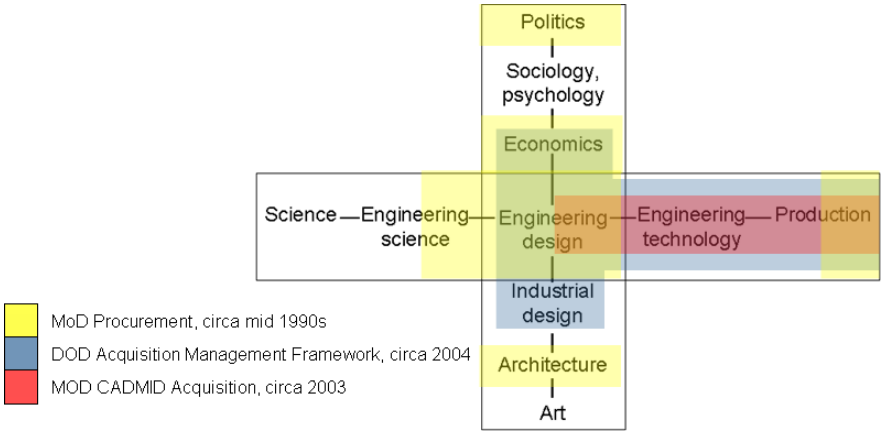

Figure 4: MOD Procurement (1990s), CADMID (2003) and DOD Acquisition Frameworks (2004) situated within the Dixon and Penny (1970) Engineering Design Process

In terms of historical causality and the *'arrow of time'*, Figure 4 would suggest that, at least from the 1970s onwards, there has been a move away from science, engineering and the politics, architectures and understanding of organisations and individuals and more towards methodology (in terms of process) and technology. At the same time, the divisions between the physical sciences (and engineering) and the social sciences and arts appeared to be widening, for example between the EPSRC and ESRC or the Engineering Sciences, where management science came from, and the training of MBAs. This divergence cannot simply be explained by the different funding paths, which are a symptom rather than a cause. The causes may also reflect the complex social patterns that have emerged along two distinct paths since 1859 (Darwin). In particular, the

physical and applied sciences *'have been weaving themselves together through accelerated discoveries of their mutual relevance*; whereas *a doctrine of intellectual isolationism… has been the reigning view in the social sciences, which has only become more extreme over time'* (Tooby). Why? On the one hand there has been an acceleration of discoveries progressing through *'a mixture of empiricism, intuition and formal theory'* (Williams). On the other, there has occurred an apparent rejection by the social sciences of the physical sciences. This includes their *'dismissal as crude attempts of reductionism (*Tooby) and the call for the *abandoning of principled causal analysis entirely in favour of treating social phenomena as "texts"'*(Geertz). In design and planning terms, this would be readily understood as *'exclusion'* (Keates) as opposed to *'inclusion'*, with all that this implies regarding attractiveness, merit, demarcation and elitism.

The Stability Belief

In the context of a learning or adaptive system, the stable part of the learning curve may actually represent a period of examination during which time the '*body'* tests and adapts incrementally to failures. These phase changes occur at a '*moment of absurdity'* when the contradictions inherent within any model cannot be resolved by the existing science or technology. At this point, the *'body'* appears to have a choice of reforming – through phase change – or attempting to reinforce (not learn from) failure by adhering to the pre-existing rules/models. This latter option would appear to break three connected *'entropic'* rules of thumb:

- *'Complex Adaptive Systems, cannot be controlled or ruled; they will simply find ways of working around the rules if the context in which they formed remains viable'* [Atkinson and Moffat];

- *'In isolation, rule-based constructs may be condemned to failure: fixed rules, like walls, [Hadrian's Wall, the Maginot Line, the Berlin Wall] tend to fail over time'* (Atkinson & Moffat); *'if you optimise for today; you will not be optimised tomorrow'* (Bounava);

- Over time, organisations create stasis and indecision [Young] rather than enabling change and adaptation.

In 2002, the MoD introduced as a concept Network Enabled Capability (NEC). Connecting between Complexity and Complex Adaptive Systems (Holland), with ideas for emergence, and computing and communication systems (with their reliance on networks) arose ideas in the US for Synthetic Environments and, subsequently, Network Centric Warfare (NCW), and Network Enabled Capability (NEC). Yet, even by 2008, *'there* [remained] *no single definition of what NEC is'* (Keller: NECTISE). A useful understanding of NEC ([abstracted]

from a statement made by the then Secretary of State for Defence (Geoff Hoon) in *The Strategic Defence Review, New Chapter* in July 2002) considers NEC to be:

> *'Network Enabled Capability encompasses the elements required to deliver…precise military effect rapidly and reliably. At its heart are three elements: sensors (to gather information,* [and which include people]*)*; *networks (to fuse, communicate,* [enable] *and* [jointly] *exploit the information,* [between many different *"human centric"* users]*)*; *and* [capabilities] *to deliver military effect. The key is the ability to collect, fuse and disseminate accurate, timely and relevant information with much greater rapidity (sometimes only a matter of minutes or even less in "real time") to help provide a common understanding among commanders and [personnel] at all levels'* (Keller: NECTISE).

Despite their potentially more scientific, less technological, underpinnings, NCW and NEC tended to be treated separately – even uniquely – from EBO/P (Effects-Based Operations/Planning). In an effort to overcome the increasing divergence (if not contradiction) of the two main concepts, Dr Jacob Kipp (US Army TRADOC, Fort Leavenworth), led on ideas for Systemic Operational Design (SOD) (Sorrells). An alternative concept was raised by the Australian Department of Defence, under the title Adaptive Campaigning (AC) (Grisogono). Unfortunately, in the UK, NEC essentially became a measure of achieving productivity and optimisation (more for less) and so justifying *accountability and control* – the missing elements of the CADMID process – in a decreasing Defence budget. By 2005, NEC had stalled in the UK; inadvertently exposing the dysfunctional nature of the MoD. On the one hand, the Chiefs of Staff had signed up to the concept; on the other, their own Procurement Agency had not and neither had the Treasury.[1]

Multi-Modelling

Unable to make NEC or the acquisition process work, the MOD developed a series of *models* under the title MoD Architectural Framework (MODAF) – *'as a critical enabler of NEC, which enables improved interoperability and should realise significant cost avoidance benefits through improved efficiency of the MOD acquisition processes and reduction in the amount of rework required to deliver interoperability and integration'* [MODAF]. MODAF itself was based upon some 22 other models (MODAF-X) including Through Life Capability Management [MoD-EAC]. At first sight, MODAF appeared to be a step towards an Integrated Causal Model (ICM) – however, its *'paths to implementation'* were locked into pervading, metricated[2] and probabilistic S3 Models – for example Balance Score Cards and Traffic Lighting – rather than *'learning to measure what is important'* [Stothart]. Superficially, the combined

MODAF and CADMID *'multi-models'* also appeared to restore elements of the engineering design process, see Figure 3. In practice, these were disconnected and by extension, for example reading *'acquisition'* for *'economics'* and *'sociology and psychology'* for *'non-equipment LODs'*. In addition to the LODs, the MoD also introduced the Human Factor Integration (HFI) model, defined in April 2007 by the MoD Acquisition Management System model (itself replaced by the Acquisition Operating Framework model) to be: '*the cost effective, flexible approach concerned with all human aspects of Capability. HFI is a systematic process for identifying, tracking and resolving human related issues ensuring a balanced development of both technological and human aspects of capability'* [HFI]. Humans had been reduced to a '*capability'*.

