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Information Value Chain Analysis in Defence

Key findings and recommendations from senior level interviews across MOD and Industry.

Red Paper | Information & Operating Model

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At a Glance

Our extensive interviews across MOD and Industry provide a consistent view of how both MOD and Industry can realise significantly greater value on through-life contracts. Issues highlighted are all immediately recognisable. They drive significant complexity into defence whilst adding frictional cost and impacting risk, performance and safety.

In a period of enormous change and cost pressure within defence, the current operating model was viewed to be no longer sustainable. Industry is focused on expanding exports and so it needs a standard business model and support service across both its UK and global markets comparable to the U.S. DOD's Foreign Military Sales program. Significant complexity is created by platform specific commercial requirements, driven by Project Teams within DE&S's operating model. It causes proliferation of business processes and prevents this standardisation. Together with gaps in MOD's existing strategic and management processes, they drive significant additional cost into Industry. Similarly, cost pressures mean MOD can no longer sustain its platform-centric operating model. Post Op Herrick, it needs greater flexibility and an ability to directly reflect strategic priorities in decision-making.

Required changes to the defence operating model, to address key themes, also seem clear. It builds on work already done within defence reform, JFC/Commands and consensus from interviews. The challenge rather is how to bring about change, given limits in MOD's capacity to direct change on multiple fronts and that it will be gradual. We recommend building on a common long term vision to address change at two levels:

- Firstly, to invert the current operating model to drive it top-down from **defence or enterprise level** strategy rather than bottom-up from local platform decisions. It means elevating key decisions on platform investment and support so it optimises across defence as a whole and the needs of JFC/Commands. It includes rationalising and finding more dynamic (flexible) commercial models to address evolution in Operating Goals and risk. These changes must be led by a **senior MOD sponsor**. The starting point for change is defining the management and planning information required to inform decisions at this strategic level, compare options and expose performance by benchmarking across platforms.
- Secondly, to understand cost drivers, standardise and create consistent execution **at platform level**. By addressing issues highlighted in interviews there are significant cost and performance gains - a win/win for all parties. These changes are better delivered **jointly by MOD and Industry**. We have identified immediate actions for this 'bottom-up' platform driven change that will create traction, buy-in and support the case for change. These are listed and will be presented to September 2013's Joint Information and Support Group meetings.

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Information Value Chain Analysis in Defence

There are many through-life contracts delivering excellent cost savings and performance. Long-term partnering with Industry on complex, technologically advanced and high value programmes - enabled by open and transparent information sharing - has reshaped the landscape in defence. Now further radical innovation and change to the value chain is needed. Defence Reform, 2013 Treasury Spending Review and SDSR 2015 mean Team Defence moving beyond current successes to resolve intense cost pressures.

Issues preventing change have to be removed whilst rationalised and dynamic commercial models reduce frictional costs and address risk. We term this 'Contracting for the Unexpected'. It is a more strategic top-down driven model. It uses defence level information to analyse operational options, improve decision-making and inform policy, military strategy and high-level planning. It is leaner, resolves current process gaps and is more responsive to events. It removes complexity and waste within the current platform-centric model to maximise return for defence's capital.

"Enterprise cost per flying hour could be a constructive metric to get all parties to begin the conversation of how to tackle costs. It is critical to have a partnership and a long term relationship to have any chance of success"

– Senior Military Interviewee

Fast fact

Issues identified through senior level interviews are summarised under six key themes: changes in the way operational goals are defined; greater understanding of cost; rationalised and more dynamic commercial models (Contracting for the Unexpected); a top-down strategically driven operating model to replace the current platform-centric approach; enterprise information to inform operational options analysis and high-level planning; and better adaption of the through-life model to meet the specific priorities within Land

1. Executive Summary

Simply increasing information sharing does not yield increased value. Information is expensive to process and analyse. Understanding the relative value of information and the decisions it informs is key. Even more so, is understanding the issues impacting the underlying value chain for defence capability management and joint support that create frictional costs, add risk and prevent Operational Goals being realised in full. This is at platform, but importantly, also at defence level. Information is a fundamental cog in the wheel enabling value to be realised. It is design of the through-life value chain at platform and defence level and how information will be used jointly to exploit this value through improved decision-making. For Team Defence to be successful this design needs to address the new world reality of Defence Reform, shortages in skills (SQEP), inventory reduction, manpower cuts and intense cost pressure. Growth and necessary evolution in through-life contracts is the opportunity to do this. This study focuses on these twin objectives of information and value chain, including necessary cultural change and partnering behaviours.

Key themes

Interviews highlight the successes of through-life acquisition. BAE SYSTEMS's 10 year ATTAC contract halved cost per flying hour for Tornado. IMOS reduced Merlin costs by 33% with 600 MOD staff on AgustaWestland sites in integrated project teams. Building on these gains, we identify issues to be urgently resolved to provide a far better basis on which to drive the innovation and change required to meet future cost pressures:-

1. Operational Goals need to incentivise proactive management of function/ cost (e.g. cost per flying hour). A less static and more dynamic approach to through-life contracting that is responsive to events: 'Contracting for the Unexpected' and avoids inherent shortcomings in current availability based model. It differs from the acquisition staircase by looking at inflexibility that risk transfer might create
2. MOD/Industry must bridge the gap in understanding cost: drivers, requirements, through-life support (impact on capability trade in/out) and consequences of operational use of equipment (e.g. causes of fatigue and mean-time between failure). Getting cost to influence behaviour requires substantial cultural change
3. Commercial models must be rationalised. Short term contracts do not incentivise Industry correctly. Platform-centric models dictate non-standard processes, KPIs and information. This is high cost for all and not sustainable. Industry needs to standardise to focus on exports. It is a barrier to defining integrated support requirements, top-down and aligned to goals e.g. all Combat Air across Tornado, Typhoon and F-35. Information is not standard at platform level so cannot be combined or compared at defence level to dynamically model and analyse operational options, inform military strategy or high-level planning
4. A top-down approach starts with defining the strategic dashboard at defence level, which feeds down into commercial models, processes and KPIs. Information also needs to be orchestrated bottom-up i.e. Capability Body of Knowledge with each platform developing standard information to comply with Def Stan 00-600. It needs to target the big questions of interest to JFC. Invariably, this means understanding the impact or risk to securing outcomes or forecast capability and availability
5. Information is required from both MOD and Industry sources. Currently there are no common formats or standards for consolidating and aggregating information
6. Merge the advanced thinking within Land with adaptation of the model. With different drivers from Air and Maritime, the key focus is complexity of tracking and logistics of large groups of diverse systems made up of high volume/low value assets close to the front line

Benefits

These accrue in 4 areas: lower cost, improved operational effect and a more top-down strategic driven model that is more responsiveness to events. A real focus is needed on:

- Resolving issues currently driving cost into defence. Use information to reduce cost at root cause by understanding reliability and user behaviours (removing spares and frictional costs). NAO highlights on ATTAC that many benefits came from change in use by operators once they had visibility of cost consequences of actions e.g. using after-burners for take-off. ATTAC and Chinook TLCS are examples of MOD/Industry working together to address operational use issues
- Using value stream and lean principles in a top-down model that is responsive to events using pull (aligning support with goals/operational needs: 'Contracting for Unexpected') rather than current push (platforms paid for availability regardless of need or constraint). Optimise decisions at defence level, removing waste and frictional costs. Improve strategic/management processes translating strategy 'need' at defence level into precise requirements (e.g. Command Management Plan with annual flying hour drives demand forecast into parts order)
- Challenge Industry to raise quality and delivery (MOD's suspicion is UK targets are short of US e.g. F/A-18 with 98%+ targets). Benchmarks help comparison, increase transparency and trust, enabling MOD to demonstrate value for money for longer contracts. Enterprise learning provides for continuous improvement
- Improving top-level decision-making to optimise decisions e.g. compare operational options: 100 hours of Chinook or 150 hours of Merlin, based on full understanding of capability and cost per flying hour for different terrain

Priorities

Given timing of 2013 Treasury Spending Review and SDSR 2015, initial focus needs to be high value platforms (potentially Helicopter OC which has been more radical)

Recommendations

Set out below, we summarise for each of the 6 themes: business benefits, recommended actions and immediate next steps. Themes are grouped into those requiring change at platform level, which are better delivered jointly by MOD and Industry, from those at defence or enterprise level. These latter actions require senior level MOD sponsorship, starting with defining the strategic dashboard as this determines the information needing to be collated at platform level to inform option analysis and planning at defence level.

	Theme	Business benefit to MOD and Industry	Recommended Actions
Platform Level	**1. Operational Goals**	More effective metric to incentivise all parties to own and innovate to proactively reduce cost and risk whilst improving reliability, safety & operational effect	Build on work within JFC. **Immediate:** Find best practice examples that can be built on and lessons learnt in building flexibility into evolving Goals for changed outcomes/threats
	2. Understanding of cost	Focus on cost and its drivers through-life enabling proactive management at every stage including requirements definition, capability trade, support & operational use	Define how cost management is to be more integrated into every step of CADMID. **Immediate:** Identify exisiting best practives, methods and tools
	3. Rationalised and more dynamic Commercial models	Great flexibility for evolution in goals, risk & the unexpected. Rationalisation allows Industry to adopt standard global business processes to promote efficiency & exports	Define: requirements for dynamic/flexible contracts; & value chain reference model to underpin standard contracts. **Immediate:** Set out audit issues. Industry make case to rationalise
Defence or Enterprise Level	**4. Invert operating model to strategic & top-down driven**	Decisions on optimisation of investment and support elevated from platform to defence level, aligned with strategy & needs of JFC/Commands, saving cost & improving effect	Define strategic dashboard mapped to information sources in MOD/Industry. Define enterprise level business processes and how to fix gaps in strategic and management layer
	5. Enterprise Information strategy	Providing information to invert model to benchmark & analyse operational options, improve decision-making & inform policy, military strategy & high-level planning	Define information strategy for aggregating enterprise information from MOD/Industry & what is required at platform level. **Immediate:** Tool to assess relative value of information
	6. Merge and adapt for land	Leveraging benefits of commercial model, cost, risk transfer, operational capability & SQEP	Identify pilots for creating through-life model unique to constraintsand issues within Land. **Immediate:** Identify critical success factors, lessons identified and potential pilot

There need to be demonstrable benefits for both MOD and Industry to move forward in terms of cost, risk, operational effect and removing complexity from the business model

Fast fact

Value accrues at platform level through greater standardisation around leading practices, lower cost and improved operational effect. Much of this is recognisable as existing in pockets today. The definition of Operational Goals is the starting point, but it is rationalised and more dynamic contracts that are key. It allows the current model to be inverted to a top-down strategically driven approach that is more responsive to events and needs of the Commands. It enables enterprise information to analyse operational options, improve decision-making and inform policy, military strategy and high-level planning. It allows benchmarking to challenge Industry to raise quality and delivery, whilst optimising decisions for cost, effect and safety.

"Much of the issue comes down to MOD not valuing partnership. The reality is MOD needs a contract but if that is everything effectively the battle is lost"

– Senior Military Interviewee

Fast fact

In mapping out an overall value chain, this study offers a reflection of the challenges in defence capability management and what needs to be addressed – on a joint basis – to improve operational and support decision-making to lower cost and enhance effect. Defence Reform and defence cuts make this all the more urgent. A through-life capability-based approach is required, not just at platform level but importantly also at defence or enterprise level. A much clearer understanding and definition of strategic goals is needed; a top-down approach to capability management; appropriate commercial and cultural changes to support the new model; and a clear understanding on new policy that the outcomes we seek are information-enabled. Information and exchange requirements must be thought through from the very beginning. The challenge is to first resolve the business issues that create frictional cost and destroy value and then let the information needs fall out, not the other way round.

How to read this document

This IVCA paper builds on the earlier case study of the Successor Programme, published in January 2013 and available online. It draws on evidence from face-to-face senior level interviews with MOD, DE&S, Commands and Industry, based on 10 defined questions. A list of 35 people, who kindly agreed to be interviewed, is provided at the back.

The overall picture is highly fragmented with value chains differing by programme. There is limited standardised practice and different groups are responsible for each aspect of the through-life model (capability, commercial, process, information) with significant differences between environments. Each interview presented a unique insight reflecting the interviewee's particular vantage point on the end-to-end value chain.

Interviews

The 10 interview questions in Section 3 are divided into 4 parts: A. Understanding the current environment and drivers for change; B. KPIs and business processes; C. Information; and D. Implementation. A consolidated answer from the 35 interviewees is provided for each interview question. At the start of each question is a summary of key conclusions. This is then followed by the written response synthesising the views of the 35 interviewees for that question. At the front of Section 3, we have taken the 10 key conclusions tables (one per question) and brought them together in groups labelled Issues. These issues are summarised in a table on page 14 where they are linked to the 6 themes discussed in Section 2.

Conclusions paper

This point of view paper elevates the discussion to bring out key themes. The end-to-end through-life value chain is an enormous subject. The aim of the paper is to be highly selective in identifying a set of meaningful recommendations. The paper consists of:-

- **Single System of Value** – value stream mapping/engineering can be applied at programme level. The issue is that it is non-standard for every CLS. Drawing on interviews, we look across all CLS to identify a general end-to-end value chain model describing the key tenets of successful through-life contracts. These contracts materially increase value through better information exploitation. Value is the result or beneficial outcome of correctly setting up each layer of the model so it aligns to Operational Goals (value stream). One interviewee coined the phrase a 'Single System of Value' to describe this. It neatly summarises IVCA's aim.
- **Key themes** – building on issues in Section 3, we identify 6 themes that emerge from interviews. Themes describe what is needed for through-life contracts to continue to be successful. They reflect on the enormous change in defence and intense cost pressures. The table below tracks themes to interview questions (Q1 to Q9).

