

Informing high level trades - some novel techniques

By Bob Barton (BAE Systems) and Dick Whittington (Salamander Organization)
March 2008

Abstract:

In the increasingly complex acquisition environment that characterises Defence, the ability to make good trade off decisions is often limited by time and resource. The resulting outcome can often be disastrous in the area of command and control improvements, many of which are relatively low in real cost terms but can have disproportionately high impact on Military Capability.

Trade - off techniques have tended to rely on spread sheets and military judgement, with OA not always playing the definitive role that it should. The analysis and decision process is then compounded by the need to maintain big ticket items on long commitments, forcing "salami slicing", cancellation of small - medium scale projects (often the command and control elements) and an inability to compare "apples with oranges", or as some observers have put it "apples and Wednesdays"!

Over the last two years a number of new techniques have been developed which generate a set of consistent views which, in turn, enable a much more objective basis for analysis, quality trade - off and decision making. These have been developed by direct working with the customer, to ensure that they represent practical solutions. The use of SMEs to help develop the tools and techniques has increased responsiveness and encouraged innovation.

The paper will outline the work undertaken and the types of visualisation and decision aids that have been developed showing how these have been used in practice to gradually enhance the overall process.

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Introduction

Delivering Military Capability in today's cash-strapped environment is dependent on good trades across the breadth of the *problem – solution* domain. Trades are a vital part of a holistic capability investigation process, this paper looks at how an inclusive approach to developing a trade environment has helped the understanding of Through Life Capability Management (TLCM) and helped mature a TLCM method which provides the means to ensure that capability decisions are taken in context. The development of methods to support good option analysis, in a way which improves the response times and overall value, will deliver mutual benefits to MOD, Industry and, most importantly, the User.

Through Life Capability Management sets the agenda for change in MOD acquisition, but is regarded by many as little more than the “latest initiative”. However, the MOD has no better way to balance the books and deliver the right Military Capability at the right tempo. As such there are many reasons to believe that TLCM is an enduring need and will have a widespread impact on the defence sector.

Tom McKane's vision¹ of Through Life Capability Management (TLCM) as “*an approach to the acquisition and in-service management of military capability in which every aspect of new and existing military capability is planned and managed coherently across all Defence Lines of Development (DLoDs) from cradle to grave*” is now widely accepted. This vision has been embraced as a key aspect of addressing the funding challenge posed by the Ministry of Defence's (MoD) anticipated major acquisition programmes such as CVF, FRES and JCA. More than ever before it is critical that our resources are deployed wisely and without waste.

The budgetary challenge in the UK, created by the need for major new procurements is exacerbated by well over 200 Urgent Operational Requirements, costing in excess of £1.4billion. Whilst UORs, by definition, arise from unforeseen circumstances, arguably many of these are actually a result of failings in the acquisition process. UORs, whilst acting as a “quick fix”, ironically can compound the follow on acquisition situation. They are delivered piece-meal, with limited consideration of through life management, ultimately adding further cost and complexity. A more efficient acquisition loop, working at the right tempo, would help significantly reduce this aspect of the budget burden.

The acquisition and management of military capability is increasingly complex and costly, and the demands of the front-line require a more responsive and agile acquisition

¹ UK MOD, *Enabling Acquisition Change*, June 2006

approach. The Defence Acquisition Change Programme (DACP)² has been established to effect a step change in performance, to achieve more timely delivery of capability to the front-line and better value for money. The challenge falls to the whole acquisition community, including industry, to respond with conviction.

As a leading prime contractor to the MOD, BAE Systems has committed to working with MOD to contribute significantly to an improved industry response. This article describes an initiative led by BAE Systems to meet the TLM challenge. A range of partners, including York-based Salamander, small to medium enterprises (SMEs) and other academic, industrial and commercial organisations, enrich the approach in terms of methods, tools, information and process.

Responding to the Challenge

Our approach is to deliver an inclusive environment to support informed capability management decisions. We are bringing together the processes and tools needed to address “capability based trades” in an environment which delivers increased objectivity, a single view of the truth, and pace. The approach increases the shared awareness across decision makers, including all DLoD³ owners. This improves the cycle times and will deliver the required Force Elements at a tempo to match changes in the external environment.