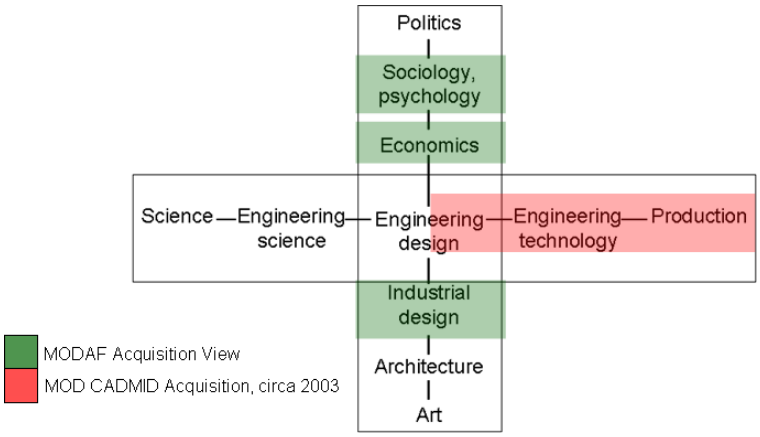

Figure 5: CADMID and MODAF situated within the Dixon and Penny Engineering Design Process

Increasingly, these underlying models appeared to dismiss other branches of knowledge and enquiry, specifically the physical sciences, as ignorant attempts at '*reductionism'*, whilst declaring that the social sciences were '*independent of the laws of biology and psychology'* (Murdock). In the MoD, from the 1970s the science and engineering, and in addition the politics, art, principled social sciences and economics have been displaced. In their place, a series of *'exclu-sive new models have been developed (using MODAF…and associated meta-model/taxonomy'* [MODAF-X]), mostly with only passing reference to the core sciences, politics and economics. These process-models have been applied in almost inverse proportion to the Defence budget;[3] for example, most of the above models were introduced between 2001-2008. The lexicon has also changed: engineering, science, art, economics and politics have been removed and, whereas architecture used to refer to the physical design and building of structures, MODAF considers architecture in terms of processes and methodology.

Confusio ad Absurdum

The adoption of MODAF also came at a time of increasing digitisation, when technology was seen to be capable of running and administering complicated processes. This had specific implications for information, data, communication and knowledge. For senior managers, officers and politicians – as advised by the principal consulting firms – it offered the *'belief'* that they might offset costs by process and so make do with fewer professional scientists, economists and engineers. At the same time, most of the UK Defence Research base was sold off. By changing its research and engineering base, the MoD was also placing risk on risk itself– no longer able to assess *'the probability of an adverse event occ-urring and its impact'*. Knowledge, Information and Data had essentially been displaced either to Industry, where it chose to retain it, or to processes and meth-odologies. The knowledgeable or intelligent *'customer-networks'* necessary to make sense of multiple-processes were no longer *'in being'*.

Computing also gave the impression of precision – of knowing exactly where one is – through metrication. In turn, metrication underpinned the conjoined managerial creeds (mantras?) of *'Evidence Basing'* and *'Performance Management'* through two processes: *'**Probabilistic Inductivism** combined with the **Euclidean** insistence upon **verification**'* [Lakatos]. The emphasis upon *a-priori* and *-posteriori* bivalent probabilities – as opposed to possibilities or even possible-probabilities based on *'**graded** or **fuzzy** data sets'* (Fagin) – was then used to quantify intuition. Worse still, S3 models, like the Euclidean model, *'never **have** to admit defeat:* [their] *programmes are irrefutable;* [it is simply a matter of] *establishing that the truth of the original axiom was inadmissible'* [Lakatos]. Since there is no notion of defeat, refutation or failure within these S3 models, the emphasis is not upon changing the model – or even allowing it to *fail* and *adapt* – but on *stasis*: repeatedly revealing that earlier models were not *'real S3 models'* and replacing them with new ones, which *'are'*: multi-modelling.

Whereas Technology had driven the acquisition and design processes through the 1990s, it may have run out of steam by the turn of the millennium, Figure 4. Multiple-process-models then began to drive the technology and science: the ends had become the means. The 1996 Procurement process was largely in place from the 1960s. Between the Strategic Defence Review, 1998, and 2008, in addition to 25 acquisition models, the MoD also introduced NEC, Effects Basing,[4] Resource Asset Budgeting (RAB) and the Higher Lines of Command [MOD: HLOC]. At the same time, new departments, DfID, were created largely from the FCO and new combined organisations such as the Post Conflict Resolution Unit (PCRU) – from FCO, DfID, and MoD; now the Stabilisation Unit (SU). Unable to introduce Effects Basing across the other departments, the MoD then put forward the Comprehensive Approach [JDN], nominally under an FCO lead. In operational and tactical terms, the Stabilisation Unit has had

minimal practical impact – organisations are reluctant to deploy their individuals and individuals are prevented from deploying by the underlying rules; Human Rights; Health & Safety etc, etc. In application terms, the Comprehensive Approach has been a *'comprehensive failure'* (Miller).

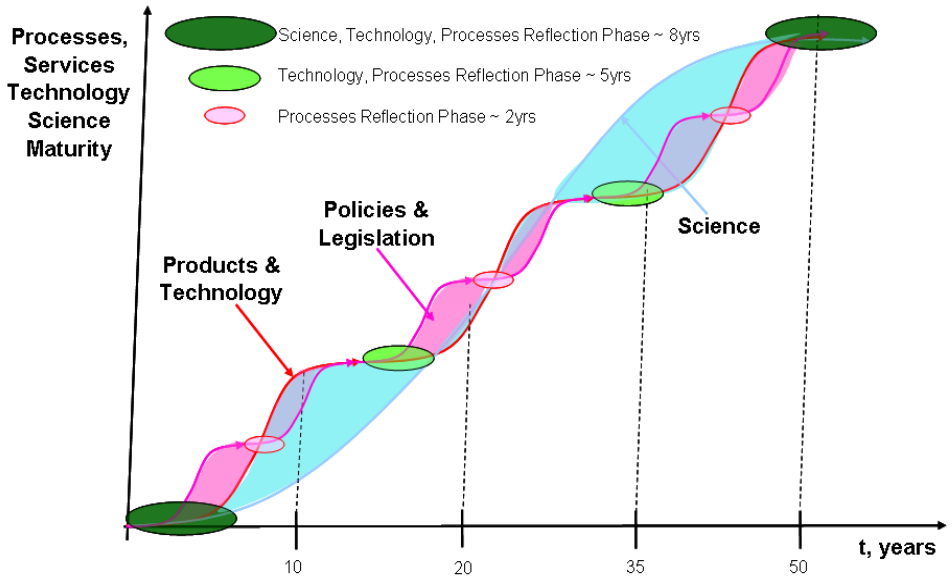

Figure 6: The Ideal Science, Technology, Process Learning Curve

Dr Dover, in his evidence to the House of Commons Defence Select Committee, perfectly sets out the dilemma facing all fleets of any size – from the Wright Flyer to the F-35, irrespective [Atkinson: 2008].

> *'Philip Pugh and Norman Augustine are the fathers of the concept of Defence Cost Inflation (DCI). In both their studies, they concluded that all* [peacetime] *military* [organisations] *are subject to year on year compound inflation in the* region of 8%. *The impact of their statistical analysis (which was done in relation to the* [RN]*) meant that (on the assumption of compound UK defence budget increases of 2-3% per year) the navy would shrink by a compound interest figure of 2-3% a year. If one projects these figures out over 50 years, the navy becomes so diminished that it ceases to have any meaningful utility. The real-life inflationary costs of notable defence procurement projects – like the proposed aircraft carriers, and Eurofighter Typhoon – have come in at higher figures than presented by Pugh and Augustine. If we couple the inflation of these headline projects to the replacement of the nuclear deterrent and to other core costs such as the recruitment and retention of services personnel* [organisations and networks], *fuel, ammunition and the like, then the pressure on the defence budget begins to look daunting'* [Dover].

Since 2001, the UK Armed Forces have effectively been at war. Equipment expected to last 25 years is being consumed in 8 years, about a third of its life expectancy. Not surprisingly, the combined impacts of a reducing Defence budget, Defence Cost Inflation and wartime consumption rates are placing enormous pressure on the Ministry of Defence and its component Single Services, the Royal Navy (and Royal Marines); the British Army and the Royal Air Force. Further complicating matters, the Operational Analysis (OA) models used to develop UK Force Structures are based upon scenarios lasting 6 months – in other words, structures intended to fight operations, not campaigns.