Theme	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9
1. Operational goals		•			•	•			
2. Understanding cost		•			•				
3. Rationalised & more dynamic commercial models	•	•	•		•	•	•	•	•
4. Strategic & topdown driven model			•		•	•		•	
5. Enterprise information strategy	•	•	•	•	•		•	•	•
6. Merge & adapt for land	•	•							

- **Recommendations** – we bring together overall recommendations and high level action areas. These will need to be built into detailed action plans through workshops with the wider Joint Information Group and Support communities, but there is a clear need for a senior level sponsor to drive top-down change with MOD.

2. Information Value Chain Analysis (IVCA) - Conclusions

Launched in 2012, IVCA is a joint MOD and Industry initiative sponsored by the Joint Information Group (a sub-committee of the Defence Suppliers Forum).

2.0.1 Overview of through-life support contracts

Often referred to as CLS[1] or IOS[2] , their proportion of contracts in defence acquisition will grow from 20% in 2007 to 65% by 2017. This coincides with a period of enormous change with: Defence Reform; Total Support Force[3]; Future Force 2020[4]; SDSR 2015[5]; withdrawal from Afghanistan; shortages in suitable qualified experienced personnel (SQEP); a drive to cut MOD's £40B inventory and defence manpower cuts. Industry is changing to compensate for lower UK spend by growing exports (including support).

Defence changes will be reflected in CLS addressing: SQEP, operational effect and force generation. CLS will broaden to embrace more Defence Lines of Development (DLODs) and address issues in current MOD audit reports. The MOD/Industry boundary is shifting with Industry taking on services closer to the front line and more management (as well as execution level) processes. This presents risks in setting output-based specifications where it is difficult to predict future threats or volumes, particularly in Land. Key will be developing CLS commercial policy to create more dynamic/flexible models using value for money to address complex service arrangements where requirements cannot be defined in sufficient detail upfront, "Contracting for the Unexpected". Industry has to standardise its business models to operate in export markets and reduce cost[6].

There are many excellent examples of CLS, built on transparent information sharing and long-term partnering. BAE SYSTEMS's 10 year ATTAC[7] contract has halved cost per flying hour for Tornado. Since 2006, IOS for Merlin (IMOS) has reduced costs by 33% with 600 MOD staff working on AgustaWestland sites in fully integrated IOS teams. In Maritime, Sonar CLS has delivered a 20% saving and improved reliability on assets up to 30 years old with a co-located Thales/MOD team. Value realised by CLS on these older platforms is stark. It highlights that the model applies to new and old platforms alike.

As more DLOD are integrated, so CLS advances to Contracting for Capability (rather than availability), such as Air Tanker[8], MFTS[9] and WIST[10] (including training). Key differences between Maritime, Land and Air environments mean CLS differ. The Heavy Equipment workshop at Camp Bastion and Supreme[11] are good examples of Industry's role in Land.

1 Contractor Logistics Support (CLS) takes different forms but, in essence, it is through-life contracts that integrate all services (traditionally bought separately) under a single prime contract incentivised with output-based performance mechanisms.
2 Integrated Operational Support (IOS) are CLS in the air environment including helicopters and Hercules C-130.
3 TSF provides a fully integrated and sustainable military (Regular & Reserve), Civil Service (CS) and contractor support force E2E, in which the characteristics & strengths of each are optimised to deliver Defence Support. A Full Operating Capability is to be achieved by 1 Apr 15
4 FF2020 - Defence Planning Assumptions for the Armed Forces in the year 2020
5 The 2010 Strategic Defence and Security Review (SDSR) presented planning assumptions to 2020 but focused on actions up to 2014 leaving it until SDSR 2015 to define remaining actions needed to deliver the 2020 vision
6 See ADS paper: Through Life Support to Exports
7 Awarded 2006, providing on and off aircraft depth maintenance & capability insertion to meet future requirements of Tornado GR4 fleet . There were a number of contributing factors to the saving, not just CLS, but the process in itself revealed much that could be improved by information sharing, changed behaviours and relationships at all points in the support chain.
8 AirTanker - awarded the Future Strategic Tanker Aircraft (FSTA) contract in 2008 for air transport and air-to-air refuelling service over 24 years. It includes all support services including aircraft maintenance, training, infrastructure, fleet management and ground services.
9 Military Flying Training System – In 2008, Ascent was awarded a 25 year contract to provide the flight training needs for Royal Navy, RAF and Army Air Corps from fast-jet, rotary wing and multi-engine pilots, to rear crew
10 Wildcat Integrated Support and Training (WIST) – Awarded in 2012 for through life support and training of Wildcat helicopters. Initially for 5 years but with a commercial framework enabling delivery until 2044, subject to demonstrating continuing value for money.
11 Contract with Supreme Group for fuel oil and food supplies in Afghanistan

Key are more rationalised and dynamic through-life contracts using VfM to address complex services where requirements cannot be defined in detail upfront and diverging from the acquisition staircase approach to risk by "Contracting for the Unexpected"

Fast fact

Forecast growth in through-life contracts coincides with a period of enormous change with Defence Reform, cost pressure and skills deficit with MOD impacting its capacity to reform itself. In response, the MOD/Industry boundary is shifting with contracts covering more defence lines of development and deeper skills and capability requirements. This growth is an opportunity to urgently address issues within the value chain for defence capability management. Adopting a more systematic and, where possible, standardised approach to the platform level value chain removes complexity, frictional costs and allows commonly defined information to feed through at enterprise level and so empowers a top-down strategically driven model to form at defence level.

"Pulling together an approach that aligns sub-systems and DLODs is a good problem space to tackle. The lead into the model [Operational Goals] is critical"

– Senior Military Interviewee

Fast fact

Correctly setting up the value chain, that underpins through-life contracts for defence capability management, is summarised as a Single System of Value. It enables materially increased value through successful information exploitation. It draws on leading practice in areas of Air and Maritime. Key is defining Operational Goals and creating a direct tie with through-life support requirements, KPIs and incentives such that information and exchange requirements can be defined from the outset. Key will be adapting this model to the strategic priorities and complexities of Land

2.1 Single System of Value

2.1.1 Operational Goals

Value in this model is defined by Operational Goals for a capability – operational effect and efficiency. Successor serves a single mission offering great clarity on the 'effect' it is looking to achieve through-life. This makes it easier, than for many capabilities, to pinpoint the relative value of information in maintaining a Continuous At Sea Deterrent.

Materially increasing value through information exploitation is the beneficial outcome of correctly setting up each layer of the model (Figure 1) aligned to Operational Goals. An interviewee coined the phrase a 'Single System of Value' to describe the model and this neatly summarises IVCA's aim. MOD cannot be seen as a single or even a federated enterprise, so there will need to be variants driven by volumetrics and environment.

Information exploitation is about realising latent value within the model across the full length of CADMID: in Design/Build and In-service. It critically depends on building trust and collaboration, information sharing and integrating co-located MOD/Industry teams. This includes all stakeholders including Capability, Commands and Project Teams.[12]

2.1.2 Single System of Value Model

Its genesis is defining Operational Goals and translating within Capability Management into requirements for how the platform will be supported through-life - the aim of Def Stan 00-600. It includes Operational Levers, KPIs and incentive models. Goals and KPIs must be enduring to deal with changes in tempo, terrain and consequences of operating outside the 'envelope' but also promote the right culture and partner behaviours.

The Single System of Value needs to cover all sub-systems (often contracted separately) and MOD GFX[13] supplied components. It has to fully integrate each DLOD, so that all elements operate to a single baseline, pulling together to realise Operational Goals.

If CLS is delivering value (effect and efficiency), it is because there is a direct connection between Operational Goals and the definition of CONEMP within Capability Management. This creates the tie between Operational Goals, URD, Operational Levers, KPIs, processes, information and decision-making. It comes down to correctly specifying CONEMP and CONUSE for through-life support at a sufficiently detailed level that information, exchange requirements and governance are defined pre- contract, avoiding conflict later. It means capability trade-in/out is based on understanding through-life consequences using cost models. The challenge is CONOPS, CONEMP and CONUSE are not a well understood processes. Historically it was carried out at Main Building remote from Commands and DE&S. DE&S take the URD as a *'fait accomplis'* whereas in reality it is never static and needs to include the art of the possible with innovation industry bring.

A senior military interviewee commented on Figure 1: "pulling together an approach that aligns sub-systems and DLODs is a good problem space to tackle. The lead into the model [Operational Goals] is critical. What is potentially missing is the overall understanding of what you want that needs to drive this model. A very clear statement of user requirements". It opens the debate into how best to divide down capability into systems and sub-systems, and then look at support systems for each, adding: "this is highly complex if it is all to be based on output-based metrics and completely aligned". Another commented: "the diagram [Figure 1] is very recognisable as the problem statement" with the risk of disconnect as each part is driven bottom-up and not aligned.

12 Co-location is not always practical for all teams e.g. under new models where CAM and TAA organisations exists separately. In this case, ways need to be found to support virtual team working.

13 Government Furnished Equipment issue to the programme

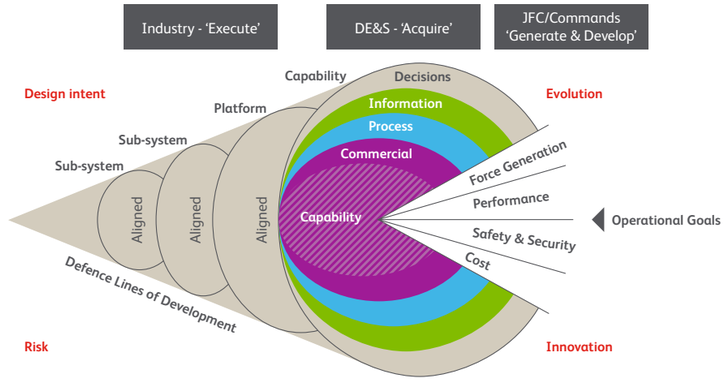


FIGURE 1: SINGLE SYSTEM OF VALUE

2.1.3 Information perspective

Simply increasing information sharing without each layer of Single System of Value being correctly set up will not yield value. Information is expensive to cleanse, collate, store and analyse so the relative value of information must be clear. Information is a fundamental cog in the wheel enabling the Single System of Value to be successful. It includes all design, build and in-service activities including maintaining design intent. Information skills are as important as engineering; information is a key source of value.

If configured correctly, the Single System of Value provides a powerful incentive for Industry to identify areas of improvement. The experience of successful long-term CLS/ IOS contracts is that gainshare and the right behaviours incentivises Industry to increase value generating pull for information. At the same time, gainshare pushes DE&S/ Commands to share information and work collaboratively with Industry to realise it.

2.1.4 Looking forward

A key challenge is evolving from sharing transactional data (usage, condition, spares) to valuable information output from highly integrated strategic/management processes such as 3, 5 and 10 year technology roadmaps. The Integrated Support Plan should hold this with the Logistics Information Plan defining information exchange and formats.

A second challenge is that the model focuses on engineering and asset management at a unitary platform level. The opportunity now is to elevate the model to defence level and make it both top-down and more responsive to evolving threats and Operational Goals. This means providing defence level information to optimise decisions on operational options, high-level planning and support requirements. This requires aggregating information from MOD and Industry sources, to enable comparison and benchmarking across capabilities and enterprise learning. This means enterprise level processes (above platforms) that cut through complexity and dynamically simulate choice.

The current information sharing model at platform level is focused on industrial transaction data. The challenge is to evolve it to more valuable information whilst raising the overall model to defence level to become more top-down driven

Fast fact

With a Single System of Value at platform level the challenge is how to raise it to defence level. The approach needs to be top-down but orchestrated (from an information perspective) bottom-up i.e. common information with standard definitions at platform level that can be aggregated and bench-marked across capability options ('enterprise information'). It means fixing current gaps in strategic and management processes and raising them to defence level as well to operate with enterprise information to analyse compara-tive operational options, improve decision-making, inform policy, military strategy and high-level planning. By moving from platform-centric to a top-down defence level model, it empowers decision-makers within Defence Reform by giving them the information they need to drive strategic choice and optimise decisions.

"If a platforms needs to increase from 80% to 90% availability there is no proper grip on end-to-end costs of doing so. It becomes very difficult to judge as there is no understanding of cost drivers or what the experience has been for comparable platforms."

– Senior Military Interviewee

Fast fact

Issues at a platform perspective are under three themes. The first is Operational Goals. Significant concerns were expressed on their clarity, flexibility and focus on availability rather than linking reliability, cost and the impact of decisions such as cost per flying hour. The second was the limited understanding of cost at every stage of the lifecycle including cost drivers and the consequences of operational use of equipment. Finally, complexity needs to be removed by rationalising commercial models. Current practice drives unique KPIs, processes and information for each platform, preventing enterprise information and benchmarking. They also need to be more dynamic and flexible. To secure buy-in to change there must be demonstrable benefits for both MOD and Industry

2.2 Key themes

In Section 3, we summarise key issues identified through interviews. In this Section, we rationalise them into 6 key themes that underpin our Recommendations.

1. Orientation of Operational Goals

Whereas companies drive towards enterprise level corporate goals (profit/share price), the defence equivalent is: "Can we do what we need to do (Operational Goals), when we need to do it (Availability) within budget (Cost)?" Significant concerns were raised with the way Operational Goals are defined including clarity, flexibility and focus on availability - paying even if delivery is not needed or constrained. The preference is a much stronger link with reliability, cost and impact of decisions (e.g. cost per flying hour) with safety always being seen as a core business driver.