This approach means we need to consolidate diverse sources of information – architectural, programmatic, performance and commercial – and harness the technologies to provide “evidenced information for informed decision making”. This will ensure military judgement is continually informed, underpinned and validated by hard evidence.

Trading is a key element of the approach, and for this reason we have called our offering



Figure 1. TRAI DE Concept

TRAI DE™ - TLM Robust Acquisition inclusive Decision Environment⁴. Decisions in this arena are essentially about trading; constructing and sustaining a consistent, affordable and balanced portfolio. Making any decision means changing the balance of that portfolio at some level, and that in turn has an impact on the risk profile.

² <http://www.mod.uk/DefenceInternet/AboutDefence/WhatWeDo/FinanceandProcurement/DACP/>

³ Defence Lines of Development: see http://www.aof.mod.uk/aofcontent/strategic/guide/sg_dlod.htm

⁴ Barton & Whittington, TLM: Working together to enhance military capability, RUSI Defence Systems Vol 10, No 3, Feb 2008.

Putting this in context, we can bring to life the **capability value chain**⁵ as a complex set of nested “OODA” loops, feeding from the same common view of truth. The “*Recognised Acquisition Picture*” runs through all levels of decision, as a pan-DLoD axis, to synchronise the trading decisions relating to (on the far left) National debate

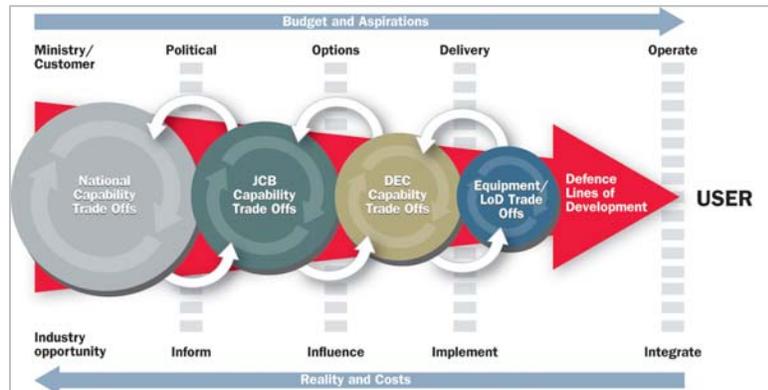


Figure 2. Capability Value Chain

(e.g. nuclear deterrence), through to (on the far right) the scope of a particular project, achieving the necessary focus on the requirements of the user. Through the **TRAiDE** environment a decision at any of these levels can be analysed in terms of its implications across the value chain – the knock-on effects, the impact on risk, and the other dimensions that need to be addressed to retain coherence.

Rationale behind the TRAiDE concept

Currently it is difficult to perform effective trades with sufficient consistency: the quality of data/information management is poor and there is a lack of coherent tools and process through which it can be applied. MoD has recognised that the resulting decisions are both poorly informed and difficult to substantiate.

Capability is produced through a combination of a number of different components and it can be difficult to optimise.

BAE Systems and Salamander have jointly conceived and developed TRAiDE to provide a means to support “Capability trades”- both within and between capabilities. The TRAiDE environment enables a range of capability options to be evaluated leading to better informed decisions.

Principles of the TRAiDE environment

TRAiDE is based on a number of key principles:

- 1) Open approach – enabling utilisation of disparate sources of data
- 2) Information flows through a single information manager, regardless of source/destination
- 3) Inclusivity - designed to utilise new and extant mechanisms, tools and their providers
- 4) Intuitive visualisations – enabling simpler interpretation of results
- 5) Evolutionary – incremental and pragmatic development based on user feedback
- 6) Scalable – enabling aggregation and disaggregation of capability at all levels
- 7) Timeliness and quality – appropriate outputs, matched to customer need and decisions

⁵ UK Ministry of Defence, Acquisition Management System (AMS)

So what is TRAIde?