Figure 6 considers the ideal conjoined – science, technology, services – learning curve, based upon a processes and services (including policies and legislation) time constant of 8 years.[5] At regular moments over the 50-year cycle, reflective phase changes occur. These reflective periods are seen to be vital if: a) the science, technologies and processes are to remain aligned; b) failures identified and c) learning is to take place. But what if, as conjectured by Tooby and Cosmides, the social sciences had rejected the underlying sciences and become fixated more on processes and technology? Figure 7 suggests what may have been happening.

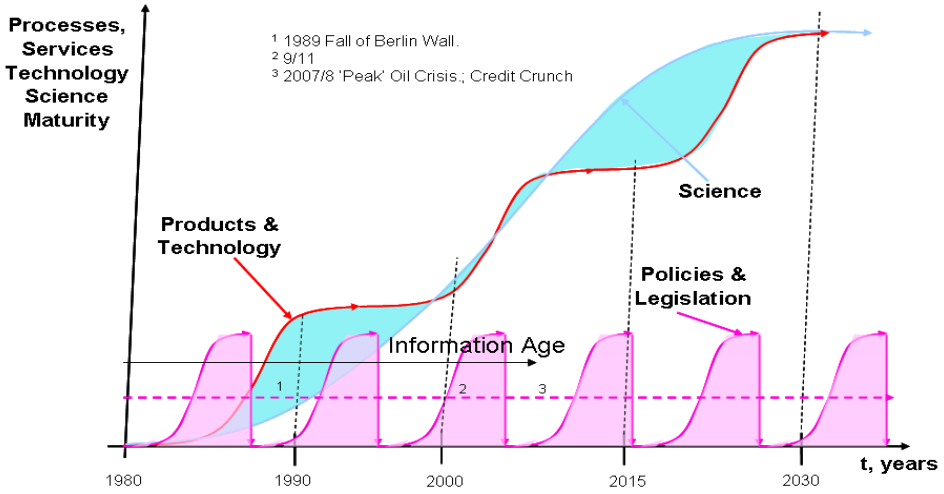

Figure 7: Failing to Learn

After an initial period of rapid and coincident cross-thematic learning in the early 1980s, this was effectively nullified by the *ascientific-exclusionism* that extended into politics, economics, organisations and structures from the late 1980s. Essentially, each new model maintained that it was *sui generis* (of its own kind) or a *tabula rasa* (blank tablet) and could be explained simply by referring only within itself. Nevertheless, there was some recapture in the

1990s as the underlying structures relearned what they had learnt until again rejecting them and beginning again. If this is correct, and then we are now into the third process learning curve since 1980 and the underlying gap between science, technology and processes/legislation is widening. Effectively, organisations and their underlying models are not learning and bubbles are forming between the curves, for example the credit-crunch bubble that burst in 2007. Placed in context, the UK Armed Forces, having constructed their forces about similar ascientific, process dominated multi-models, are experiencing a similar bubble burst. Commitments are not matched to resources, which are not matched to designs, which are not matched to the science, which are not matched to technologies.

Information Capture and Knowledge Exchange

If Knowledge can be lost and gained – learned and forgotten – its management is important to any organisation. As part of General Petraeus' Strategic Assessment undertaken by the Command and Control and Knowledge Management cell, it was noted that the underlying KM processes were not working [Atkinson: 2009]. This assessment concluded that:

> *'Despite the recommendations arising from both the 9/11 and Butler reports, that there had been insufficient analysis, modelling and work done to develop what the 9/11 report rightly observes as the "Need-to-Know; Need-to-Share; Need-to-Use" model (we called* [it] *the Three Needs Model (3NM)) and which both reports recommend, within trust based, virtual networks that encourage interaction, dissent and alternative or minority hypotheses, or uncertainty to majority reporting. This we judged to be the hallmarks of a healthy organisation where dissent is seen also to be an expression of loyalty to the organisations represented and their people; to be encouraged. Moreover, it is also our assessment that the Need-to-Know model is not replaced by the Three Needs Model. Organisations and states have certain knowledge – the crown jewels – that they have every right to protect. Our assessment suggested that there is a need to develop new methodologies for sharing and using information – creating transparencies as opposed to transparency – across domains, which we describe in terms of new understandings for Knowledge Management, Communities of Interest and Information Capture and Knowledge Exchange (ICKE).'*

Many organisations have inadvertently embarked on exercises of knowledge and information destruction. As example, taking Bunges social-knowledge model – *'…cognition is personal, but knowledge is social'* – and applying it to many organisations, for years there has been downward pressure on numbers. This, in turn, has led to the displacement of people – through re-location and

redundancy. Up and until the late 1990s, information was stored in the tactile – frangible – form of paper, files/packs. These packs were stored in local cabinets – *'in the custody of'* originators and *'librarians/registries'* alike. They were occasionally weeded by an expert and, as occasionally, sent off for archiving. Knowledge was *'held in being'* by the organisation; its people and the mental-physical (paper and cabinet) data established. People knew where to look – they were situation aware. Sold the myth of *'knowledge management'* (Wilson), senior management were persuaded that they could recreate their *'networks-in-being'* [Keller: NECTISE] by a) getting rid of the people (experts and librarians) and b) scanning all the old frangible packs to create new, *'exciting'* KM data bases, with access to all. Now, no one knows where to look – they can no longer 'sensemake' (Alberts[6]) – and staff officers are left frequently either a) recreating the wheel or b), spending hours trawling old data bases. Inevitably, it is easier for them to build new models – multi-modelling – which the organisation prefers them to do. So, careers are advanced, billions wasted and lives lost.

A rule, sometimes known as the DICK Trap,[7] is not to confuse Data with Information with Communication with Knowledge, and assume they are the same or interchangeable: they are not. Although not in itself an entropic rule, failure to adhere to the rule has caused confusion in the system – in other words, it has increased entropy. An interesting entropic rule of thumb is however suggested:

- That unless otherwise prevented, the bad (models, processes, organisations, individuals) over time will tend to drive out the good (based upon Gresham's Law)

Economics of Design and Adaptation

A complex system would adapt – changing its structures to match its environment. This has not been occurring, which suggests that the models are complicated and reactive; not complex and reflective, as presented in Figure 6. Such complicated linear re-modelling is based upon a rejection of the underlying science and an inability to enable reflection. It is essentially the politics of spin, where decisions drive actions and what is decided and observed and how the organisation is orientated[8] – the reverse OODA loop[9] – which introduces three further entropic rules of thumb:

- *'If the parts of a system interact locally in a non-linear way, then the model transitions from a complicated system to a complex system with emergent and adaptive behaviour.*

- *'If local interactions are linear, the system is complicated, but not complex – the whole is the sum of the parts, and the behaviour of the whole system can be understood by examining the parts.*

- *'In a complex system, the whole is more than the sum of the parts, and to understand it one needs to focus on the global emergent behaviour of the system'* (Atkinson and Moffat).

As a pressing example, take IEDs. In late 2007 questions were raised regarding the ratio of fatalities to injuries in the two operational theatres. US statistics suggested a ratio of fatalities to injuries somewhere in the region of 1 fatality for every (non-related) 30 injuries; increasing from 1:4 in WWII to 1:19 during Vietnam. UK figures have been difficult to obtain but appear to suggest similar or higher ratios; possibly as high as 1:50 in more urban conflicts. This has specific implications for the provision of long-term care and the nature of conflict – for example, triage breaks down at these numbers. It is necessary in effect to think of *quatrage* – for every fatality, there being 7-12, Tiers 1 to 4:[10] Tier 4 being those with multiple fatal injuries unlikely to have survived in previous wars.