This function/cost metric is the classic value engineering measure. As a more sophisticated metric, it adds to information exchange enabling parties to understand cost consequences of operational use.

Setting Operational Goals and commercial mechanisms by platform creates non-standard processes and information for each platform. This can lead to non-alignment of a platform with its sub-systems, the unintended consequence of which are the Command becoming the service integrator responsible for bringing coherence. Conversely, choosing between operational options and strategic choices is the opposite: a top-down driven activity based on key business drivers using consistent and coherent information. This means being able to look down, at defence level, across capability areas to dynamically model operational options and risks to assess how best to achieve outcomes in the most efficient and effective way, with an ability to execute decisions. This model is intensive in using truly enterprise information. It also means finding a way of updating CONEMP and CONUSE (CADMID is one-off and linear) for evolving Operational Goals.

2. Bridge gap in understanding of cost

Defence Reform, the 2013 HM Treasury Spending Review and SDSR 2015 are all driving intensive cost pressures. This means it is imperative defence has a full understanding of cost, root causes and drivers where interviews suggest it has incomplete knowledge today. In an environment where upfront acquisition, operational effect and mission have primacy, there will be significant cultural challenges to change operational behaviours.

This includes understanding costs of requirements, through-life support and implication of capability trade as well as integration of DLODs. It means drawing the link between lower cost supply chain management (with optimised inventory) and supportability engineering decisions enabling cost to be managed downwards. It means understanding the consequences of operational use of equipment and behaviours (e.g. causes of fatigue and mean-time between failure), implications of different terrain and operating outside the envelope. Looking at civil organisation such as airlines, they understand both costs of operating different routes and factors contributing to higher costs such as fuel burn.

It requires mapping a tightly integrated end-to-end value chain with all DLODs. The opportunity is to re-write JSP886 embedding standard process reference models to enable easier contracting/handover of processes to Industry as well as referencing in engineering, operating and safety factors. For example, SCOR provides standard process models with all data requirements/metrics for each process stage. If combined with ASD/AIA (S1000D for tech docs, S2000M for material supply and S3000 for logistics support), OAGIS and PLCS for data standards it provides the whole model: process reference models with standard boundaries, outputs, metrics/data requirements, interface definitions, roles/responsibilities and information and exchange requirements. Whilst MOD has expended significant effort developing PLCS it requires leadership to drive implementation as a standard.

3. Rationalised commercial models

Project Teams have freedom to define a commercial model for each platform. The impact of this is cost of complexity (and frictional costs of being unable to do so), but also:

a. Performance cannot be benchmarked or compared across platforms, limiting enterprise level learning, exploitation and identification of good practice. (e.g. why cost per flying hour differ between platforms). Enterprise learning enables better policy and standards. This thinking is behind current work on core Master Data Assumptions as part of the Whole Life Cost Modelling Working Group.

b. Platform and sub-systems may have different KPIs/Levers and be at different points on the acquisition staircase. The impact of poor KPIs is a hard lesson learnt for defence, incentivising industry partners to pull in different directions impacting availability of the overall capability.

c. If information is non-standard without common definitions or meaning, it cannot be aggregated. This means enterprise information with common meaning cannot be created by consolidating information from MOD and Industry sources.

d. Unique requirements for each platform lead to unique processes, KPIs, information and exchange requirements. This adds cost and complexity for all. It is not sustainable. It runs counter to Industry needing to globalise through standard processes, to grow exports from 35% to 65% of UK defence output.

e. Complexity makes it difficult to simulate operational options as constraints, commercials, operational restrictions, fix times are all non-standard. It works against top-down enterprise strategic planning, dynamic modelling of operational options and responsiveness to the needs of the Commands.

f. Inconsistent profile of retained risks. Each CLS has different MOD retained risks. As MOD aggregates assets with different CLS/contracts to form an overall capability, risk compound. Commands ends up with risks they did not expect and so lack clarity on how best to manage. The appetite of JFC/ Commands for these different risks is unclear.

g. MOD needs to be able to work closely with Industry to secure better and more standardised outcomes, which includes fully exploring the 'art of the possible'. It is only possible if requirements, contracts and relationships are conducted with Industry in a truly partnering way. This means a better and closer relationship. From the outset MOD needs to understand how information on performance against requirement will be exchanged so MOD is able to demonstrate value for money.

Interviewees highlighted that defence is driven by unpredictable 'events'. JFC is looking at Capability Packages, which is an inherently more flexible approach to capability management than the Force Elements, particularly if a capability is not available. It considers different capability options and wants to benchmark and compare them. A more flexible commercial model fits with this as short term gaps in capability have to be bridged by flexing existing capabilities as the equipment plan is fixed for 4 years. Current contracts are not good at delivering this flexibility or establishing how Operational Goals can be evolved or changed. This requires a dynamic CLS.

Long term and dynamic may be difficult to reconcile, whereas it is relationships that need to be long-term whilst contracts and funding can flex. In an inflexible model with a low base and surge it can be both expensive and difficult to secure funding. Flex may, for example, be MOD/ Industry working together to manage the ratio of fixed/ variable cost (the more variable the greater the flex) maximising the ability to veer and haul (e.g. flex volume). The current acquisition staircase focuses on incremental risk transfer. The question is whether in some areas maximising flexibility whilst minimising cost (e.g. volume fluctuation) is long-term a lower cost model.

For this to be supported by Industry there need to be demonstrable benefits. These might be in the form of: longer-term contracts; massive reduction in the complexity injected into their business by the existing platform-centric model; an ability to exceed the 10% profit cap for certain risks transferred; extension of incentive mechanisms or the ability to better exploit information to receive incentive payments.

A top-down strategic approach aligning information with revised accountabilities for Defence Reform. It provides decision-makers with the enterprise information to analyse options, evaluate performance, long-term plan, inform policy and optimise decisions

Fast fact

There are 3 themes behind inverting the model to be strategic and top-down driven. The first is defining a defence level strategic dashboard with the enterprise information supporting operational options analysis and strategic decisions. It includes fixing gaps within strategic and management processes and raising them to enterprise level to operate with commonly defined enterprise information. Next, this information needs to be sourced and aggregated from MOD and Industry. Today, there is no approach to allow this. Finally, the model needs adaption to priority issues within Land.

4. Defining the strategic dashboard

A top-down approach starts with defining the strategic dashboard at defence level. Metrics need to provide insight to the bigger strategic picture, than metrics sourced at platform level today, so they evaluate the risk or impact to securing outcomes and future availability rather than current availability or the minutae of fatigue or parts failure. This dashboard defines the threads together of enterprise information required to take a more strategic view:

a. A top-down and bottom-up approach. This enterprise architecture model starts with defence level strategic objectives and feeds down into commercial models, processes and KPIs. Bottom-up is commonly defined information orchestrated at platform/sub-system level that is aggregated into the dashboard. The Capability Body of Knowledge aims for this standard information, by capability, to comply with Def Stan 00-600. Also see on point 3. KPIs and Master Data Assumptions.

b. Enabling enterprise strategic/management processes fully integrated with execution at platform level. This means fixing current gaps in these processes, raising them from platform to enterprise level and switching the overall model to top-down driven. Currently, issues here are a major source of value lost.

c. Creating the understanding (including for cost) to simulate complex integration of constraints, commercial mechanisms, operational and financial data. This links to work in JFC on Capability Packages and decision support tools, such as Contingency Capability Requirements and Standards model (CCRS) to evaluate different options, constraints and risks to availability. Figure 2 illustrates the enterprise information needed to run enterprise level processes.

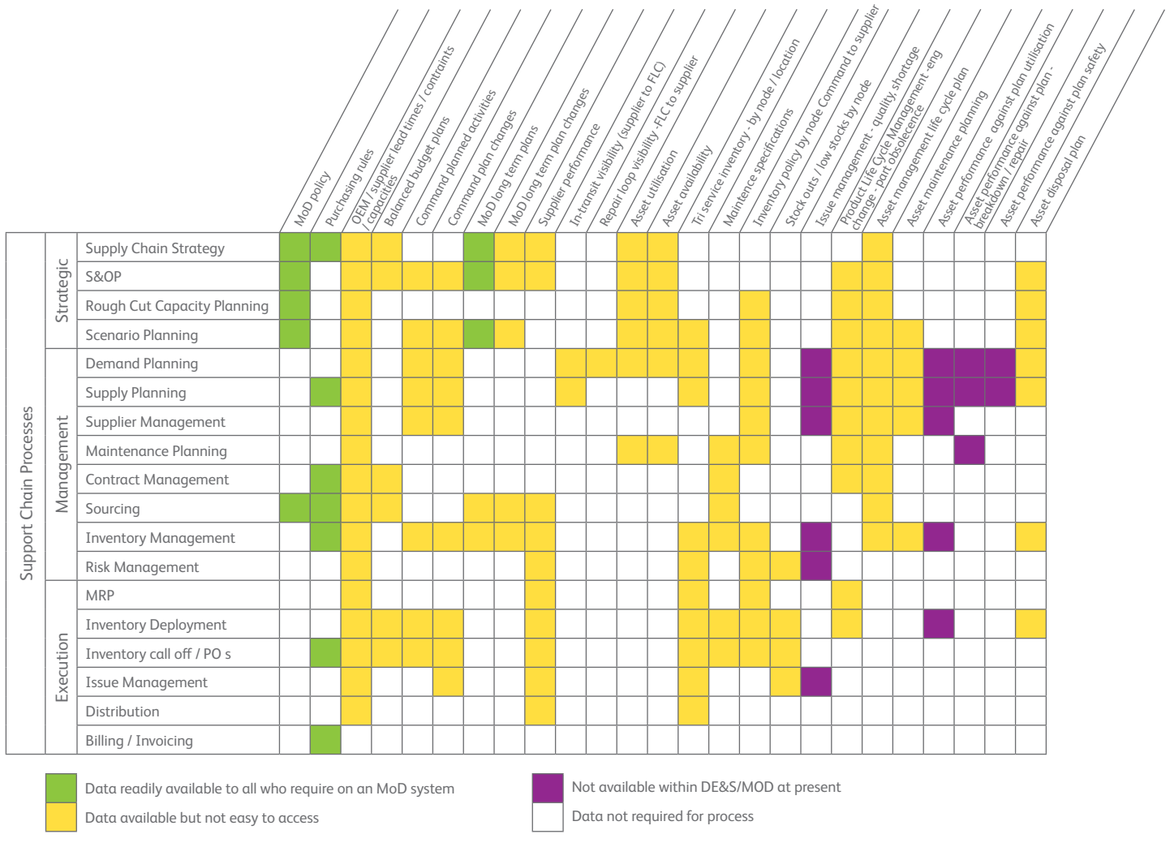


FIGURE 2: ILLUSTRATIVE ENTERPRISE LEVEL INFORMATION NEEDED TO DRIVE ENTERPRISE LEVEL PROCESSES

d. Information aligned with the revised accountabilities of Defence Reform, particularly if the GoCo model is adopted. This means articulating an overall end-to-end value chain and separating out decision-making within each body. A more top-down and responsive approach suits whichever model is adopted for DE&S.

A strategic and top-down driven approach, which is more responsive to events, enables lean principles to be used to design processes to further remove complexity, frictional costs and waste (e.g. availability not used). For example, rather than have separate teams define through-life support requirements standalone for their platform or sub-system, it presents the opportunity for a top-down approach e.g. defining them as Combat Air with an integrated set across Tornado, Typhoon and F-35.

Building on this, is the idea in Maritime Combat Systems that complex system activities (e.g. Anti-Submarine Warfare and Carrier Strike) benefit from horizontal CLS to achieve greater commonality and coherence across the fleet.

The question is whether capability requirements can be defined in a more integrated (less platform specific) way. As well as operational benefits, for Commands, it facilitates spiral development, eases contracting and reduces: complexity, inventories, through-life support costs, risk, training and SQEP requirements. It makes it easier to share with Industry long term (3, 5 and 10 year) technology roadmaps as part of integrating fleet, obsolescence, asset and supply chain management processes and a top-down strategic planning approach to support. It is easier to simulate operational options at defence level. The COMs are key in taking this more strategic view but are beneficiaries in terms of cost and availability.

5. Sourcing defence level information from across MOD and Industry

A strategic dashboard and enterprise processes require commonly defined and formatted information from MOD and Industry. It raises key questions as to how MOD will:

a. Apply common definition, standards and formats that enable data aggregation from MOD and Industry? Are there commercial issues needing resolution.

b. Avoid data fragmentation as processes are split and transferred to Industry partners? Will MOD own collaborative IT environments? Can MOD re-aggregate what it has transferred in sufficient time to be warned of issues or key risks?

c. Up its game on data quality, latency and cultural barriers to exchange and partnering with Industry? One industry interviewee stated: “We only currently receive about 20% of all the information we need when we need it”.

d. Allow Industry to have a fuller role in defining requirements for remaining MOD systems? This is part of the current debate on MJDI and BWIMS?

e. Manage growth of CLS and their sophistication means an enlarging role for Industry, the volume and complexity of required information exchange and the proportion of data held on Industry systems. At what point does Industry hold the master record and provide access to MOD (whilst MOD is nervous on this use of OEM IS is already much greater for engineering/ safety systems relative to supply chain)?

f. Access information held by Industry to fulfil safety obligations if Design Authority rests with Industry? Should MOD own collaborative IT environments such as Teamcenter for Successor?