TRAIde is provided through a combination of products and services. (Figure 3) At the heart of TRAIde is an information manager provided through the Salamander Mood6 product. Mood has been chosen for this central role as it is the best available match to the principles above; moreover it has the following attributes:

- 1) it is MoDAF⁷ compatible
- 2) it is already widely available inside the MoD

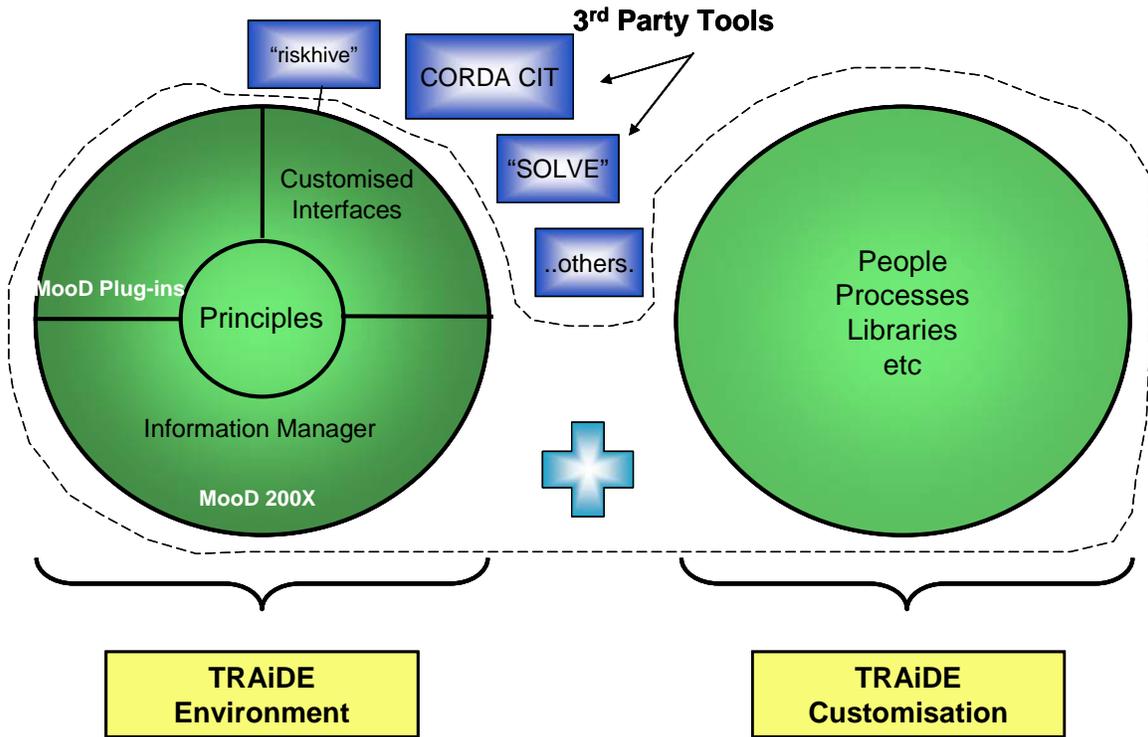


Figure 3. Scope of TRAIde

The TRAIde product comprises the Mood core augmented by a growing range of capability visualisations and interfaces, through which information can be exchanged with external tools and other artefacts.

The tools used within the initial **TRAIde** offering include Mood® from Salamander – an Information Manager with powerful visualisation that can construct, maintain and present

⁶ Salamander:
http://www.tsorg.com/salamander_technologies_mood_transformation_technology.htm

⁷ UK MOD, MOD Architecture Framework v1.1, <http://www.modaf.org.uk/>

MODAF views – supplemented by riskHive to provide risk-adjustment of programme information.

MooD is used as a hub feeding information to and accepting information from the analysis tools available. Inclusivity means that this hub can interface with any chosen tools. As each action is performed on the data enhanced information is generated and presented via MooD visualisations to support and facilitate decision making.

MooD views are coherent, using the same source data, with MooD configuring it appropriately, to feed a variety of visualisations. TRAiDE can be tailored to meet the demands of specific customers by adding interfaces (to specific tools) and visualisations thus optimising trading performance in individual situations.