OA modelling is metricated by fatalities not injuries. The 300 or more fatalities will cost the UK about £150M. Tier 4 costs, alone, are estimated at £3-4.5bn over a lifetime.[11] These costs simply have not been accounted for within the OA and MoD models – neither by the Treasury nor by the NHS or local government.[12] Military operations accounted for on the basis of *metricatable* fatalities are, in actuality, costing twenty-thirty times as much as forecast. Notwithstanding the failure of the UK to adequately look after its servicemen, the wars in Iraq and Afghanistan have added significant additional inflationary costs to the MoD's personnel budget: a budget under increasing strain to pay for pensions.[13] Not only is the MoD acquisition model broken and unaffordable – but so too is its organisational and manpower models.

The Design and Adaptation Imperative

As an example, the RN carrier fleet, Figure 8, reduces in accordance with the *'Pugh-Augustine Law'* to 2015 when there are planned to be two carriers (CVFs). Three cost curves are shown: the upper one uses the cost projection from the first CVS (*Invincible*) to the last (*Ark Royal*) and the lower two use the average cost of building the three existing carriers (CVS) as the unit of measurement, to estimate a like-for-like replacement based on the Pugh-Augustine model (DCI 8%) and the announced CVF costs of ~£4B (now £5B)). An alternative design model is suggested by the Landing Platform Helicopter (LPH – HMS *Ocean*). This was a new-design concept based on the hull of a CVS and applying Lloyds Register and [Royal] Naval Engineering Standards. Confirming the Pugh-Augustine Design Law, by constructing to these new design criteria, it was possible to build the LPH in the late 1990s at three-quarters the mean cost of building a CVS, two decades previously. Moreover,

its cost projection to 2015 suggests an alternative carrier design may be possible – and one that could also preserve numbers, almost at a ratio of three for the price of one [Atkinson: 2008].

The UK Armed Forces are faced with a brutal confluence of factors: a reducing Defence budget; a recession bringing further cuts; Defence Cost Inflation and the need to continue fighting with the UK still operating a peace time economy within a peacetime mentality. Put simply, it cannot continue operations as normal. Given the cost implications, the UK has a number of options:

- Withdraw from the present operations.
- Spend much, much more on existing processes, doctrine and structures and stay only a little longer – reinforcing rather than adapting to failure.
- Reduce the Royal Navy and Royal Air Force and spend more on the Army – so withdrawing RN and RAF presence further (and adversely impacting geo-political influence).
- Start doing things differently – in other words redesigning the organisations, doctrines, underlying models and capabilities needed to prevail and so enable system adaptation.

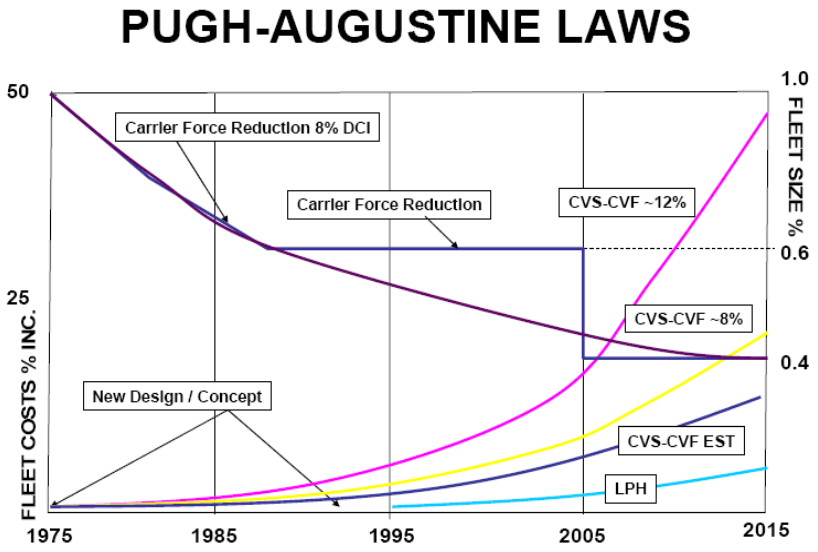

Figure 8: Pugh-Augustine Laws as Applied to RN Carrier Fleet 1975 –

As testified by Augustine and Pugh, the costs of maintaining the status quo – organisational, economic, legislative, political, industrial, business, military,

social, health, educational, training,[14] processes – and not allowing for adaptation is highly inflationary, which introduces three further entropic rules of thumb:

- Lack of system adaptation leads to complication and, ultimately, failure – adapt or die;

- The cost of retaining complicated structures, organisations, processes and capabilities and not enabling adaptation is highly inflationary.

- Failure to adapt leads, over time, to structures, processes and capabilities becoming unaffordable (dying).

It is in this respect that design becomes increasingly important. If, as posited, design is part of the adaptation process, then this should be a moment of real opportunity for the UKAF but only if they undertake a fundamental redesign. The premise of the science, technology, services model is that they remain conjoined, Figure 6. The apparently stable (surge) part of the science learning curve may also, and more dangerously, convey to some the impression of certainty, if not predictability. Lasting up to 10 years (almost a generation) the linearity implied – improvements year on year – can lead to the underlying complexities being ignored. Just as Ebbinghaus introduced the learning curve, he also introduced the *'forgetting curve'*. In this regard, it is postulated that individuals and organisations both learn and forget and that these processes go on continually – so just as one can have skills gained, one can also have skill fade. In organisations, this can lead to a form of institutional amnesia as the reasons for *'doing'* become more and more lost in time and fewer and fewer people can say *'why?'* Whilst forgetting may also be part of the adaptation process – so enabling testing and rediscovery – if the different curves continue to part company over time, what happens when the bubble between perception and reality burst? It is conjectured that, as the bubble bursts, both the good and the bad of our understanding are lost. If the burst is disastrous, then the other curves may be destroyed with it. In other words, the knowledge gained over this time is also lost and one is effectively left to start again. If one thinks of the Roman Empire, it had in place the science and technology necessary to affect an industrial revolution 1500 years before it actually occurred. This introduces another important entropic rule:

- Just as advancing technology has made the formerly impossible possible, so the reverse applies – what formerly was possible can become impossible. For example, the valves and synchros used in the original computers, radars, wirelesses and control systems are no longer manufactured and their application increasingly impossible.

Hunting the Snark

As maintained by Professor Richard Leakey [Credé], when considering technology and standards as being merely two of the basic tools necessary to provide technology based information systems, there are three levels or classes of system:

- **Type 0/Ideal Systems:** socio-technical methods taught from textbooks. These are systems characterised by a precise specification which can be met by a single solution. Unfortunately such systems, although widely taught and misapplied, are only to be found in socio-academic [managerial] textbooks.

- **Type 1/Conventional Engineering Systems:** Conventional Engineering Systems that can be applied to static, bivalent problems. These systems are characterised by a precise [probabilistic/certain] specification of requirements and are capable of adequate solution [Bayesian techniques]. They are very successful in socio-technical models [Social Network Analysis] contrived by human beings, particularly where the shortcomings can be compensated for by the intelligent user.

- **Type 2/Natural Systems:** Natural Systems which are highly dynamic and whose requirement cannot be captured but may be *'time-bounded'*. These systems are characterised by the absence of a credible specification of future needs such that any solution will be forced to adapt in some unpredictable manner. In general, user compensation for any [of the models'] serious shortcomings is likely to be inadequate. Such systems are very common in real life, forming the heart of nature. Significantly, methods for analysing Natural Systems can be applied to Conventional Engineering Systems, but not *vice versa* – you cannot control complexity.