There is no framework for understanding the relative value of information (relative to mission or higher level strategic and Operational Goals) e.g. understanding vehicle telemetry correlated with mission profiles to support tactical planning. There is also lack of clarity on data owners across CADMID/T to administer this framework. MOD needs a policy for working with owners to exploit information for gain not just FoI and Public Record. It needs to cover value and ownership across CADMID/T, access and one or more neutral service providers (brokers) to collect, collate, process and disseminate on behalf of all of defence. It might also include aggregation from MOD/ Industry sources.

In Land, the benefits of commercialising the model are understood but it is cautious because of historic experience of take-or-pay contracts. An adapted model is needed to address the uniquely challenging logistics drag and tracking tail for diverse, low value and high volume of assets and systems at deployable bases in close proximity to the front line

6. Merge the advanced thinking within Land with adaptation of the model

Many of the best examples of CLS/IOS are in Maritime and Air. Whilst Land sees the benefit, the model is less good at addressing constraints unique to Land. This reflects issues on both sides. In MOD (e.g. proximity to front line, volume/value and diversity of assets and lessons learnt on take-or-pay commitments) and in Industry (lack of predictability in how assets will be used meaning the risk profile attached to maintenance and support is unattractive other than for training).

In Air and Maritime CLS addresses affordability and risk transfer on high value, complex and technologically advanced assets. In applying CLS to Land, it needs to target the key challenges so the benefits of commercialising the model, SQEP, cost, risk and operational capabilities are being applied to the priority issues. This starts with how to manage groups of systems and bringing expertise in complex logistics and tracking chains.

Summary

In the table below we analyse the key issues identified at the front of Section 3 from the detailed interviews and the benefits of resolution. We say where we think resolution requires joint MOD/Industry involvement. Finally, we tie back to 6 themes by number.

Issues by category	Benefits of resolving issue				Who contributes to resolution?		Theme
	Drive down on costs	Improved operational effect	Top-down strategy driven	Responsive to events	MOD	Industry	
General							
Overcoming cultural barriers	✓	✓	✓	✓	✓	✓	1-6
Focus too much on transact/execution level processes	✓	✓	✓	✓	✓	✓	4
Operational Goals							
Underpin model with clearly defined goals	✓	✓			✓		1
Structure on Function/Cost form	✓	✓			✓	✓	1
Capability Management							
Development of through-life support	✓	✓			✓	✓	2
More iterative and top-down		✓			✓		2
Importance of understanding costs and trade-off	✓				✓	✓	2
Levers, KPIs and Incentives							
Links and aligns all elements of capability	✓	✓			✓		2
Standard and comparable KPIs	✓	✓	✓	✓	✓		2, 3, 4 & 5
Issues invalidating KPIs	✓	✓			✓		2
Commercial							
Rationalise commercial models	✓			✓	✓	✓	1 & 3
Impact on defence level information and learning	✓	✓			✓	✓	3
Too static, need for more dynamic models	✓	✓		✓	✓	✓	1 & 3
Longer contracts	✓	✓			✓		3
Process							
Fill gaps in strategic & management processes	✓	✓			✓	✓	2 & 4
Understanding cost consequences	✓	✓			✓	✓	2
Lack of integration and standardisation					✓	✓	2 & 4
Raise to enterprise level, standardise & drive top down	✓	✓	✓		✓		2 & 4
Ability to understand and simulate strategic choice	✓	✓	✓	✓	✓	✓	4
Information							
Data quality and latency	✓	✓	✓	✓	✓		5
Lack of defence level information to drive dashboard and enterprise level processes	✓	✓	✓	✓	✓		4 & 5
Ability to aggregate information	✓	✓	✓	✓	✓	✓	5

FIGURE 3: SUMMARY TABLE OF ISSUES AND BENEFITS FROM RESOLUTION

2.3 Recommendations

In recommending actions to take the vision forward, we distinguish those changes to invert the current model, so it drives 'top-down' from defence or enterprise level strategy, from those at platform level ('bottom-up'). Top-down requires senior MOD sponsorship whereas bottom-up can be jointly delivered by MOD and Industry. Whilst this study provides an overall vision, change is likely to be gradual and the more immediate recommended actions are to create traction and buy-in to a common vision.

This vision and associated actions to address the 6 themes naturally split into:

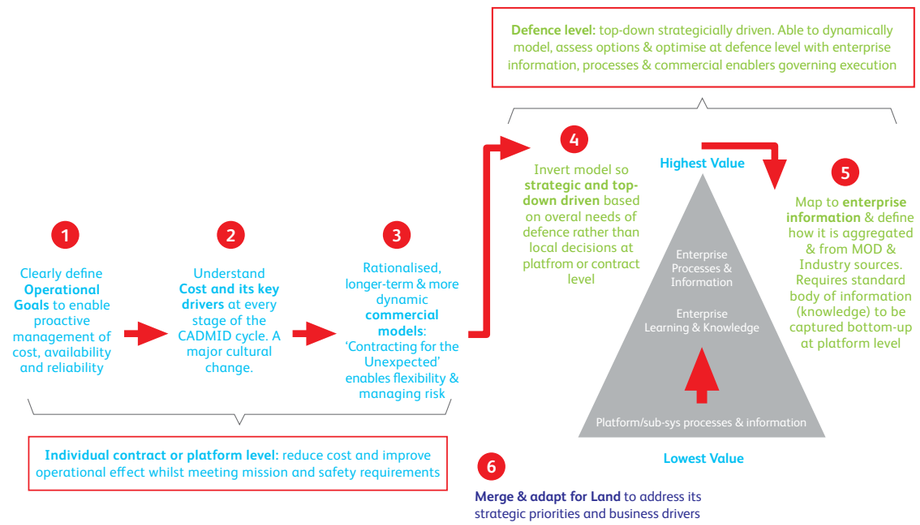
- *Defence Level:* Inverting the model to drive decisions to optimise platform investment and support based on the overall strategy and needs at defence level. The higher up the defence organisations optimisation decisions are taken the greater the value as it will link to strategy and optimise for a broader set of considerations. It enables current JFC decision support tools, such as Contingency Capability Requirements and Standards (CCRS), to inform investment and support requirements rather than continue to define them separately for each contract or platform. It requires standard enterprise information to benchmark, compare options and assess relative platform performance. It delivers lower cost and improved operational effect but also more informed decisions on policy, military strategy and high-level planning for defence. Safety continues to be a key factor.

- *Platform Level:* this covers the way Operational Goals are defined, platform cost is understood and commercial models are rationalised to create commonly defined KPIs and information. It reduces cost and enhances operational effect by following best practice for the Single System of Value. Importantly, it also introduces standard and commonly defined information at platform that will be aggregated into the enterprise information used to inform strategic decision-making at defence level. Rationalisation of commercial models is key and this makes change gradual as it requires contractual renewal or new programmes.

The immediate next steps are to:

- Identify a senior level MOD sponsor to own the vision and case for change who will facilitate looking at how to define the strategic dashboard and its enterprise information requirements at defence
- Develop CAP Forms for the immediate actions and present them to the Joint Information Group and Joint Support Chain approval meetings

The diagram shows how the six themes split between Defence and Platform levels:

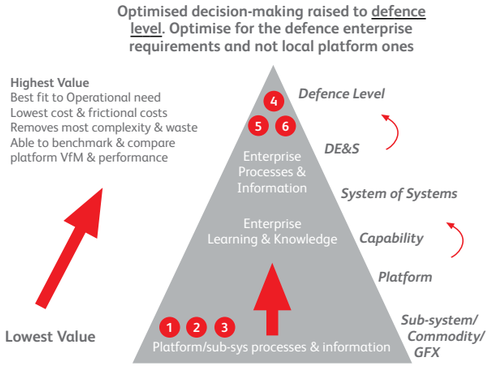


We split out the actions to invert the model to make it top-down strategically driven as distinct from bottom-up changes required to unlock greater value at platform level and enable enterprise information to be created. The key actions to implement the vision are described in the diagram below. The six themes are marked on the model by number.

The cost of complexity of running platform specific processes, KPIs and information is no longer sustainable from an MOD or an Industry perspective. For Industry to expand into export markets it needs to simplify and standardise its business model

Fast fact

Recommendations are divided between increasing value for money by lowering costs and improving operational effect at platform level from enabling the model to be top-down strategically driven, leaner and more responsive to events and the Commands. The latter is a clear vision for a more radical transformation of the operating model based on Defence Reform. Further workshops are being held to cross reference actions with in-flight JIG and JSC initiatives as well as identify future actions. This will include further work to provide additional evidence to underpin a case for change and how best to obtain it.



Delivery of vision, requires top-down implementation of:

- **Strategic dashboard** defining what enterprise information and options analysis required at defence level
- **Enterprise information** based on commonly defined information aggregated at platform level for all DLODs sourced from both MOD and Industry
- **Enterprise level strategic & management processes** to execute optimised decisions & cascade down to platforms
- **Model, benchmark** and compare options for broad set of different factors eg cost, resources, training
- **Dynamic Commercial models** to enable decisions to be reflected in changed outcomes and updated requirements

Delivery of vision, requires bottom-up implementation of:

- Clearly defined **Operational Goals** reflecting cost, reliability availability, impact of decisions. Enable flexibility/evolution
- **Rationalised commercial models** that drive:
  - standard processes, KPI's, information exchange and requirements
  - more standardised retained risks
- **Collation of standard information** based on decisions required at defence level (Capability Body of Knowledge)

We have split out those elements of the vision which MOD needs to own and deliver top-down. These require senior level MOD sponsorship. The starting point has to be the strategic dashboard – a clear definition of the information required at defence level for strategic decision-making (i.e. including JFC, Commands, Policy and Military Strategy) which needs to be collected in a common way from all platforms.

Fast fact

The link between changes at a platform and defence level is rationalisation of Commercial models. A top-down strategic approach requires enterprise information – standard based on common definitions and formats – to populate the defence level strategic dashboard and enable optional analysis and comparison between capabilities on an equivalent basis. Information for this has to be orchestrated bottom-up at an individual platform level. As well as more standardised information requirements in contracts it requires the same type of information to be collected which links into the Capability Body of Knowledge and Def Stan 00 600 initiatives.

Delivery of vision, requires top-down implementation of:

- **Strategic dashboard**
- **Enterprise information**
- **Enterprise level strategic & management processes**
- **Model, benchmark and compare options**
- **Dynamic Commercial models**

Next steps: Senior level sponsor needs to drive:

- Define decisions and information to support them e.g. compare options & run Contingency Capability Requirements & Standards model
- Define information strategy to deliver enterprise information and process requirements
- Map defence level information requirement to source
- Define approach to aggregating commonly defined information held in MOD and Industry
- Define requirement for Commercial contracts – contracting for the unexpected (more dynamic and flexible) needed to execute top-down decisions, standardise retained risk and be able to evolve target outcomes
- Manage change at defence and project team level

Delivery of vision, requires bottom-up implementation of:

- **Operational Goals**
- **Rationalised commercial models**
- **Collation of standard information**

Next steps: MOD/Industry to work together in partnership to:

- Define standard reference based models that can be used to underpin more rationalised commercial models e.g. value chain with integration of different processes, data standards
- Build on Single System of Value, address issues and integrate with Contract for Information to provide a consistent approach to CLS
- Define best practices to understanding, modelling and assessing cost at each stage of the project lifecycle
- Build Capability Body of Knowledge based on defence level definition of information required to assess, optimise and inform decisions

For this reason, to start the journey, build the case for change and deepen the business case we have worked with a team from across MOD and Industry to identify a set of immediate quick wins and actions. These are analysed below against each of the 6 themes. The aim is for MOD and Industry to be able to work on these short term steps to build traction and engagement towards the larger vision.

1	Operational Goals	• Investigate the lessons learnt of using function/cost targets within both defence and civil sectors
2	Understanding of cost	• Identifying best practices, methods and tools • Identify lessons learnt on understanding key drivers, cost modelling and consequences of use • Work with Whole Life Cost Modeling Working Group to understand cross-over and linkages
3	Rationalised and more dynamic commercial models	• Industry make case for rationalised commercial models e.g. benefit case for single IOS model • Collect examples of impact of non-standard information • Summarise issues from MOD audit report on CLS contracts needing to be addressed
4	Invert operating model to strategic & top-down driven	• Develop management and planning processes to understand the information needed • Develop strategy for a complimentary Management Information / Business Intelligence Strategy across MOD/Industry boundaries
5	Enterprise information strategy	• Tool/method to analyse value/cost for a project & it's information streams. Highlight where investment should focus (tools, training, data capture, etc) to get value. Link with LCIA/Logistics Information Planning
6	Merge and adapt for Land	• Deepen understanding of critical success factors and lesson identified for adapting model to Land • Have initial conversation with Army Command and Industry around potential pilots

In summary, we have brought together the immediate actions with the recommended actions need to implement the full vision. We have analysed against each of the six themes.