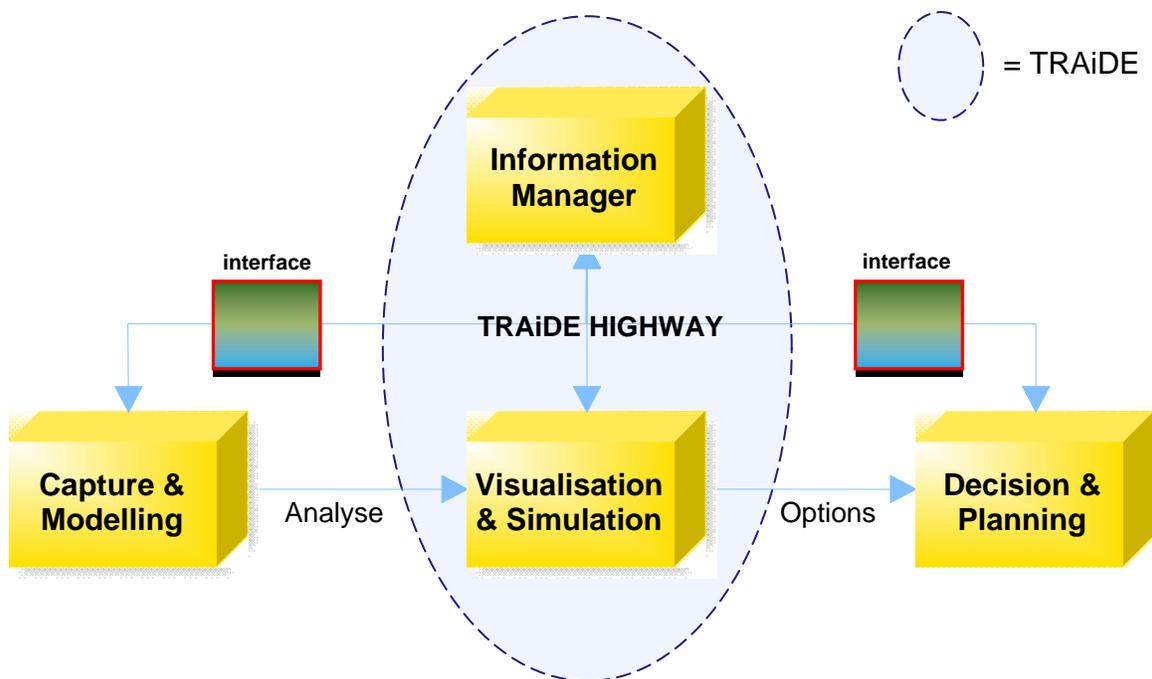


Figure 4.
Components of the TRAiDE Environment

Our initial focus for the application of TRAiDE has been at the heart of the central MoD customer - the Joint Capabilities Board (JCB) and Directors of Equipment Capability (DEC) and has included the DLoD owners. Decisions at these levels are critical to drive effective investment. It is a truism that poor capability trades cannot be rectified simply by good project delivery – the best that can result would be the efficient delivery of the wrong Force Elements. We have engaged DEC teams and structures within their current context, and demonstrated benefit by introducing methods that help them to *do business better* – the emphasis being on pragmatism and minimum disturbance. DEC's are extremely busy people and making rapid wholesale change to the way they do their business is neither practical nor sustainable. A progressive approach, supported by both extant and evolving tools within a flexible and inclusive environment is far more likely to succeed. In this way techniques aimed at driving more consistent processes and

practices can be gradually trialled and introduced without causing unnecessary and unhelpful disruption.

TRAiDE supports a range of analytical and visualisation techniques, underpinned by a common information manager. Access to TRAiDE will be through a browser type interface, thus permitting casual users easy access to a variety of views and visualisations. For the MoD the toolset will be available over the standard MoD infrastructure (DII) to enable live use by the full range of MOD users. Our aim is to provide a single window through which a variety of applications and results can be viewed, all underpinned by consistent data management at the heart of the environment

A fundamental principle of our approach is *inclusivity*. We are engaging partners widely to ensure best of breed methods, practise and tools are integrated into **TRAiDE**. Stakeholders include Cambridge and Loughborough Universities – bringing depth of thinking from a breadth of domains – together with a range of key contributors to TlCM and related initiatives.