The old Royal Navy Divisional Handbook for the welfare and care of its people used to talk about the most important single factor being the sailor. In our chase for ever more complicated solutions this may have been forgotten. The assertion is that individual behaviour is influenced by the organisation and by the underlying model and each influences the other. If our models of individual behaviour are wrong, this will impact the way an organisation and its underlying models work. Rowland examined the performance of tank and other weapons crews in battle. He expected to see a single Gaussian distribution in terms of performance, with the poor performers on the left; high performers on the right and the rest in the middle. He did not. Instead he determined three separate network-groupings, he called *'heroes, degraded and zeroes'*. Goffman identified two types of stigmatised people: *'the discredited and the discreditable'*. The discredited he described as people who *'visibly'* vary from

ideal humans; whereas the *'discreditable'* secretly vary from *'ideal'* humans and, if their secrets were known, would be rejected by other people. Jacoby used this to identify six dimensions that match these two types of stigma. Combining these observations led to the following *'Rowland Model'*:

- **Normal Deviants**
  Based upon Rowland, Goffman, Jacoby and Dixon, it is possible to suggest that Normal Deviants may be:

  - Concealable and seamless within families and largely self-discriminating and self-accrediting (Normal Deviants are seen not so much to *self-select* as *self-discriminate*).

  - Those conforming to certain group *'ideals'* of identity who actively seek peer group approval, selection and promotion.

  - Individuals whose deferential, highly likeable personas makes them influential and attractive during *'periods of stability'*, when they will use their virtues of conformity and uniformity to identify those *'not like'* them.

  - Individuals who will exploit through aesthetic stigmatisation the attributes and resources of others in order to do better than their neighbours.

  - Those exhibiting unidentifiable, very socially acceptable, disguisable, compliant even attractive characteristics closely identified to, associated with and modelled against the ideal or '*norm'*.

  .

- **The Majority**
  'The majority' does not align with the behaviours of either the positive or normal deviants. Significantly, this majority grouping appears dynamic and so non-Gaussian. In other words, it can shape and flow *inter, intra* and across boundaries and so determine its positioning within the organisation at a place it feels most comfortable with. This ties in with notions for the *'wisdom of crowds'*, put forward by Surowiecki in which he argues that *'a diverse collection of individually minded people are likely to make certain decisions and predictions better than the experts'*. He considers three types of crowds: those defined by Market judgements; those requiring coordination, and those requiring cooperation. Cooperation, he considers, can form networks of trust. Trust is seen to underlie all group behaviour and itself underpin networks. In this respect, trust is seen to have value, a factor taken up

by DARPA's Policy Analysis Map, itself part of the discontinued FutureMAP project. Surowiecki's arguments for value judgements and trust as a part of that value system were also taken up by Sunstein, where he submitted that *'by pooling information humans can use this knowledge to improve lives'*. The Majority may be:

- Identifiable as being the dynamic majority as distinct from the norm within a group or family.
- Capable of exercising group judgment and so influencing *intra* and *inter* scalar decisions through their implicit understanding of other group members.
- Capable of providing more collective than individual leadership characteristics and good at optimising flows along paths of least resistance.
- Individuals who are most comfortable within the majority but who are capable of influencing and being influenced by and attracted to others, notably those identified as being like them.
- Exhibit adaptive behaviour patterns that reflect majority thinking – or group think – and that can be seen as dynamic and so changeable when examined over time.

- **Positive Deviants**

Based upon Rowland, Goffman, Jacoby, Dixon and Sternin, Positive Deviants may be thought to be:

- Identifiable within families and largely self-selecting.
- Identifiable in and by groups – '*they have frequently shown these types of behaviour before*'.
- Individuals who exhibit strong autocratic leadership characteristics, '*notably in crises* [Rowland] and '*use* [empirical observations and] *initiative as a matter of habit'* (Dixon).
- Individuals whose uncommon behaviours or *sensemaking* (*consisting of 'a set of activities or processes in the cognitive and social domains that begins on the edge of the information domain with the perception of available information and ends prior to taking action(s) that are meant to create effects in any or all of the domains'*)] (Alberts:UC2) practices [*and ability*

consciousness] enable them to do better than their colleagues or neighbours with the same resources (Sternin).

- Individuals who exhibit visible, identifiable (Jacoby) sometimes anti-social, disruptive (Dixon & Jacoby) and, or, antithetical even abnormal and awkward uncommon practices (Sternin).

More than a Sum of the Parts

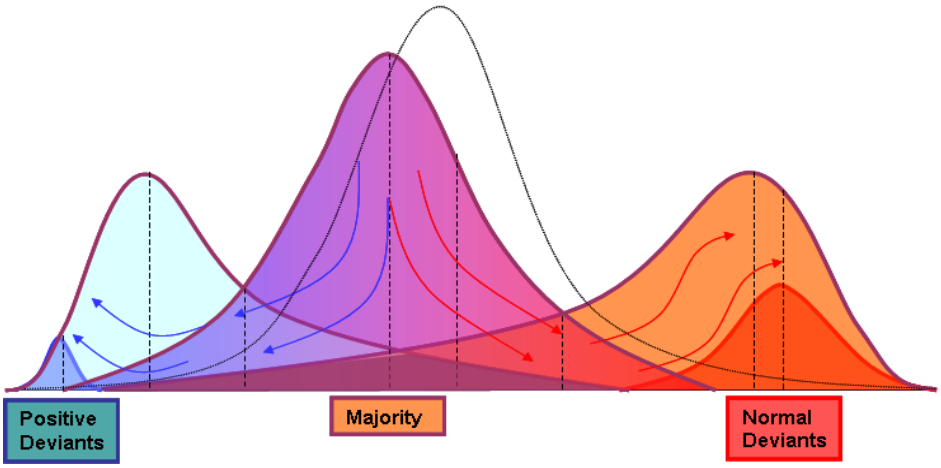

Figure 9: Rowland Distribution after Rowland, Sternin, Jacoby and Dixon

Figure 9 indicates the **single encompassing Gaussian distribution** about which most models – including legislative and regulative – are based, as are the **actual distributions** (as assessed by Rowland and others). The Positive Deviants represent between 10-15% of the population; the Majority, 60-75% and the Normal Deviants, 20-30% [Rowland]. The Rowland Distribution suggests the following:

- Two recognisable Gaussian type distributions – the Positive and Normative curves, which are relatively well defined: people know who they are.
- A dynamic Majority distribution that can, in actuality, sense and move between the Positive and Normative positions, depending on circumstances and context.
- The potential movement/mereological-flows of the Majority from its central position towards either the Positive or Normal Deviants position.

It is possible to make a number of observations from Figure 9. In particular, rules and organisations based upon a simple Gaussian distribution of human performance will tend to be biased in favour of more normative (lowest common denominator) type behaviour. This bias is supported, additionally, by the fact that between 44-58% of a population is more likely to be to the right of the

line. This will have three effects: first, to create a regulatory/process hurdle to be overcome if a population is to move to a better place; secondly, to discriminate against 42-56% of the population and, thirdly, by preventing good behaviour, arguably encouraging bad behaviour. In other words, it puts in place the very conditions noted by Gresham, where the bad can drive out the good. As example, the 1970s Labour Government had raised taxes on the rich to 90% of their income. Clearly this was iniquitous and, as a result, high-income taxpayers found ways not to pay; revenue fell. Unexpectedly, when the Conservatives cut taxes on their return to power in 1979, revenues from high-tax payers actually rose. Why? One reason may be that reducing taxes encouraged good behaviour and made it more possible to discern bad behaviour and to punish it accordingly. At the same time it became easier to pay what was seen to be fair; rather than taking time to avoid.

Model	Description	System Class	Rowland Population
ICM	➢Synthesising ➢Evolutionary ➢Individual/Team ➢Functional ➢Causal ➢Dynamic ➢Integrating ➢Replicable ➢Instrumentable	Type 1 & Type 2 ➢Applicable ➢Engineered ➢Comprehensive ➢Dynamic ➢Natural ➢Adaptable ➢Non-compensating	Whole ➢Sensing ➢Evolutionary ➢Inclusive ➢Self-Selecting ➢Dynamic ➢Adaptive ➢Changing
S3M	➢Processing ➢Reactionary ➢Self/Group ➢Issue Based ➢Symptomatic ➢Static ➢Multiplying ➢Replaceable ➢Metricatable	Type 0 ➢Specifiable ➢Socio-Technical ➢Unique ➢Static ➢Unnatural ➢Replaceable ➢Self-Consuming	Normative ➢Prismatic ➢Reactionary ➢Exclusive ➢Discriminating ➢Static ➢Replaceable ➢Changeable

Table 1: Comparison of Tooby, Leakey and Rowland Models – Where are You?

