By Christopher Bean, Research Associate, U K Defence Forum

The first thing to seek out when reviewing the performance of any government department is to explore how it has sought out the nature of the complexity.

To mix both prose and metaphors a rose is a rose is a rose, calling it by any other name even though it might smell as sweet cannot disguise the reality that when all is said and done a thing is what it is. What matters is not what something is called but what it is. Examination of the MOD's performance in its biggest military equipment projects is the same as examining its

competence to understand the nature of complexity and its manifestation in complex systems of which the MoD itself, with its superordinate structure, is a wonderful example. Whether this is at the higher levels which balance the physical, moral and conceptual, a challenge that is no less complex than the three body problem in physics or the procurement of a socio-technical system such as a ship or the capabilities reflected in the MPR all can be described as complex.

Yet what this thing complex is remains something of a mystery; it is blamed for delays, problems and cost overruns due to: complex commercial arrangements, technically complex projects, complex management, complex interrelationships with partners, complexity of acquisition, complex delivery arrangements, complex weapon assessment etc. So it is a common phenomenon that is perceptible; its symptoms are obviously describable yet its nature is little understood. Whilst its character seems akin to Kant's noumenon, that thing-in-itself which is independent of traditional casual relationships; the didactic influences on current system engineering or management practices, which rely on rational relationships between system variables, fail completely to understand such complex system characteristics as equifinality.

The PAC Chairman observes a "disappointing set of results, particularly because the problems are being caused by previously identified failures such as poor project management, a lack of realism, not identifying key dependencies and underestimating of costs and timescales. The reoccurrence of these problems suggests that the Department's latest acquisition reforms, introduced in 2001, are not yet resulting in the Department making better investment decisions or improving the execution of its defence projects," emphasises such complex challenges.

Yet reality tells us that it is this very same complexity which if its nature is understood, is what should give our military new competitive advantage in the changing socio, political, military environments we ask them to serve in; whilst evolution tells us that struggle for success is not between different ways of organising life (process and procedures); but a struggle between different systems.

Yet we have a system that has become based on monocausal thinking, where comparison of best practice is drawn, irrationally from a complexity perspective, from other industrial sectors;

yet rational thinking should tell us that every complex system is independent, it has its own characteristics as to how the various parts interrelate both with themselves and with their operating environment. Complex systems display counter intuitive characteristics as a result of the interaction of their variables; the existence of many parts is not a problem for either system designers or system operators if these interactions are expected and obvious; yet the reality of complexity is that these interactions were not designed into the system by anybody. They therefore perplex management and system engineers because they acted in terms of their own design of a world that was expected to exist; yet the world was different.

Tyrell put forward the terms divergent and convergent to distinguish problems which cannot be solved by logical reasoning from those that can. Life is kept going by divergent problems, complex interrelationships. Yet convergent problems have become managements', particularly the MoD's, most useful invention; they do not, as such, exist in reality but are created by a process of abstraction. When they have been solved, the solution can be written down, codified, and passed on to others, who can apply it without needing to reproduce the mental effort necessary to find it. If this were the case in the real world of socio-technical systems, economics, politics, education and so forth there would be only mechanical reactions. Divergent problems force people to extend themselves; they demand and thus provoke the supply of, forces from a higher level.

The only times when a complex system displays the characteristics of a linear causal system, such as a clock's mechanism, is during either periods of constant growth, such as a bull market in economics, or during very short periods of time, such as computer based trading on the stock exchange and where in 2007 computers could outperform people. But the MoD is and has never been in such a situation, its challenge has always been far greater and of far more criticality to the country.

There therefore seems to be a blindness to the nature of complexity which manifests itself in continuing malfunction in managing well intentioned solutions; reforms proposed in the past have invariably failed due to the lack of professionalism in the complexity with which they were implemented. Successful managers know that, hard as it is to make decisions, it is ten times harder to implement them. It is no coincidence that so many books have been written about making decisions and so few about implementing them. Much well-founded knowledge has been gained about the phenomenon of complexity in systems: knowledge that would allow the prospects of successful reforms to be improved many times over, if only it were recognised and applied. To ignore it and, for that matter, to deny the complexity of itself, is a manifesto for failure.

We know the law of "required complexity" has the same importance in social-technical systems as the law of gravitation has in physics. Just as one cannot send a rocket into orbit without the necessary supply of energy, so one cannot put reform measures into practice without the necessary complexity of implementation. It is not by chance that most consultants' services end at the point where it becomes truly difficult, at the implementation stage.

Furthermore, we know how important real-time control is in the implementation of measures, as are continuous feedback and fine adjustment based on it. People know how to deal with

networking and it is equally clear that key measures have to be tested for their effects, especially the unintended ones and not just by a cost-benefit calculation. It is also known that measures have no reasonable chance of being effective in isolation but only as a networked whole, because the organisation in which they are supposed to work is also a networked whole. We know that such plans need quite special communication processes that must cover all ranks of staff contributing to the implementation. In today's organisation, there is no point in trying to achieve reforms in any other way.