Figure 5.
Stakeholders in TRAiDE Development & Delivery

Deployment and Experience

The strength of the “inclusivity” approach – including significant joint work between MOD and Industry – is paying dividends. A number of existing and new artefacts have been employed on the analysis to aid the breadth of “what if” options provided across the DLoD, Industry and Capability dimensions. In order to maximize the benefits, the **TRAiDE** framework itself has been designed to ensure ease of interfacing and tool adoption. The current version interoperates with riskHive and current trials and future releases will interface with a range of additional components to broaden the range of analysis and visualisation.

Our continuing development programme is incorporating a range of subject matter experts with diverse skills throughout the life cycle, supported by complementary tools, including ISSE⁸, developed by Vega and used by the MOD’s Integration Authority to define and analyse system of systems architecture implications. This enables our environment to benefit from the investment in the MOD’s Architecture Repository to inform and validate capability options. In order to increase the rigour of the analysis and extend the trades into other areas, such as industrial factors, CORDA has brought a range of DEC-proven techniques and analytical tools into the environment.

The emphasis on pragmatism and practicality has been achieved by close alignment with real projects, such as the following:

⁸ Vega Group plc, ISSE – The Integrated Service Support Environment, <http://www.vega-group.com/services/capabilityacquisition/isse/>

- ▶ An initial proof of concept was undertaken within a new area - Joint Medium Weight Capability. This has now been extended to a major current area of investigation – Future Combat Air Capability (FCAC), undertaken in conjunction with DEC's Theatre Airspace (TA) and Deep Target Attack (DTA).
- ▶ Salamander and Vega currently work jointly within DEC CCII on the Joint Command & Control Support Programme (JC2SP), with Salamander's focus at the business level complemented by Vega's at the system level. Intercepting and incorporating that work within **TRAiDE** brings a real opportunity for further exploitation to derive additional benefit from the investment.
- ▶ The MOD, via KPMG and their own appointments on TLCM tools, are evaluating the best methods before deciding on a consistent approach

Lessons learned, conclusions and way forward.

The MOD's approach to TLCM has been based on driving in longer-term thinking, effective "trades" and greater consistency. Consistency of approach is best supported through mechanisms which force process coherence - through direct application to essential tasks. Central MoD staff, the majority of whom are drawn from Service personnel, naturally experience problems in making best use of unfamiliar tools and interfaces, especially where irregular and infrequent use compounds the unfamiliarity.

There is a plethora of such tools and interfaces within the MoD IT environment; this not only makes usage difficult it also impacts adversely the ability to make coherent trades. It is quite clear that sound information management is a basic enabler of effective TLCM trades. The outputs of any analysis performed on this information, needs to be made available to a hierarchy decision makers. Consistency of format, simple aggregation and coherence of source data is essential to support decision making in as objective a way as possible. It is neither possible nor desirable to eliminate subjective judgement in such decisions – Military Capability is not an absolute. However, consistency of interpretation demands that views are intuitively and easily assimilated by infrequent, and in some cases, casual users. The best way to achieve this is through a single interface and common set of visualisations. The principles underpinning **TRAiDE** have met with broad user acceptance and the pilot applications have yielded important lessons to aid its practical implementation. **TRAiDE** delivers a consistent environment and users benefit from access through structured interfaces accessed through Mood.

*The benefit of pragmatic applications such as **TRAiDE** is in the ability to drive incremental application and development; this delivers practical and focussed evolution.*

Through the careful and pragmatic instantiation of **TRAiDE**, in a real – world application, we have identified powerful lessons for its future development. We have also captured some associated lessons, for example the need for greater consistency in the taxonomy used – and indeed the impact of and shape of Departmental structures – both of which are key enablers in the difficult arena of capability trades: from this perspective, our approach has demonstrated a transformational potential. Moreover, from our initial focus on *doing business better* within the current constraints, we have been able to gain the support of a representative spectrum of users as well as actively engaging in the

establishment of mechanisms and structures to *do better business* in terms of future focus and agility.