Another example may be the behaviour of middle-senior management. The SA80 weapon system provides an example (see below, p. 29). No junior civil-servant, contractor or soldier would wish to have provided a defective rifle to the front-line; nor is it creditable that their senior officers or CEOs would have wished to. In which case the fault, it would appear, lies mostly with middle-senior management. Applying Gresham's Law, to an organisation comprising the Rowland Distributions, Figure 10, and S3M processes and structures that are biased towards control (as opposed to command), this will naturally favour

normative behaviour, see Table 1. In other words, it will discriminate against those individuals who exhibit visibly identifiable sometimes anti-social, disruptive and, or, antithetical even abnormal and awkward uncommon practices. Worse still, it will essentially create a fail-safe as opposed to a safe-to-fail environment in which risk and risk-testing are encouraged; the bad will be actively encouraged to drive out the good.

If the above aggregations are the *'ground reality'*, then it would significantly challenge models based upon Gaussian derived rules of *equivalency* and *diversity* – such as the standard social science model. Principally, this is because of the S3M's *'distinction between the material world of anatomy and physiology and the mental world of psychology'* (Tooby). S3 Models use this distinction to imply *politicised* notions of social-equivalency – if everyone is equal, then no one can be different – to construct their *'meta-models'* by arguing that 'human cognition may have developed as the purely *epiphenomenal* consequence of the major increases in brain size' (Lewontin). In other words, we are *'here'* only by sheer accident and we can explain individual performances *non-causally* with no reference as to why, how or what we are actually seeing. This returns to multi-modelling. Most S3 models of individual behaviour are Gaussian-probabilistic and the underlying rules and organisational constructs assume this. Yet, if this is not the case and the world is non-Gaussian and human processes cannot be reduced to a Gaussian *'balanced score card'*, then this S3 (-HFI) model will ultimately be *'revealed and replaced'* in due course – multi-modelling.

Of particular concern is the fact that many Western organisations and process-es are socio-technical (Type 0/ideal systems (the tyranny of idealism?)) based upon rigid specification; a single solution and no *telos*. There are other issues to do with reductionism and Probability Theory and also to do with the selection and management of individuals and the making of rulers, rules and processes. Not only does it put in place the conditions for rules and processes to fail over time, but it also infers that conditions – incentives – encouraging good behav-iour (rather than rewarding bad) may be far more productive. It also suggests that fixed metrics and targets will not only fail over time but will also and potentially irrevocably change a systems performance and characteristics. This will be an important factor in understanding individual, group and team behaviour within organisations and their coping strategies.

- **Making Due Cause**
  Figure10 below tries to situate Designing, Planning and Campaigning within its wider causal context, taking ideas through from inception and some form of philosophical base, through to theory making, abstraction, methodology (or process) through to Practice (and Testing and Evaluation) to Application and Delivery – the Golden Thread. It attempts to

indicate the flows and the iterative nature of the process and the fact that ideas are not exclusive to any one element. Situated and connecting between Abstraction & Concepts and Methodology is seen to exist along with the Designing, Planning and, in a military sense Campaigning (connecting Abstraction & Concepts, Designing, Planning and Methodology). Additionally shown is the UK MOD CADMID ((Concepts), Assessment, Demonstration, Manufacture, In-Service and Disposal) process and, also, the scenario development (increasingly part of the planning and design process) and production phases. Implied within the Design Process Model is causality – the golden thread with its *'arrow of time'* [Price] – that connects/integrates between Philosophy and Theory and Delivery.

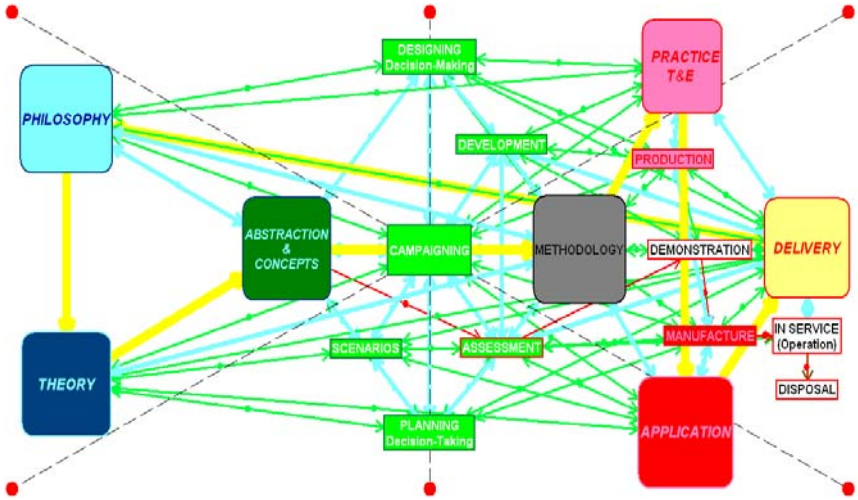

Figure 10: Situating the Design Process

For the system to be closed loop, the effects of Delivery (including those of assessment, development, Methodology, Practice, production, demonstration, manufacture, Application (in service) and Disposal must also affect and so influence emerging Philosophies and so Theories and Abstraction. To be effective, the Delivery model has also to be Causal – yet since Russell's (1913) declaration that *'causality is a relic of a bygone age'*, we still have *'few satisfactory accounts for the directionality of causation'* (Price). This paper is not intended as a study into causation nor its directionality – *'the arrow of time'*. Nevertheless, causality and the arrow-of-time appear intimately associated with Designing, Planning and Campaigning. For the intention of designing, planning and campaigning is to create, control or influence some future

effect. Yet proving future (predictive) causality – *'if I do A then B will occur as a consequence'* – is fraught with difficulty.

Causality also underpins our understanding of adaptation and so helps explain the divergence between the Standard Social Science Model and the Integrated Causal Model. The ICM considers causality with regard both to *'cause and effect'* and *'symptoms and causes'*. In other words, it seeks to understand both *'reactions to actions'* and actions to reactions and the dynamics between them. By contrast, the Standard Social Science Model, based upon the *'abandoning of principled causal analysis entirely in favour of treating social phenomena as "texts"'* (Geertz), has concentrated almost exclusively on symptoms as opposed to causes. Design as a process needs to be seen as part of a Causal continuum and therefore an element of its science and explanation. In this regard, engineering may also be seen as the applied science of causality and effect but again, although a new understanding of what and who engineers are in the 21st Century may be needed, beyond signalling some directions this is not the purpose of this paper.

- **When it Goes Wrong – Causal Analysis**

  A hallmark of a Complex Adaptive System is how it learns and adapts to failures (Dörner) rather than success. Over the last thirty years, the UK Armed Forces have been involved in a variety of conflicts, from Northern Ireland (1970s); the Falklands (1982); the Tanker War (1987-1990); the First Gulf War (1991); the Balkans (1990s); Sierra Leone (2000); Afghanistan (2002-) to Iraq (2003-). In the earlier part of this period, covering Northern Ireland, the Falklands, the Tanker War and the First Gulf War, there is historical evidence to suggest that the Ministry of Defence remained an adaptive organisation, concentrating upon delivery to the soldier, sailor and airman. For example, during the Northern Ireland Campaign, a *'MoD within the MoD'* was established to run the campaign. Given the losses being suffered by Ammunition Technical Officers (ATOs) in the early 1970s, the Wheelbarrow was rushed into service literally over a weekend, following liaison between the old research establishment in Chertsey, military officers and the MoD. Not a single ATO was lost to these types of Improvised Explosive Device (IED) in Northern Ireland from its introduction to the present day. During the Falklands War, the removal of fixed wing air cover and the Gannet early warning aircraft left the Fleet exposed; leading in part to the loss of HMS *Sheffield*. Defence scientists at Bedford working around the clock identified spare Searchwater production radars, being manufactured by Plessey (now Thorn EMI), and six Sea King (W) Helicopters and had these radars fitted and with the Fleet before the end of the conflict[15]. Both these examples suggest

that up and until the 1990s, the UK Armed Forces apparently had in place the type of people, organisations and processes that could respond and adapt rapidly to change.