		Immediate	Implementation of new model
1	Operational Goals	• Find best practice examples of function/cost • Identify lessons learnt & measures to achieve flexibility for evolving Goals/ outcomes	• Build on work within JFC on definition • Look at benchmarking to establish VfM to improve quality, delivery and cost
2	Understanding of cost	• Identify existing best practices, methods and tools	• Define how cost management is to be more integrated into every step of CADMID • Address cultural change challenge on cost
3	Rationalised and more dynamic commercial models	• Make case for rationalising contract models • Collect evidence of impact of non-standard information • Summarise MOD audit issues on CLS to address	• Define requirements for dynamic/flexible contracts • Define value chain and reference model to underpin standard contracts, KPIs, processes, risks & information • Embed value chain within JSP886 re-write • Make case for longer duration contracts
4	Invert operating model to strategic & top-down driven	• Understand information needed • Strategy for complimentary MI/BI across MOD/Industry boundaries	• Define strategic dashboard using defence level needs • Map to sources within MOD and Industry • Define enterprise level business process • Fix gaps in strategic & management processes & if latter better delivered by industry
5	Enterprise information strategy	• Tool/method to analyse value of information streams & where investment should focus	• Define enterprise information strategy • Define information requirements at platform level
6	Merge and adapt for Land	• Understand critical success factors for Land • Identify potential pilots	• Identify pilots for creating through-life model unique to constraints and issues within Land

There are excellent examples of where the model is well set up and driving considerable value but also where it is too short term focus focused and partnership with Industry is resisted

Fast fact

Based on 60 hours of interviews with 35 interviewees, over 100 issues were identified to inform 85 key conclusions summarised at the start of each of the 10 interview questions. This was used to create the 6 themes within the Executive Summary. In this Section, we analyse the issues and conclusions by layer of the Single System of Value. We start with points interviewees made on the way Operational Goals are defined and then move into the model to points on capability management, commercials, processes, information and risks. This can be read in conjunction with Figure 3 which explains the benefit of resolving each issue and who needs to contribute – MOD and/or Industry.

"Another critical challenge is that MOD does not cost its requirements and so it makes trade-offs without really understanding the cost implications. FRES had a long and healthy debate around the requirements and made all the trade-offs but at no point were the cost drivers really understood. There is little or no investment modelling."

– Senior military interviewee

"There are shortcomings with the support contract – a combination of short duration and lack of a coming together of a whole support strategy for the domain. There are 3 different platforms and there needs to be an integrated top down strategic plan for how each will be supported whereas today it is very much a bottom-up platform specific model. It is partly an issue with the UK customer not having yet coalesced a single view and power sitting with the PT to drive a view based on local preferences."

– Senior military interviewee

3. Summary of Interviews

3.1 Issues analysis

We carried out over 35 interviews at a senior level across MOD, DE&S, Commands and Industry. These interviews identified a number of issues and they are listed below.

Overall

- There are excellent examples of where the model is well set up and driving considerable 'value' but also where thinking is too short term cost focus and partnership with Industry is resisted
- Current focus is engineering and asset management data for execution processes at platform level
- Quality and latency are major issues. One interviewee said "we only currently receive about 20% of all the information we need when we need it". Requires information skills and awareness of DQ issues
- Export growth is driving Industry to standardise internationally. It wants to reduce the transaction cost of non-standard MOD models and accommodating different approaches for each platform

Operational Goals

- Not always clearly defined to underpin model. Makes it difficult to exploit information to drive greater value. Currently, always platform specific
- Set at outset but not evolved (as distinct from upgrade) to reflect changes in threat or platform role so supportability engineering, information and DLODs are reset. CADMID is one time and linear
- Trend towards more sophisticated KPIs to avoid imperfections of availability and to link into cost, reliability and impact of decisions (e.g. cost per flying hour) More complex information exchange as it means understanding operation use and financial implications
- Not structured to deliver flexibility in Industry costs e.g. maximising variable vs. fixed cost
- Delivering operational effect is a balance of cost, effect and safety. In the post Haddon-Cave world, safety is a core driver for the business and a key attribute of capability
- Easier to set Air and Maritime than Land. Often lack of historic usage patterns

Operational Levers, KPIs and Incentives

- Clearer linkage needed between Operational Goals and Operational Levers, KPIs and incentives
- Often Operational Goals not aligned for platform and all its sub-systems. MOD pays for availability when its use is constrained
- Growth of horizontal CLS splits out more sub-systems, so creates more complexity
- KPIs require common definition, formats and standards. Often too many. Carry a cost for analysing and blur accountabilities
- MOD understanding of consequences of operational use on KPIs and cost if incomplete
- Issues in theatre can invalidate KPIs (surge, terrain & operational envelope). These issues are not always anticipated or managed inconsistently

Capability Management

- Limited use of CONEMP/USE to develop through-life support requirements. Means process, information and exchange requirement ill-defined at CLS signature. Creates issues downstream
- CADMID one-off and linear. CONEMP/USE not updated for evolving threats and Operational Goals
- Need for more integrated view of requirements to facilitate spiral development, ease contracting and reduce: complexity, inventories, through-life support cost, risk, training and SQEP requirements
- Lack of cost modelling in support of capability trade means limited understanding of through-life cost impact, breaking MOTS, detrimental to support options and through-life costs
- Limited coming together of operational and enterprise financial data (e.g. infrastructure and warehousing) to form enterprise view of costs
- Opportunity for through-life support requirements to be defined top-down (e.g. Combat Air for Tornado, Typhoon and F-35) not bottom-up standalone by platform or contract

Commercial Mechanisms

- PTs free to define commercial approach. Makes contracts non-standard and model bottom up driven
- Results in unique processes, KPIs, information and exchange requirements. Cannot benchmark, aggregate or compare platforms or capabilities
- Prevents enterprise information, knowledge and learning. Creates so much complexity cannot simulate operational options at enterprise level
- Without standard mechanisms, difficult to align capability with platform and sub-systems
- Maximises availability at platform or system level even if constrained overall or not required
- CLS are relatively static. The question is if they can be more dynamic
- CLS policy not on radar for commercial policy. Is it keeping pace with growth/ evolution of CLS?
- Longer contracts required to build trust and for payback on information capabilities needed

Process

- Gaps in strategic and management processes. Limited use of best practice tools. SQEP issues
- No standard process models or templates. Roles and responsibilities often not clear. Process integration (fleet, obsolescence, asset and supply chain), different levels (strategic, management and execution) and DLODs can be poor
- Lack of enterprise level processes operating across and optimising platform activities based on enterprise information and dynamic models
- Optimisation requires complex integration of information from different processes, policies, understanding of complex constraints and commercial mechanisms. Not currently possible

Information

- Rights of use often unclear. Stems from lack of clarity on data owner across the CADMID/T cycle. Who owns rights?
- No framework for understanding relative value of information. MOD needs a policy on exploiting information for gain not just FOI and Public Record eg ownership, access and neutral service providers to collect, collate, process and disseminate on behalf of all of defence
- Current focus is more on transaction data where quality and latency are perennial problems
- Advances up acquisition staircase with more sophisticated KPIs requires more complex information exchange e.g. operational usage
- To dynamically model operational options and input to strategic processes requires enterprise information – standardised and aggregated from MOD and industry sources. Not available today
- How will DE&S support new information requirements of Commands and pull together the key threads to drive a top-down customer responsive model?
- Growing proportion of defence data with Industry. How is fragmentation avoided?

"MOD Commercial is conservative in approach by nature. In the commercial world you take risk to make money whereas MOD commercial systems are more designed to follow rules and protect Ministers and so it becomes very conservative, which makes change difficult to achieve."

– Senior military interviewee

"The real value is not just in the debate as to who does which process but also in the dialogue surrounding information sharing – what MOD wants and in which order. We will be instructed to "fix this box to the platform" rather than an open dialogue "we want to introduce a new capability" and let us as build partner look at the best way of achieving that outcome. This requires MOD to share long term strategic information about future operations. This is a gap in the strategic level thinking."

– Senior industry interviewee

"Successor is a very fixed supply chain around a single base and highly specialised."

– Senior military interviewee

"The Successor Case Study made complete sense. The information model and paradigm makes absolute sense as you have a clear view of who you are dealing with. The through life process is well understood. You know where it is going to be built, live and be supported from. You can get it right from day one."

– Senior military interviewee

"The Successor Case Study was good as it laid out the picture end-to-end whereas normally only certain elements are looked at and there is not as complete a vision of what the model could look like."

– Senior military interviewee

How to aggregate and make available at enterprise level in MOD if no common standards or formats? Should MOD own collaborative environments through-life?

Risk

- Generally, CLS transfer financial risk. MOD does not always source information to manage retained risks if it sits in Industry
- MOD loses visibility as processes move out to Industry. They only get visibility when a risk has become a live issue.
- Each CLS has different MOD retained risks set by Projects Teams. As MOD aggregates contracts to form a capability, risks compound and Commands ends up with risks they did not expect. The risk appetite of JFC/Commands is unclear. There is disparity on the information available to manage both retained and aggregated risk profiles.

3.2 Summary responses to interview questions

Section A: Understanding current environment and drivers for change

1. What did you think about the Successor Case Study as an end-to-end model?

Key conclusions:

- The Case Study is a good starting point with a logical and more architectural driven approach to managing information as a strategic asset through-life
- The models need adaption to address differences between environments, platforms and scale/value of platforms. One size fits will not work
- Land has the most significant challenge in adopting the CLS model to its environment. Also priority areas where it needs expertise are different e.g. less large platforms and more managing expertise in integrating, tracking and handling logistics chain for large groups of smaller systems
- Any standardisation in the approach to information management needs to offer tailored options that combine:
  - Standard approaches (where possible) to reduce cost and complexity
  - Components that can be common to a specific Environment (Maritime, Air and Land) or value;
  - Components that are programme or contract specific.
- Key is pinpointing the relative value of information and extracting only valuable information needed to be managed through-life
- Information workers and skills are as important as other resources and skills. Information is a value asset needing to be managed strategically
- More dynamic access to information enables new business models; better management of risk; acceleration of engineering design and build; and an ability to develop better concepts of through-life support

Summary of interviews

Interviewees thought the Case Study was good at presenting the key elements of an end-to-end and through-life model for information management. It was this logical and more architectural driven approach to defining information requirements that they thought most useful. It offered a good starting point for Team Defence to investigate information management in a more holistic way.

Interviewees highlighted that whilst the approach in Successor could be universal, it would be important to emphasize different elements to reflect the needs of different environments, operational scenarios and platform complexity. Successor is clearly highly complex from technology and supply chain perspectives but it serves a single mission offering greater clarity on the 'effect' it is looking to achieve through life. This makes it easier to pinpoint the relative value of information in maintaining a Continuous At Sea Deterrent.

Successor underlines the importance of the 'information era'. It needs information workers as well as engineers as data is valuable as an asset. So electrical engineers create the capability whereas the value is driven by information – an information management skills culture is key. MOD need to consider what new business models are enabled by more dynamic access to information – the art of the possible.

Interviewees perceived that Successor was one of the few areas where MOD had tighter budgetary controls in terms of complete through-life costing. This meant it was better placed to assess the impact on through-life costs from different capability trade-ins/offs. In contrast, MOD is generally not good at costing its requirements. Organisational structures often prevent capability level cost analysis and budgeting/ planning (how much it costs per flying hour).

Many of the key themes within the Successor Case Study were familiar to those working on IOS within the rotary wing and more recent CLS within the Air Environment. This highlights the wide body of good practice and common lessons identified on how best to set up this new model. Often interviewees highlighted issues but at the same time it was possible to find instances where those same issues were being successfully resolved (costing requirements and cause/effect modelling are good examples).

Interviewees thought the Successor Case Study was timely in playing into the environment where change is needed to CLS but also recognising the potential value of information exploitation. A senior MOD interviewee noted: "the Case Study highlights most of the key issues that have been escalated from other sources within MOD. It is an area where MOD recognises that more needs to be done and the Successor model should be seen as part of the solution".

1.1. Applying lessons from Successor to different environments

Interviewees felt Maritime and Air were more advanced on the acquisition staircase with more long-term contracts than in Land. CLS has been driven primarily by cost and accountability (risk transfer) issues. Considerations such as safety and airworthiness were familiar to Air and Maritime with sharing information to track serial and part numbers. This has created an environment in which MOD and Industry participants should be comfortable with sharing information and collaborative working. It will increasingly impact Land with new European vehicle safety, logging and audit tracking requirements. In Air and Maritime the existence of OEMs, MOTS[14] and fewer suppliers and specialist maintainers has reduce the competition landscape so behaviours that can hamper effective information sharing may not be as pronounced as in other areas. Conversely, Land has retained greater autonomy and so a significant move towards CLS would represent a more radical change in their business model with more work needed to prove the model in their environment. Interviewees highlighted key differences that need to be factored into any standardised approach:

- **Maritime** – naturally fits the Successor Case Study. Maritime engages in complex system activities such as Anti-Submarine Warfare and Carrier Strike which involve independently procured systems, so there is a trend toward more transversally or horizontally managed sub-system contracts that benefit from greater commonality across the fleet. This means assets such as Sonar CLS form separate sub-systems from the main platform and are issued GFX. There also tends to be greater clarity on industry roles reflecting unique capabilities and infrastructure assets which leads to more collaborative behaviours and less overt protectionist behaviours by suppliers. The Successor Case Study makes complete sense in this context.
- **Air** – tends towards greater variability. Aircraft operate from fixed UK (for deep check) and deployable overseas bases (for line maintenance) with implications for the predictability and outcome of support processes, particularly in different terrain. Access to and the latency of receiving information held in front line systems varies. Platforms fulfil multiple roles/missions and these can evolve over time. Within Combat Air (CLS) and Helicopters (IOS), collaborative and information-centric models have proved to be highly successful with large numbers of MOD/Industry staff co-located and collaborating on share information.

  For international collaboration programmes, there are a set of political complexities than can put the focus more on upfront acquisition than on through-life support.