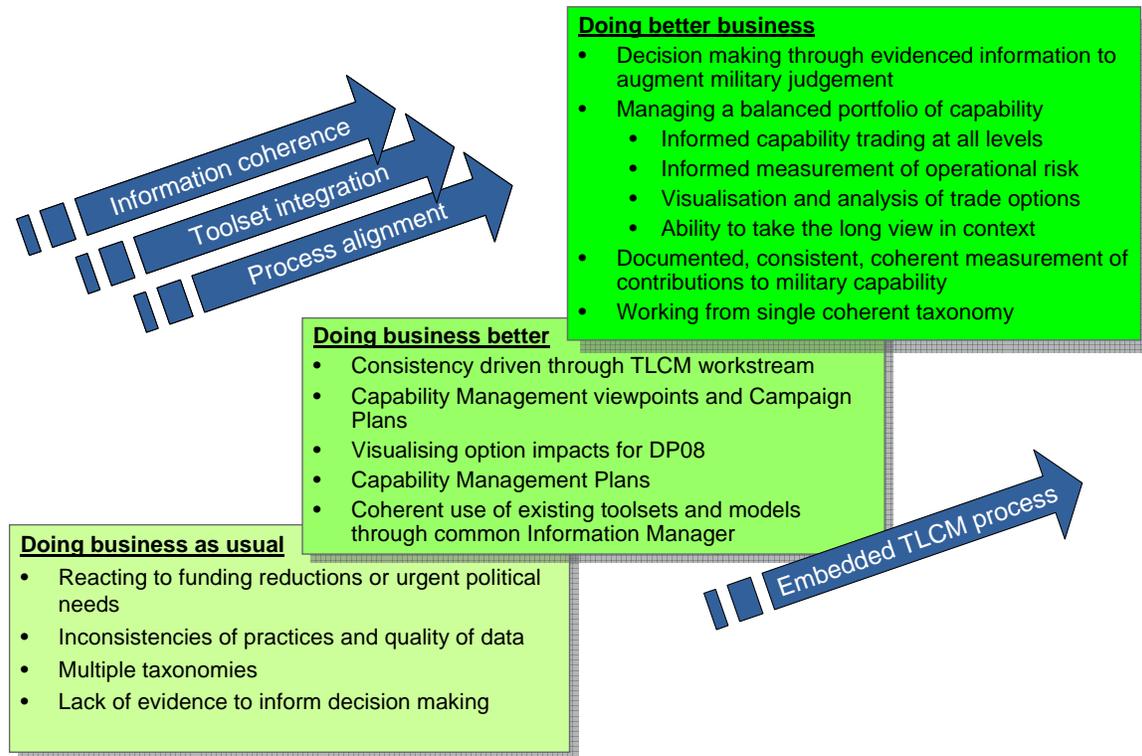


Figure 6. Delivering the Vision

Embracing the **TRAiDE** approach presents the opportunity to wrap a decision-making method and toolset around a wide and diverse collection of information to connect across the levels of consideration. This will lead to a practical and proven step forward in improving the decision process and thus the outcome of capability based trades.

Our work in this area is developing in a progressive and constructive manner, involving close work with several MOD teams. Over the coming months we plan to develop further **TRAiDE** interfaces, all with consistent visualisations, but always with the tools chosen by the user as “best for the job”.

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Novel information of machine translated Almighty Student light novel. Novel information of machine translated Martial World light novel. Novel information of machine translated A Thought Through Eternity light novel. Recommended by. Ancient Strengthening Technique - Volume 25 - Chapter 2454. But Auction House is this , had already not spent money to Auction House of this level , by the thing trades the auction , the fool will change money . Qing Shui walked , resplendent in gold and jade green Auction House , inside luxurious incomparable , although arrived at this Mortal City ten several days , but here all basically have not gone to look , but knows something from the Nuo Lan information . High Comprehension Low Strength æžā“ä;@çœŸā¼°ā °. Taking up his father’s title, protecting Goddesses, an unusual path of cultivation. Xiao Family’s dandy Young Master Xiao Chen, degraded to trash of the clan, with his father missing and thrown out of the family. His fiancée became his mistress, and Xiao Chen has become his fiancée personal servant, what was most pitiful was that there weren’t any wages and he still had to pay rent! However;it doesn’t matter, there is spring for unlucky teenagers| For whom did he become an amazing cultivator for? Description from Novelupdates.