At some point during the late 1980s this appears to have changed. An example from this period was the introduction into service of the SA80 Rifle and Light Support Weapon. The House of Commons Third Report (1993) stated *inter alia* that: *'Many issues were related to discovering operational problems late. The number of faults discovered and the length of development time (1985 to 1992) are indicative of an inefficient design and development process'* and it says of the SA80: *'British Aerospace has suggested to us that there could perhaps have been greater participation of user representatives in all stages of the design, its translation into hardware including concept definitions'* [HFI].

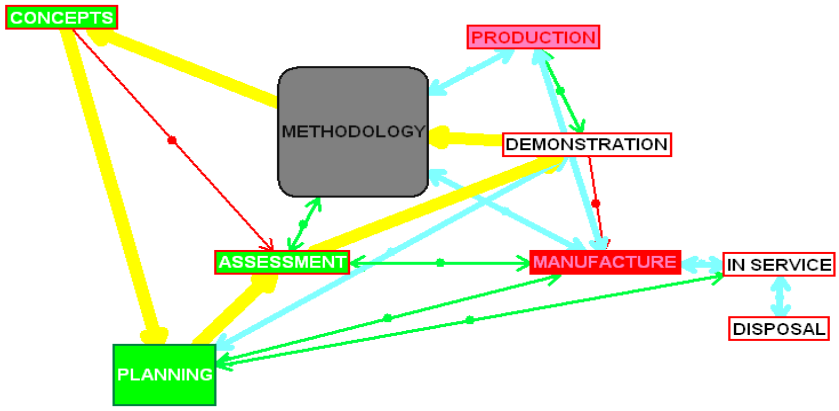

Figure 11: Methodology Driven CADMID Process

The cost of putting right the SA80, which performed poorly during the First Gulf War, was £24 Million, including 32 modifications and a new bayonet catch and cleaning kit. Some 20 years after inception, the NAO 2003 Operation TELIC Report commented: all but a few troops deploying on Operation TELIC were issued with the upgraded version of the original SA80A1. Despite some isolated difficulties with the weapon, equipment performed well during the warfighting phase, and reports have indicated that there is now general acceptance that the SA80A2 is an effective and reliable weapon system.

As already stated (p. 26), it is unbelievable that the MoD or its staffs would wish to deliver a non-functioning rifle to its soldiers. Yet the processes in place did exactly that. By a process of deduction and

removing from Figure 12 those elements that do not appear to be in place – for example a concentration on Delivery – it is possible to suggest the Methodology Model, Figure 11. Methodology is central; driving concepts (with no abstraction), which in turn drives the planning and so the assessment and demonstration phases, upon which decisions are based and the metricated/assessed results used to prove the Methodology (not the product) is working.

Within this cycle, there is minimal consideration of production, manufacture (even though it is part of CADMID); whilst in service and disposal largely replace Delivery. If this is what MoD – and quite possibly wider government processes have become – then there is also little or no room for adaptation or reflection. The methodology drives the process which drives the capability which in turn drives the strategy. The type of principled engineering designs and thinking envisaged by Pahl and Beitz are simply driven out. It is this type of knee jerk methodism that Dorner refers to in *The Logic of Failure*. It has also been referred to as Managerialism; Decisionism (making, never taking, or taking, never making) or simply as Methodologism.

The extent to which the UKAF design process appears to have become dominated by methodology may be seen in the existing Urgent Operational requirement (UOR) process, which has been used extensively to support current military operations. In many regards, UORs have been used to both circumvent and augment the existing acquisition processes but sometimes, as Earl Attlee [House of Commons Hansard] recognised in 2004, creates *'bizarre'* results. These *'bizarre'*, some might say paradoxical, results may have something to do with the fact that lack of adaptation is creating conditions for reaction.

In Figure 13, *'reaction'* directly drives Methodology and so both Cycle 2 and Cycle 1. Because it is reacting to changing circumstance, Cycle 2 goes directly to production and manufacture; necessarily including Delivery and some Abstraction (but decoupled from Concepts), with minimal need for Practice (Testing and Evaluation) and demonstration, other than to continually test the Methodology-Concepts link. Additionally, because so many UORs are being *'consumed in action'*, there is little to dispose of. Effective Methodology should act as the governor between the two cycles but finds itself being driven by Cycle 2, itself dominated by the manufacturers, the practitioners (soldiers, sailors and airmen) and the *'recipients'*. Cycle 1 is geared directly to Cycle 2 through Methodology which now includes some conceptual development, Abstraction and assessment (demonstration becomes reaction) and is disconnected by Methodology from practitioners and manufacturers.

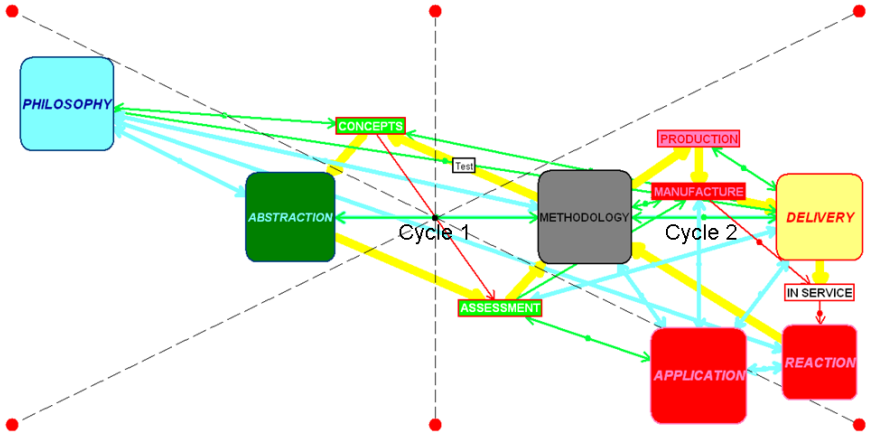

Figure 12: Reactive Driven UK 'UOR' Delivery Process

Unwittingly, the UOR process places *'the other'* within *'our'* OODA loop and not them within ours. Because there is no time for reflection, the process is reacting and not adapting; so allowing the enemy to influence if not determine (define?) *'our'* Philosophy – itself, paradoxically, reformed in *'reaction'* to the UOR process. Dangerously, the UOR Delivery process gives an impression of being adaptive and efficient whilst actually consuming the resources necessary for proper thinking and reflection that could make the process effective and adaptive.

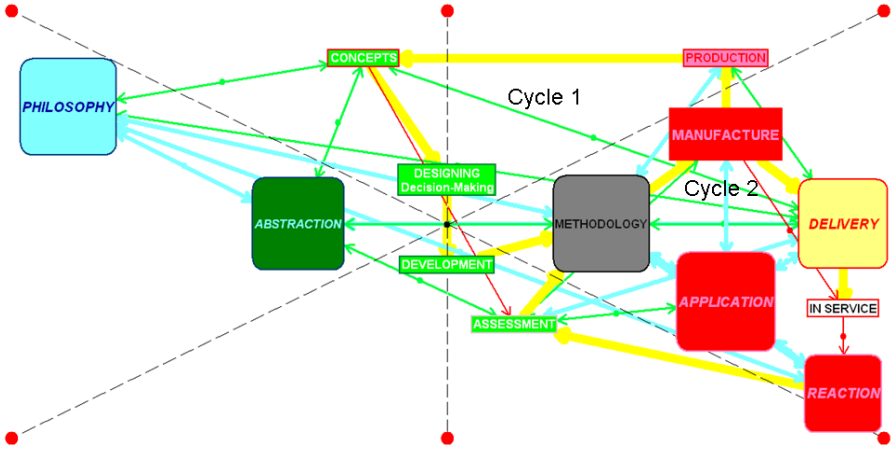

Figure 13: Reactive Driven US 'UOR' Delivery Process

In discussion, (Lesher-Atkinson), the UOR process above may be what is occurring in the US, where there remains a stronger manufacturing base than in the UK and where the Military Industrial Complex arguably still operates. Two cycles are again seen to exist; turning or spinning about the Methodology and manufacturing *'couple'*. Cycle 2 again drives Cycle 1 through assessment (now part of Cycle 1), Methodology, Manufacture, Delivery and *'in service'*. Manufacturing, in the US process, in turn drives Cycle 1 through production, which in turn drive concepts, designs, development and Methodology. Although Methodology still predominates, it also finds itself competing with manufacturing as to which is pulling or pushing harder and responding more quickly. In this regard, the US UOR process is less regulated – and potentially more reactive – than the UK version.