14 Military of The Shelf (MOTS) solutions

"In contrast, to Successor, Land is managing a 'cloud' rather than a unitary asset with problems because information is imperfect. With LOSA equipment can be designed with the information needed to manage the 'cloud' from day one. It is a cloud because it involves lots of disparate pieces but the man driving all planning assumptions not the equipment unlike in Maritime and Air."

– Senior military interviewee

"Commercial models are all so fixated with cost rather than value and recognising that removing risks can be a real source of benefit. There are too narrow a set of criteria and too much fixation on cost. Every single PFI has "take or pay" issues currently as they have bought capacity now not needed. Army HQ has to re-cycle repairs through certain contracts as they have surplus capacity they are otherwise paying for."

– Senior military interviewee

"The domination of upfront acquisition and the lack of development of in-service support models is definitely an issue. In many respects, the separate DPA and DLO model was better because at least within the DLO there was a high level of professionalism in considering the through-life implications and it was an organisation that cared about these issues."

– Senior military interviewee

"The issue with CLS is that it takes time to build trust and large scale information exchange will change over-time as trust builds and needs evolve. You only have to look at the 10 year history of Op Herrick and the way information flows between coalition partners have constantly evolved as trust has been built."

– Senior military interviewee

Each build partner retains information on design and this creates complexity from a baseline configuration management perspective. Some sub-systems are managed transversally (e.g. radios) but with constrained budgets for upfront acquisition there is a reluctance to upgrade such component systems so each platform tends to have unique equipment with higher inventories and through-life costs as a consequence. Transport aircraft such as C-17 are pre-existing platforms that are supplied MOTS with support arrangements. With these assets economics demand that UK follow what the US dictates in terms of the upgrades required. Airworthiness is a key issue. Interviewees felt that this provides additional complexities for implementation within Air.

- **Land** – very different. Interviewees likened it to managing a 'cloud' rather than a unitary asset with the 'man' rather than equipment (as in Maritime and Air) driving operational decision-making. Information is fundamental to establishing management and control over this 'cloud'. Typically, a Battle Group has hundreds of different assets which will change by theatre and by role with the value, volume and number of different platforms/versions (e.g. 4 for Mastiff). This complexity of value/volume of groups of systems is different from other environments. The volume means it always has rolling programmes for upgrade rather than standardisation. The way assets are operated changes by role and with the tactics of the adversary so there is an immediacy not found in the other environments. This is an issue as the risk profile is not attractive to Industry where current and future use cannot be predicted. Assets operate from deployable moving bases which add significantly to the logistics drag and complexity of the tracking chain. Proximity to the front line for much of the maintenance work also makes Land unique and prevents industry from performing certain roles. For example, Reacher[15] is under CLS but it was not possible to send it back from the front line for servicing and so the CLS had to be broken so military personnel could maintain it.

  Whilst Air and Maritime have a single interface with their CLS provider, one interface with Industry in a location, such as Bastion, is very difficult. There are an increasing number of output-based contracts such as Reacher and Supreme as well as joint models such as for the ESS Heavy Maintenance Workshop at Bastion. CLS is not seen as a model that fits well with the vagaries of the different battlefield scenarios although the benefits of it are clearly understood. CLS has generally been based on a class of asset whereas in the Land context the volume of different types of asset means it is better to consider groups or fleets of systems – managing all the issues that come from getting them on the road. Land sees the benefit of commercialisation of the model but is cautious given the issues it faces but also the historic experience of high costs of take-or-pay commitments. The new Land Operating Systems Architecture (LOSA) may offer the prospect of a more standard system-based approach to which everyone can conform and a hook for a Successor type model based on standard components, processes, information requirement and exchange definitions.

15 Reacher is part of Skynet and is a mobile satellite communications hub used by UK MOD Reacher trained personnel which allows connection of theatre communications to be made.

2. Looking at the way Concepts are defined, do you think sufficient focus goes into creating an integrated view (across DLODs) of the operational elements including key user requirements, operational levers and decisions such that information and exchange requirements can be reflected in a CLS?

Key conclusions:

Operational Goals

- Not always clearly or as fully defined as needs be, making it difficult to pinpoint the relative 'value' of information to fully exploit value
- Effective CLS align Operational Levers, KPIs and incentives with Goals. Issues: ability to regularly re-set volumes, changes in terrain, surge (& timescales) and operating outside envelope
- CLS model is relatively static and the question is whether it can be made more responsive and dynamic to enable operational options to be optimised.
- Key to setting Operational Goals is understanding comprehensive data on baseline historic usage & planning assumptions (with risk analysis)
- Easier in Air and Maritime than Land given diversity/volume of assets, usage patterns, difficulties in tracking, data quality, variety of ways assets brought together as systems. Requires good historic information and demand modelling
- Growth of horizontal CLS adds complexity and risk of non-alignment to Goals

Capability Management

- Limited use of CONEMP and CONUSE to develop through-life support requirements as part of capability management
- CADMID is one-off linear process so does not handle updating CONEMP/USE for supportability engineering and information requirements as platform's role change to reflect evolution of Operational Goals as nature of threats change
- More integrated view on requirements to spiral development, eases contracting and reduces: management complexity, inventories, through-life support costs, risk, training and SQEP requirements. Enables simulation at enterprise level
- An enterprise view of the capability and costs needs to be taken. Integrating all DLODs and cost consequences (e.g. warehousing, shore-side infrastructure)
- Lack of detailed understanding of cost drivers and cost modelling of through-life cost of capability and trade in/out implications. May break MOTS by specifying unique requirements and preventing innovative and lower cost support options e.g. rotable pools.
- Precedents (Boeing TLCS) of Industry support MOD on cost modelling. Complex inter-relationships between platform components means cost models may be better with OEM help as SQEP/understanding does not exist in MOD
- Defence Support Solutions Framework may offer and approach to greater standardisation and a more enterprise level approach.

Commercial Management

- Project Team have freedom to define unique commercial mechanisms
- Makes DE&S business model driven bottom-up by platform:
  - Each contract has unique KPIs that drive definitions of unique processes, information requirements and exchange definitions for each and every contract. Each contract is not standard
  - Drives additional cost into Industry. Given their need to standardise their business model, globalise and address export markets this is not sustainable. Industry will charge back costs of non-standard processes
  - Without standard mechanisms makes it difficult to align all sub-systems within a capability is different Operational Levers, KPIs and incentives or at a different point in acquisition staircase
  - Within DE&S, means no enterprise information or enterprise learning as information cannot be aggregated or added together. Cannot benchmark platforms to understand differences and operational options

"The question is why can't you create a more dynamic CLS contract? The current commercial models all want you to be able to predict long-term. There are contractual frameworks going out 30 years but there is no model informing the debate on its key components."

– Senior industry interviewee

"The issue is that regardless of SDSR defence is an "events" driven business. Unforeseen events do not sit comfortably with committing to output-based specifications. It cannot easily predict so it needs contractual models that offer enough wriggle room rather than cast iron output-based specifications."

– Senior military interviewee

"Operational tempo will always change and therefore contracts needs to reflect the ability to alter the operational tempo. Lack of an end-to-end model perpetrates the view they have no control over the capability in theatre. Commands need a flexible contract that enables mechanisms to be changed."

– Senior industry interviewee

"There is no model that exists with MOD that enables one to plug in and model different operational options. All you really need to understand are where are choke points in support. The issue is that policy dictates operations – there is no dynamic model that looks at how long to repair an asset. For this you need to be above platform level and look at all options across the domain."

– Senior industry interviewee

"You should optimise at 'capability' level i.e. what it takes to do the job. If you optimise at platform level you need a far more flexible CLS. It creates competition at platform level and MOD ends up paying for availability it never uses. How many platforms do you need if you increase overall readiness by removing the constraints of CLS pulling in different directions - you need less."

– Senior industry interviewee

  - Standalone maximises availability by platforms/system even if not required to meet enterprise Operational Goals as distinct from platform
  - Opportunity to follow IOS, standardise contracts and build on learning in setting directions. A key step in creating enterprise information (standard KPIs that can be added), knowledge & benchmarking
- CLS currently not on radar for Commercial policy
- KPIs becoming more sophisticated to avoid imperfections of 'availability' and link into reliability, cost and impact of decisions (e.g. cost per flying hour)
- It also requires
  - more complex information exchange and collaboration e.g. understanding how users operate the contract on the flightline to be able to make changes resulting in cost improvements and reduced risk
  - longer term contracts because of investment payback consequences
- Advances up acquisition staircase will also require increasingly complex CLS metrics and information exchange across the MOD/Industry boundary
- Cost models require operational (asset and supply chain) and enterprise level (i.e. including all infrastructure, logistics and warehousing) financial information to be combined, which has been a challenge historically for MOD
- Would require enterprise level processes cross-cutting platforms and capabilities as well as enterprise information to enable them

Summary of interviews

Interviewees thought it was pivotal to understand the **Single System of Value** (Figure 1 and Conclusions paper) and the different layers within the model. The model applies to In-service processes as well as overall design and build, including managing integrity of design intent from initial stages of design, through manufacture, in-service and upgrade.

The Successor Case Study set out a more dynamic information model with Teamcenter[16] as a single shared IT environment to drive a new business model. Its potential advantage is collaborative design with the supply chain, allowing entire views of the product based on "concurrent engineering" and enabling spatial design to mature faster.

It enables innovation through information sharing with MOD, suppliers and In-service partners. It can develop an early view of the maintenance schedule and allow fuller development of concepts for through-life support, albeit in the context of Successor there are security and ITAR constraints. This allows downstream processes to be involved earlier in the design process and address In-service lessons identified on earlier platforms. It requires all parties to embrace new ways of working and resolution of any security concerns. In a MOTS contract, this would typically be a service provided by the OEM.

Successor underlines the 'information era'. It will be the first submarine programme handing over a baselined and fully populated MBOM[17] in Teamcenter with the boat to underpin through-life support, configuration management and design intent. It needs information workers, as well as engineers, as data is every bit as valuable an asset.

Defining information requirements for Teamcenter requires a detailed understanding of the relative value of information. Frameworks such as LCIA structure and define categories but do not differentiate its value. Successor uses a logical and architectural driven approach to define information requirements based on a 5-layer model. It starts with Operational Goals and CONOPS and decisions based on events and fed by processes. It considers wider fleet, mission and programme perspectives as well as information enabling MOD to manage unique risks inherent in a nuclear submarine.

16 Siemens Teamcenter is one of a number of industry standard integrated suites of Product Lifecycle Management IT applications. It is used for sharing information and working together across the product lifecycle. Real-time collaboration and application sharing create an environment for information to be quickly communicated among all key participants, eliminating barriers between functional groups and securely integrating PLM data from many different sources through a single interface.

17 Manufacture Build of Materials (MBOM), which is distinct from the designed (engineering bill of materials), as it is what is needed for through-life support, ordering spares etc.

2.1 Operational Goals

Interviews highlighted the challenges in defining Operational Goals in outputs terms, particularly for a new asset type or where historic consumption patterns and costs are unclear. A senior MOD interviewee commented: *"for the vast bulk of CLS there is insufficient understanding of baseline usage. This means entering a CLS arrangement which is not well bounded, where the risks are unclear, will inevitably lead to higher costs later"*. Too high a committed availability% adds cost and unnecessary inventory if the platform is not used, whereas meeting operational surge requirements also carries a cost. Interviewees questioned whether current organisational structures and the lack of standard, commonly defined enterprise information allowed MOD to learn at enterprise level and identify good practice across all CLS (e.g. why were cost per flying hour more expensive on one platform or in one terrain or one type of training exercise more expensive than for another).

There is work going into Operational Goals within Joint Force Command, which is linked to the move from Force Elements to considering Capability Packages. This is part of defining what outcomes defence wants to achieve and the strategic goals it is seeking. By defining this as Capability Packages there is more flexibility than the current Force Elements at Readiness Approach, which is too rigid in specifying Force Elements which may not be available. Defining capabilities recognises there are different ways of achieving the outcomes e.g. fire support from helicopter, artillery or aircraft. Military judgement panels will look to define the Capability Packages required to get the necessary Force Effects against scenarios. The Contingency Capability Requirements and Standards model (CCRS), based on MooD, supports this exercise. Post Herrick everything will be in CCRS and it is not far off NATO's force standards models. Across 30 or so scenarios it aims to define:

a. *Most dangerous and most likely scenarios* e.g."5 powers defence agreement" and the Capability Packages required to support it. The scenario outputs are put into CCRS/MooD so it does not look at a combined Service approach i.e. how to provide "close fire power support" as a Package and then how to enable it. The aim is to provide the J5 planners with what we have too much of and allow them to work up what is required with any gaps. In theory as CCRS/MooD can incorporate cost information this could eventually form part of the dynamic modelling capability if it was accessible from DE&S in the right format. By drawing up a package with limitations and constraints within that package you get a fuller understanding of the key risks – e.g. if it is a reasonable military or governmental risk that you are running from any shortfall in the Package against what is required. You can then look at mitigations in terms of equipment or human (e.g. more training) and actions required.

b. *Environmental considerations* e.g. in snow, jungle, high altitude, hot and dusty

MOD Interviewees noted that almost every Private Finance Initiative (PFI) contract had 'take-or-pay' issues, with capacity bought that was now not needed by a shrinking armed forces. CLS has similarly long timescales. Caution needs to be exercised so usage is not set artificially high or at completely wrong levels. This means leveraging information about historic usage patterns and planning assumptions (albeit contracts are far longer than any planning time horizons) and having cause/effect models. In general, it is easier to collect historic usage patterns in Air and Maritime than in Land because of the comparative lack of diversity and volumes of equipment. This means whilst Land see signficant advantage in commercialising the end-to-end model it is cautious about CLS. A lesson learnt from PFI on the take-or-pay consequences of a shrinking military is to be careful about which risks to pass Industry. They may be reflected back in an inflexible cost base later and so working with Industry to identify the risks and mitigations is key.