That is all part of the cybernetics (control & communication) of complex systems necessary for efficient management - or in other words, the efficient configuration, governance and control of complex organisational systems. Recollection though informs that this is not so easy; a couple of years ago giving a talk to senior management in the MoD on what was a particularly complex topic, they asked couldn't they just be provide with a tool as they were too busy to think about such complex, [acausal interrelated] issues? Such incidents are not unusual as they reflect the nature of 'creative destruction' with its dichotomy of the convergent thinkers who had excelled in the operational system, but now were required to perform as divergent practitioners within a management system of process and practice that had been established for a previously perceived world; something that was confirmed by a review of management practices some seven years ago and which failed to influence the outcome of the many subsequent change initiatives such as Stocktake.

This emphasises that there was no scrutinisable understanding of the complex nature of the system of interest went some way to ratify that well known worst kept secret of the difficulty in addressing tough tradeoffs and making decisions; decisions that require an understanding of the nature of complex systems. But we should not be too surprised as one of the underpinning disciplines system engineering (SE) has itself not evolved to meet the challenge.

In 1989 the introduction of formalised SE into the UK moved us beyond the then current engineering practices of analysis, control engineering etc.; when defence procurement moved into a new life cycle, away from cost plus to prime contracting; a move that produced a new level of competitive advantage within industry and one that the then UK industry wasn't fully prepared for. Recent examination of SE exposes that it seems to have followed something of a classical sigmoid curve, where sustaining improvements are delivering increasingly less in terms of marginal utility whilst requiring increasing economic resource.

The UK MoD's move from requirements to capability in 1999 was a significant change although reviews, certainly McKinsey Health Checks & the US academic review indicated that the nature of the complexity, the deep systemic issues holding back change, was a more significant barrier than originally anticipated – perhaps this was because of the autopoietic nature that resides within the system?

The DPA and DLO experienced similar problems with their change programmes, which NAO acknowledge have been primarily a result of complexity, [capacity and culture are just variables of a systems complexity, hidden from post hoc analysis by the equifinality]. Hence, the rather poor results requiring even more change initiatives.

The MoD's recent Procurement Capability Review Improvement Plan; is but another initiative and although it recognises the sophistication and complexity of MoD's procurement activity; it recognises it as a symptom and not its nature. It therefore proposes traditional management mechanisms which sadly follow what has become standard management practice of reducing the problem to stove pipes and treating the symptoms individually – there is no holistic understanding generated of the system's complex nature. But this is also reflected at the policy level, where the Green, Orange and Magenta Book sponsor, the Treasury, concur they have yet to come to grips with the nature of complex policy, procurements and service delivery..

Even though the MoD's Acquisition Operation Framework (AOF) recognises that more complex systems are now the norm and 'platforms and equipment are increasingly complex' with the consequential need to improve thinking across the Defence Lines of Development (DLoDs) as well as through-life; current practice reflects a world of classification and codification rather than the relational and relevance worlds which are the norms of complex system understanding. Similarly, in the USA their DoD System of System Guide remains, although a very nicely put together piece of work and does try to address such thorny topics as validation, are we building the right system; invariably returns to the comfort zone of the familiar and traditional world of cause-effect thinking. System of systems is though tautologous as any system is made up of other systems from the quantum to the universal, and, therefore, appears to be no more than a way of deflecting the lack of real effort which is required in understanding the nature of our complex systems. Indeed we can find in UK academia which supports the MoD, describing complexity as a 'wicked problem' which again is an excuse for not creating methodology (discussion about method) fit for our current challenges. If we accepted 'wicked problems' as being too difficult we would have no new competitive advantage, science would not have advanced very far.

In conclusion it seems that since the ending of the Cold War with its perceived clarity of attrition warfare and cost plus contracting the MoD has continually strived to re-create its structure and function, more appropriately aligned to the changing environment it operates and seeks success within; yet by its very own complex nature which seems increasingly autopoietic (process whereby an organization produces itself; literally, self-production) it has still not overcoming the challenge of understanding the nature of complexity. It therefore seems important to search for alternative, non-traditional ways of looking at such challenges, doing better what it did before will not provide future success; although it is the traditional way of improving efficiency it cannot increase effectiveness in its dynamic operational environment.

When organisations, people, are faced with the complexity of interconnectedness at first their threshold of inhibition rises; dealing with any kind of complex process repels them and directs them to the more familiar and comforting focus on questions of detail and day-to-day business. This barrier between the convergent comfort and the divergent uncertain reality has to be overcome, thresholds of inhibition would seem to be the next step for the MoD if it is to overcome the PAC's findings which reflect a 'disappointing set of results, particularly because the problems are being caused by previously identified failures such as poor project management, a lack of realism, not identifying key dependencies and underestimating of costs and timescales – all characteristics of complexity.