Both the UK and US UOR processes have nevertheless demonstrated the inefficiencies and ineffectiveness of existing acquisition processes whilst partly enabling the reconstitution of important elements that might enable a more coherent approach. Nonetheless unconnected and divided – as both UOR processes have become – and denied the opportunity to sensemake (Alberts), both processes are dangerously reactive either to *'the other'* or to methodologically driven savings measures, which, in actually, is what the assessment models have become in Cycle 2, UK, and Cycle 1, US. Something seems to have happened to a process that appeared to work quite well – and concentrated upon delivery – to one that appears increasingly unable to deliver. This section identifies some of the weaknesses. Setting aside the immorality of a system that cannot deliver a functional rifle to its soldiers. The questions become *'what happened to the process?'* and, more importantly, *'can it be put right?'*

A Time to Reflect

We, not just the UK or the MoD, are in a complete mess, as testified by the recent IPPR report (Shared Responsibilities: A National Strategy for the UK), - which makes for hard reading, particularly for a Navy Officer. Much of what they have to say I am in agreement with – it is their conclusions and recommendations, or at least how they have been interpreted, that I disagree with. Before we can find our *'way out'* to *'the place we may want to be'*, there is some real soul-searching to be done as to how we got here in the first place. As this paper suggests, there has been a significant parting of the ways over almost two generations, between a causal if not empirical understanding of ourselves, our rules and our organisations/institutions – the *Common Weal* – and where we now find ourselves. In International terms this is a very dangerous place to be – when our trusts, confidences, Alliances, friendships and beliefs are called into question, so too is our ability to influence and so prevent and deter.

In determining why we have got to this place, we need to look at what is taught, trained and applied within our major institutions of state and universities and to our political, military (security) and economic (including banking) practitioners. Given the recession, we have a brief opportunity for a strategic repose upon which to reflect and begin re-designing the people and fleets (maritime, land and air) that we will need tomorrow. This will be hard and principled work for which we will need the type of principled, educated people who can stand and think on their own two feet and *'design-us-out'* of the corner we find ourselves in. We should be under no illusions: Alliances and international friendships will founder or flourish based upon the outcomes. And, for the record, as we disengage from the current land campaigns, we will need ships to carry our strategic influence but ships we can afford to lose when we use them. The challenge for our designers and planners should be to match strategies to capabilities – can we, for example, design five carriers for the price of one CVF, so that we can afford to use them strategically and tactically? This will mean reversing the current processes where our methodologies drive our capabilities, which in turn drive our strategies – the means have become the ends.

This analysis brings into sharp focus the questionable practices of the closed élite's formed specifically around the senior civil service, the political class, the consultancy companies, the judiciary, the media, the police, the military, industry and the City. Judged against the other spending departments, the MoD is a paragon of virtue. Yet scrape away the comparative veneer and one can see a multiple-failing organisation – driven by careerism, elitism, exclusionism and fear. What is more is that the type of ascientific unprincipled methods and processes being taught in the majority of our leading institutions and applied within our organisations, are deeply and fundamentally immoral. Its practitioners are not actually concerned by the philosophy or theory of what they do; nor in the delivery of something to the people they so *'ostensibly'* serve – how else can one explain the SA80? They are interested in the methodology and processes necessary to advance their own careers – hence Methodologism. They are as incapable of understanding morality as amorality. This brings into focus Decisionism. On the one hand, there are those practitioners who focus entirely on making but never taking decisions – the hallmarks of a diplomat. These practitioners are not interested in the philosophy, theory, abstraction, concepts, designs or actions (Observe, Orientate, Decide, and Act) but only in the processes that sustain their rank rather than position and ability. On the other hand, there are those – the Neo-Cons for example – who equally immorally focus on decision-taking without ever being responsible for carrying out their actions, let alone understanding the consequences (observing and orientating).

It is difficult to be both optimistic and pessimistic at the same time. My pessimism is that we are so badly broken and we have too few people who understand and can make a difference compared to those who will deny any opportunity for innovation and change – the senior middle management. These people will resist any call for a proper and fundamental debate of our *Common Weal.* My optimism is based upon the fact that we really have no choice now but to stop, think and reflect deeply and then start doing a fundamental redesign of our political, economic and security enterprises. Peter Hennessey commented recently when asked about a British revolution, that we have ten years to sort out the economy and the politics. As Churchill said to Roosevelt in 1941: *'give us the tools and we will finish the job'*. Our tools are a combination of people, organisations and our underlying processes and rules – the *Common Weal*.

I am engineer. I want to start building again and, in so doing, do what I can to restore that Common Weal. To all who may read this paper, I say – will you help?

* * *

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Notes

1. This was at the time of the introduction of Resource Accounting and Budgeting (RAB) when MoD Civil Servants thought they had negotiated with HMT cash repayment for assets and overheads dispersed. Treasury officials denied all knowledge of this *agreement*. The result was that the 10% uplift in defence spending provided was effectively nullified. NEC had to make up the shortfall through productivity: it was actually a cut.
2. In its original use, as outlined in the OED, *Metrication* described the act of changing from imperial units to metric units: metres, grams, and seconds, as the international standard for physical measurements. More recently *Metrication* has been applied to the science of measuring.
3. Falling annually from about 5% of GDP in the mid-1980s to 2.3% in 2008.
4. In June 2008 the US essentially challenged Effects Basing: JFCOM/ACT, General James Mattis USMC declared the end of Effects Basing: USJFCOM will no longer use or export the terms and concepts EBO, EBA [upon which the Comprehensive Approach was based], ONA, and SoSA in our training, doctrine development.
5. Based upon two terms in office of about 8 years in the US and UK parliamentary / congressional systems.
6. Alberts: 'Planning is part of sensemaking'.
7. As described by Dr Jamie MacIntosh, UKDA Chief of R&A
8. Politically, this is effectively the doctrine of the neo-conservatives with their concentration on decision-taking, whilst others took the actions.
9. Observe, Orientate, Decide, and Act.
10. Triage included three levels: 1, walking wounded; 2, those who required medical attention and would return to the front at some point and 3, those severely wounded requiring significant medical attention and who would never return as combatants.
11. This is based upon a Tier 4 injured serviceman being unable to work again and requiring full time care for the rest of a reduced life expectancy of about 15 years from time of injury.
12. As significantly, it should be noted that the NHS model was based on Triage. The same factors improving the survivability of injuries and infections apply equally to the NHS as they do to the Military. In other words, the NHS is attempting to fund a model for which it has only 60-70% of the resources now required. The existing model has become unaffordable – it will never work.
13. In this regard, the accountants (who predominate within most consultancy companies) have driven out the actuarial sciences.
14. As example, a recent OFSTED report indicated that 45% of servicemen were not completing training due to the operational tempo.
15. This same Seaking/Searchwater combination subsequently proved itself for tracking vehicles on land during the Iraq War.

END

Defence Academy of the United Kingdom
Research and Assessment Branch

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Returning Science to the Social (Making Sense of Confusion: A Case for Honest Reflection)
by Simon Reay Atkinson

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