As an extension of Operational Goals is setting Operational Levers (e.g. volume control to be able to scale up or down to meet operational needs), KPIs to track Industry delivery and incentive mechanisms (e.g. gainshare) to reward all parties for working collaboratively to secure better outcomes. Levers should be structured in a way that maximises flexibility in the contract with Industry albeit this may carry a cost (see cost modelling through-life support implications). A good example is to minimise fixed cost

"A key requirement for an effective CLS contract is for all parties to have a very clear view of what it is they want the contract to achieve by way of Operational Goals – what outputs do they want to deliver and how should all systems and sub-systems align to achieve this goal? This is not a trivial question, particularly where it is a new type of asset or where the existing baseline or how the asset is or will be used is not clear."

– Senior military interviewee

"Often the URD is developed and only later is the CONEMP written to cover off the operational elements. FRES was one of the few examples where the CONEMP was really first and afterwards the requirements were written. It is very hard to imagine the asset way ahead of the procurement."

– Senior military interviewee

"For the vast bulk of CLS there is an insufficient understanding of baseline usage. This means that entering into a CLS which is not well bounded, where the risks are unclear and on the surface appear to be passed to the contractor will inevitably lead to costs being passed to the customer. CLS also have a relatively long timescale but events change to such an extent that much of the provision for support is then undermined by those events."

– Senior military interviewee

"Immense caution needs to be exercised so you don't set levels artificially too high or at completely wrong usage levels. This means understanding the historic usage patterns and planning assumptions, albeit many of these contracts are far longer than any planning time horizons. Flexibility is key as is not passing too much risk onto the contractor as this will be reflected back to the customer in additional costs."

– Senior military interviewee

and maximise variable costs to enable flexibility in adjusting volume. A key factor can be the notice period for Operational Levers (e.g. 2 months advance notice of surge requirement). In the Defence Reform model, Joint Business Agreement (and the new commercial arrangements by 2015) between the Commands and DE&S need to be reflected in the CLS and outcome KPIs with Industry so all parties are completely aligned – Command (Generate and Develop); DE&S (Acquire) and Industry (Execute). A more dynamic and customer responsive CLS model is required. The current model is too static.

The IOS experience within the rotary wing community underlines the importance of getting the construct of this Single System of Value right from the outset. For IOS, it enables all sub-systems and suppliers (other than engines which are GFX) to be aligned so that Operational Goals and Levers are reflected within DE&S's JBA and Industry's IOS contract for each 5 year call down on the 25 year contract. This alignment makes the information management task easier as all parties have a commonly defined set of Goals, KPIs and incentives and so are all driven to meet or exceed the Operational Goals set for the platform.

Experience with IOS is that creating the model successfully also helps identify improvements. With each iteration of IOS, the model has been improved and it has meant there is the trust from within MOD to allow more activities to transfer to Industry as confidence in the model and trust between the parties has grown. There are now 600 MOD staff co-located on AgustaWestland sites working collaboratively. The dynamic has created a real demand for information sharing from Industry, finding new opportunities to extend information exploitation.

One of the challenges is that even with successful examples such as IOS, there is a lack of standard contracts. Recent restructuring at AgustaWestland forced it to focus on delivering a standard IOS contract rather continue with everyone being different. Inconsistent KPIs and incentives generate different IT/data requirements although they look to achieve similar outcomes. AgustaWestland's move to a standard IOS, in turn, has raised the question within MOD about whether it should do all IOS in a common way. This would allow better benchmarking, reduced management cost and aggregation of commonly defined data. Currently, all rotary IOS are being re-written in a standard way albeit there will need to be slight differences reflecting different platform specifics such as Apache (Attack) and Sea King (Search & Rescue).

Finally, increased use of horizontal CLS (e.g. award of £600 contract to Thales[18]) as opposed to the single prime contractor model, in the absence of standard contracts, makes optimisation of capability difficult. Maritime Combat Systems is looking to move away from the prime contractor model (Type 45) to managing more systems transversally across the fleet (Type 26). Standardising has the benefit of reducing complexity, support costs, inventories and training requirements as well as making it easier to project a long-term technology road map that will enable better integration of support processes. Greater standardisation of contracts may help build alignment into the model to enable this.

2.2.1 Capability Management

The consistent message from interviewees was that within the Concept and Analysis phases of CADMID, there has been insufficient focus on through-life support. The merger of the DPA and DLO should have enabled this balance but the lesson of history is that upfront acquisition, affordability and trade-in/out have remained dominant. Similar sentiments are expressed by the NAO: *"Historically the Department has focused on achieving the full performance requirement, even if this means suffering delays, cost increases, or having to cut equipment numbers. The Department currently expects to achieve 99% of its equipment capability specifications. However, average project costs have risen by nearly 12% and projects have been delayed by nearly 30% since the main investment decision. So it is clear that meeting the specified performance requirement has had priority".*[19]

18 10-year agreement for Sensors Support Optimisation Project (SSOP) builds on Thales's Contractor Logistics Support contract, signed in 2003. Thales will maintain 17 different systems across the British fleet, including Type 45 destroyers, Type 23 frigates, Hunt and Sandown classes of minehunters. It includes the Navy's nuclear submarines' visual systems, including periscopes for the Vanguard and Trafalgar classes. It extends to the new Astute class submarines' advanced optronic masts, bringing maintenance together under a single contract.

19 National Audit Office. Ministry of Defence: The Major Projects Report 2012. Published 10 January 2013

The report concludes more positively: "Early signs show that it has begun to make realistic trade-offs between cost, time, technical requirements and the number of, for example, ships, aircraft or vehicles to be procured. However, the variances to cost and time reported this year [2012] indicate it needs to do consistently better. In these circumstances it is not yet possible to conclude the Department is consistently delivering value for money from managing its major projects."

Organisational structure and the historic division of budgetary responsibilities have not helped to balance acquisition and support. With Defence Reform, interviewees believed this is changing as budgets for through-life support pass to the Commands. Within Land, for example, the DLODs for acquisition and support have been brought together in a single owner – DG Logistics Support & Equipment (LS&E). This is an important step towards better balancing these elements from the outset of CADMID.

Whether there needs to be a set of policies or a more overt extension of CONEMP and CONUSE to cover these elements was not clear. The Defence Support Solutions Framework (DSSF) may provide a good model in promoting a standardised enterprise level approach with key aspects that are common to all and others where there is choice including opt-out. It may be appropriate to use size and complexity (e.g. Cat A, Cat B) to define what level of standardisation is appropriate to achieve inter-operability and enterprise information and learning. JFC are very much aware of the issues and work is going into definition of Operational Goals and CONEMP/CONUSE. The Joint User (formerly Joint Capability Coherence Team) have the role of reading and ensuring CONUSE/CONEMP are coherent at the 'below capability' level.

Another issue highlighted is that CADMID is a very linear process. CADMID does not handle well the natural evolution in a platform's operational role or innovation and there is no established process for updating CONEMP and CONUSE. This is distinct from obsolescence which is addressed through upgrade partway through-life. This means that there is no formal process for evolving supportability engineering, processes and information as the nature of threats evolve and Operational Goals change.

Allied to CADMID being linear, Interviewees questioned whether CLS could be more dynamic. For example, there is no notion of being able model different operational options based on an understanding of constraints and choke points in support, then being able to affect that choice by tuning up/down availability within contracts. This means policy dictates operations. A dynamic model could look at how long to repair an asset and optimise locations for spares based on its impact on operational flights. For this you need to be above the platform level and look across all options (e.g. rotary wing fleet) and how operational effect could be delivered most efficiently. A dynamic CLS would enable the operational levers both to allow dynamic analysis (e.g. cost per flying hour) of options but to vary outputs more than today. MOD is not sufficiently joined up today to look across different capabilities. The model maximises availability at a platform level regardless of need or constraints impacting use. There are different levels of visibility of operational levers so it is very hard for MOD to be joined. No supplier wants complete visibility of their supply chain. All rules have changed and so it may be timely.

The issues that Concepts need to cover for through-life support will also vary by Environment. Land operates more from deployable moving bases and assets are often not maintained from a "main" base location such as in Air. The tracking chain and logistics drag can become very complex, which is a reason why greater thought needs to go into through-life asset support and maintenance as part of the early CADMID stages and how information and IT may enable them. The benefits of commercialising the model is understood in Land and managing large groups of systems may be a key area for Industry expertise to be applied. This will become more important as Land moves towards a model where not everyone owns their own kit but rather it stays in theatre and/or is shared. It will require the right information to enable management and control.

As technology becomes more advanced and cycles faster, so securing inter-operability of all components is more complex, a level of expertise is required to understand the interaction of all aspects of through-life support. The sheer variety of equipment in some environments and the diverse way in which equipment might be used is another issue.

"A good organisation should be able to model operating cost at a high level and can inform cost of theatre. If you operate an asset in a sandy environment you should know the cost parameters will be 20% up; tropics 50% up; high environment – 30% so you can estimate what it will cost to operate in these different environments."

– Senior industry interviewee

"The reality is for it to be win/win most efficiencies come from a change in end customer behaviour and change in the modus operandi for the relationship. What has happened with the DE&S relationship is that they have abrogated the customer/supplier relationship in order to get the savings."

– Senior military interviewee

"CLS information and metrics are at best an initial attempt to define how a platform might initially operate. It does not reflect the inherent flexibility of that platform and the measures and adaptability required from it. You can pre-work all that upfront to consider how changed role impacts supportability and maintenance hence information requirements."

– Senior industry interviewee

"Acquisition was never looked at in terms of its through-life support cost implications. If you own the reliability risk you will end up specifying very different systems."

– Senior MoD interviewee

LOSA within Land has the potential to assist in building out the through-life support model and information requirements to manage and control assets. It creates inter-operability between assets and people (key in Land) based on creating common standards. It allows information to be taken from a vehicle or assets mounted on one in the knowledge they will interconnect.

2.2.2. Capability Management - Costing

Interviewees from all sides highlighted the challenge created by the lack of effective MOD cost modelling to support evaluation of through-life impact and trade in/out decisions on capability requirements. A key part of this is the lack of cause/effect modelling to understand the key cost drivers. The speed of technology change and obsolescence (e.g. radio batteries) means costing is essential to weigh up options and choices (e.g. is incremental acquisition a better approach). In the absence of a much fuller understanding of through-life cost implications there is a propensity to make trade in/outs without understanding the full through-life cost implications. For example, FRES had a long and healthy debate on requirements and trade-offs but at no point were the cost drivers ever really understood.

There are good examples of where this has had a detrimental impact on through-life costs and reduced operational effectiveness. The £34M write-off on Bowman is a good example reflecting the early trade-out of barcodes, as part of the logs package, for other functional capabilities. The need for cost modelling to support decision-making also a key recommendation within NAO reports: *"The Department should assess whether it has sufficient commercial, cost modelling and project management skills to develop the commercially viable support solutions and negotiate contracts, given the increasing complexity and likely volume of industrial logistics support[20]."*

A further implication of not costing requirements is that generic MOTS solutions can be broken by specifying unique requirements. This results from the lack of understanding of through-life cost implications at the point of decision within Concept and Assessment. In the civil arena, there is far greater use of leasing rotables so initial provisioning of spares is spread across a large international customer base (an emerging opportunity in defence). Non-standard or unique assets do not work with this model. Through-life costing of unique modifications also needs to factor in the loss of these types of economy of scale.

A final point on cost is that there is tendency to define the 'asset' narrowly rather than integrating across the DLODs and identifying all potential frictional cost implications. This means the impact on equipment may be considered but not how the wider requirements to achieve the Operational Goal, with subsequent downstream through-life cost implications, will also be impacted e.g. need for training, new shore-side infrastructure, transport, warehousing or additional support costs. An enterprise view of cost is key as it includes all the elements. Clearly, what is critical is having an accurate configuration baseline across all DLODs including information so that the cost implications on all DLODs can be evaluated.

On Chinook TLCS, Boeing has recognised the challenge faced by MOD. As a service, it provides MOD with cost modelling through the early stages of Concept definition. Boeing is using innovative tools to conduct sophisticated cost modelling of through-life costs, the trade in/out space and informing MOD choices. This enables MOD to strike a balance. Reducing the cost of a flying hour by 10% is a win/win. On complex platforms, Boeing views that it is difficult for MOD to perform cost modelling on its own as it requires a very detailed understanding of all platform components (e.g. air frame, engines, comms, navigation and flight systems) and the key interactions and cost implications. Boeing also has reach back to the experiences of a much larger fleet in terms of its customers for Chinook worldwide.

20 National Audit Office: Transforming Logistics Support for Fast Jets. 16 July 2007.

2.3 CLS Commercial

MOD interviewees highlighted audit reports from the Defence Audit Committee as flagging two key concerns: SQEP and current CLS arrangements. A Type 45 broke down after a re-fit where the Royal Navy did not have the capabilities or staff to carry out necessary repairs but the CLS did not cover through life support – a clear gap.

MOD needs to be able to work with Industry to deliver better and more standardised outcomes and ensure Industry is properly incentives to fully explore the 'art of the possible'. In the move from considering Force elements to Capability Packages and with a lockdown on the 4 year equipment plan, there are limited options for planners to bridge any capability gaps other than through limited UOR. The current model of inputs, process and outputs is easy to measure but does not consider what happens if different outcomes need to be achieved. This means being able to vary outcomes with contractual flexibility to use existing equipment to bridge the gap. This is only possible if in the way requirements are defined, the way Industry is engaged and contracts are written is in a truly partnering way. It is about a better and closer relationship. MOD needs to understand how information on performance against requirement will be exchanged to judge value for money and that Industry will not exploit the situation.

MOD interviewees thought there was general acceptance of issues with CLS, including KPIs. They expressed reservations about the use of availability%, particular if use is being constrained. The preference is measures geared that link in reliability, cost and impact of decisions (e.g. cost per flying hour) as well. Availability is highly ambiguous as it does not mean equipment can be used – Available in Helmand? Available for training? HIOS has a definition of world-wide availability on the flight line but even then some sub-systems such as engines are not defined in the same way and it is not always clear how to bring all sub-systems together. Although an IOS, HIOS is not delivering a capability based output. Availability may contribute significantly to higher cost and inventories (having all platforms with high availability when they are not needed to meet enterprise level Operational Goals, as distinct from platform level). It can also be invalidated by operating outside its 'operational envelope' or the impact of a different terrain (hot and dusty). This is discussed further in Q5.

This picks up a critical issue that the Commands have a relatively poor understanding of the cost consequences of use of equipment and requirements. Industry is felt as being reluctant to help them in addressing this. There is also a suspicion as it is where they make their money. For example, the NAO review of ATTAC highlighted the many benefits resulting from changes in use and practice by operators once they had visibility of the consequences of their actions – e.g. use of after-burners for take-off. There is a similar issue in Land in operational design in theatre - how they fight and what they do to sequence activity, thereby alowing better forward planning with a 6 month horizon. For example, if you stop the opponent manoeuvring (the so-called MOGing activity) you expect the battle to shift to the towns and the nature of the threat to change to reflect greater use of roads.

As an alternative, Chinook TLCS, is focused on delivering a contract number of annual flying hours at a target cost with an ability to reset at periodic intervals. This was thought to be relatively unique in that Boeing has invested time to understand how users are operating the contract on the flightline and aimed to reduce cost by linking output (flying hours) with input cost to arrive at a cost per flying hour. Similarly, Wildcat included development of the support model as an integral part of the Concept and Assessment phases. This enabled AgustaWestland to commit to a fixed ratio of: number of man-hours of support per flying hour. This is built on benchmarks from their other platforms. It is an average that holds for operational surge and includes an adjustment if Wildcat is flown outside its 'flying envelope'.

The challenge with these more sophisticated metrics is that they require more investment and more sophisticated information exchange. By necessity, this requires a longer term contract. For example, reliability may require Health Usage Monitoring Systems (HUMS) or equivalent to analyse and perform root cause analysis. The payback on both the investment in HUMS and reliability improvements is more than 3-5 years.

Contract length is therefore a key issue. It was felt that the Single System of Value model based on information sharing and collaborative working needed a contract of at least 10 years in duration. There are examples of much longer contracts.

"Looking at defining Concepts, anything coming out of DE&S has been "platform heavy" and it has not made the mental shift to buying services. It is not good at assessing the services it is buying and really ascertaining whether contractors have sufficient SQEB and experience to deliver those services."

– Senior MoD interviewee

"The 25 year contract is pivotal to creating CLS and IOS models and getting them to work. You have to be in it for the long haul to be willing to make the investments needed. To create a successful long-term relationship the level of information sharing required cannot be achieved on a 3-5 year contract."

– Senior industry interviewee

"Whether it is a set of policies or an extension of CONOPS is not yet clear. As MOD is being thinned out so it no longer has enough people available to focus at a sufficiently strategic level at a proper resolution of the CLS issues."

– Senior military interviewee

"Leveraging contracts to deliver sponsored reserves maybe another approach – creating an enduring relationship which positions suppliers well for any re-compete."

– Senior military interviewee

The 25[21] year contract for IMOS is viewed as essential to delivering target benefits. There are fully integrated PT/AgustaWestland teams who access a shared collaborative IT environment and work collaboratively on exploiting information and resolving issues in a single Yeovil location. Costs have come down for IMOS by 33% in the 10 years to 2016. It very much follows the model in Figure 1 with all suppliers and sub-systems incentivised, under a prime contract; to deliver the common Operational Goal of flying hours at a 33% reduced cost with a gain-share for over-performance. Industry is incentivised to exploit information to increase reliability: reducing cost of spares and re-designing components to improve their reliability to meet the aircraft availability target.

Another issue is the challenge of multiple CLS on a single capability each with distinctly different Operational Goals (Levers, KPIs and incentives) being set by different Project Teams at different levels of the acquisition staircase. Indeed some of the services may still be in-house with MOD e.g. commodities. With no standard approach from a Command perspective, it is difficult to aggregate KPIs to a platform level view and to flex a single set of operational levers to optimise performance and cost. MOD may be paying for availability% on one set of contracts when it is constrained by another. Growth of CLS and greater use of horizontal CLS to achieve greater fleet commonality and inter-operability of equipment (e.g. radios, sonar, radar) means this issue needs to be tackled.

An allied issue is that as you move up the staircase, MOD can lose sight and understanding of the risks to availability. One senior MOD interviewee comments: *"on a power-by-the-hour contract you only know you have a problem when it emerges with none of the advanced warning you have with an in-house platform".* CLS has focused heavily on the transfer of risk but often a more balanced decision is needed as there are 'take-or-pay' consequences. Defence is an 'events' driven business and unforeseen events do not sit comfortably with output-based specifications. For example, Army has not used Challenger tanks for 8 years. MOD could be better off deciding not to transfer certain risks as it is better placed to manage variability. Periodic review cycles for output metrics is key as are Operational Levers.

A fundamental issue remains that CLS *"is simply not on the radar for Commercial policy".* This must be addressed if any form of commercial standardisation or lessons learned exercise is to take place.

2.4 Process

These are discussed more fully in Q7 and Q8. In terms of the single value system, the Operational Goals that have driven development of the concepts for through-life support in the Concept and Assessment phase need to drive creation of a joint, integrated process model and allocation of roles and responsibilities between MOD and Industry.

2.5 Information

This is the very outer ring and informs decisions. Underpinning the Single System of Value are the safety and governance processes as well as the need to generate and retain the information needed through-life to ensure the integrity of design intent. This is discussed in more detail Q9 and Q10.

It is clear there are different actors/participants with policy not always keeping pace with the acquisition staircase and some standards conflicting in a through-life context. Industry can still face significant issues on data quality and accessing information it needs. The KBR Oshkosh tank transporter is a liability-based contract. It set out clearly that it needed MOD to provide 29 data elements. MOD could not source the data and so the contract was invalidated.

21 In 2006 AgustaWestland was awarded the 25-year IMOS contract to increase the availability of Merlin helicopters to the Front Line Commands, while saving the MoD and UK taxpayers around £500m in support costs over the 25 year period of the contract. Under the IMOS prime contract, AgustaWestland has partnered with Total Support Services, an alliance between SELEX Galileo, Thales UK, GE and the Defence Support Group, to support air vehicle avionics and with Lockheed Martin to provide support for the Royal Navy's AW101 Merlin mission system and the Merlin Training System at RNAS Culdrose. AgustaWestland signed a contract with the UK Ministry of Defence (MoD) covering the second five year period of the 25-year Integrated Merlin Operational Support (IMOS) contract for the period 2011 to 2016. The IMOS contract provides a comprehensive availability based support package for the UK MoD's fleet of AW101 Merlin helicopters. The contract includes payments for achieved flying hours and incentivisation arrangements associated with delivering agreed levels of aircraft serviceability, operational fleet aircraft numbers and Royal Navy AW101 Merlin Training System availability.

3. Will changes to the force generation model as a result of SDSR (Total Support Force, Future Reserves 2020) change CLS? Is there an opportunity to re-look at CLS as regards operational requirements for supportability and maintainability?

Key conclusions:

- CLS will evolve driven by SQEP, operational capability and the needs of Force Generation. This means Industry playing an enlarged role
- CLS are become broader in scope and more complex in nature increasing the complexity of information exchange and making them more difficult to model
- If more is transferred to Industry a new model will be needed to develop SQEP for military personnel performing retained roles e.g. front line maintenance
- As more processes and data move into Industry it raises key questions. Whose processes and systems are services delivered on e.g. front line? Who retains master records? How do logisticians get visibility e.g. into the repair loop
- As JBAs (between Commands and DE&S) morph into full commercial contracts, it will place increasingly sophisticated information requirements (integrated operational and financial) to empower the Defence Reform model
- DE&S will need a much more detailed understanding of the levers and linkages at a capability level between Operational Goals and outcomes and be able to dynamically model operational options for the Commands
- Today, there is a lack of enterprise information or an ability to dynamically model operational options or strategic choices above the platform level. There is no top-level strategic dashboard to reflect the key threads of enterprise information empowering decisions in the Command
- The limitations on enterprise information is because there are not the common standards, definitions and formats to enable aggregate information across platforms as well as from sourced from Industry
- Lack of standardisation of KPIs and definitions across CLS make aggregation of information and alignment of sub-systems extremely difficult
- This is no longer sustainable. DE&S & Commands require standardised enterprise information, processes and levers to optimise value. Industry is have to standardise its business models, adopt international standards and globalise to address export markets that now represent 65% of its business

Summary of interviews

Interviewees were all of the view that Defence Reform, TSF, FF2020 and defence cuts as well as SQEP issues will inevitably see Industry form an expanding part of the delivery chain, subject to MOD guidelines on how close civilians operate from the front line.

One of the key questions was how to make the current model more top-down driven (whereas today it is centred around platforms) and more demand/Command-responsive bearing in mind budget and decisions now sit with the JFC/Commands as reflected in Command Management Plans. There was also a sense that whereas the DE&S/Industry interfaces were well understood, many of the real problems lay deeper at defence level within the MOD, particularly around ownership and performance at senior leadership level. This included the Centre and its role in setting policy, military strategy and high-level planning. In addition to the impact of Defence Reform, interviewees highlighted accountabilities had been fundamentally re-drawn and information now needed to be aligned with this new model to empower it and decision-making within it. The use of non-standard contracts and consequential non-standard KPIs, processes and information makes this a challenge. This needs to be addressed to create enterprise level information and also the ability to aggregate standard information from across both MOD and Industry. It also requires the ability to dynamic modelling the operational options and strategic choices across the JFC/Command and GoCo/DE&S boundaries. Finally, it requires the enterprise level processes to be able to execute decisions top-down.

"As MOD looks to narrow its scope, we need to 'lean forward' to help MOD and do more. This means moving away from a transactional relationship into one based more on partnering. This means it is all about how the contract is set up and the duration of the contract."

– Senior industry interviewee

"A lot of supply chain is common and there is too much argument about uniqueness of defence whereas warehousing, transport and logistics are all very common. There will be parts of maritime or front line with genuine uniqueness but much of the joint support chain is very standardised and has suffered historically from the pretence that it is different."

– Senior military interviewee

"There are new drivers for CLS. Industry will definitely move forward than deep checks. The function of what will be performed is very clear. The key questions are what information systems would be used to carry out work further forward, whose data and whether MOD current systems are even fit-for-purpose from an industry perspective?"

– Senior industry interviewee

"If we take on an enlarged role the key question is how MOD get its SQEP from the remaining work. It will struggle to get the skills it needs to perform front line roles. What you end up with is a combined maintenance force of joint MOD/Industry so there is a competence and training regime."

– Senior industry interviewee

3.1 Likely CLS evolution

CLS has historically been driven by affordability and accountability (transfer of risk) whereas interviewees thought it now likely to evolve with new drivers including SQEP, access to operational capabilities (within Industry) and force generation.

Air Tanker already fits this Force Generation model with Industry providing aircraft and aircrew, as opposed to just aircraft to combat squadrons. In this regard, current CLS are viewed to be a narrow interpretation of Develop and Generate requirements. Ultimately, what is required is Force Generation: marshalling a capability for a given cost. This requires Industry to provide a service that integrates the DLODs (e.g. including training, infrastructure, information etc) and delivers Operational Goals set by the Commands at a performance level and cost. Availability is a very partial metric in this regard.

Within the Commands, a view was expressed that a real down-side of CLS was that there was limited or no early warning of problems. Issues only became apparent once they had impacted. When platforms were maintained in-house they had a much better understanding on the key risks to availability but the contractual/re-tender implications of missing KPIs meant they had lost this visibility.

The Supreme Contract for Catering and Fuel Oil in Afghanistan is a good example of how the views on what services Industry can provide on the front line is changing. With 6,000 contractors operating at Camp Bastion out of a total of 15,000 personnel, interviewees thought the TSF concept was well understood and thought it will help address current SQEP issues that cannot be fixed by Defence Reform or by the GoCo vs. DE&S+ debate.

3.2 Re-drawing the MOD/Industry boundary

Up until now much of the information exchange across the MOD/Industry boundary has related to demand, condition, usage rate and inventory levels. This more transactional data is used to drive execution layer processes and monitor contractual KPIs. Interviewees thought changes in CLS were likely to see Industry play:

a. *A broader role than execution level processes.* There are 3 levels of process (execution, management and strategy) with Industry mainly operating at execution level. Interviewees saw Industry now taking on more of the management level processes as well. Industry has better access to best practice, SQEP, knowledge and experience in these management processes that MOD does not have. Frequent changes in posting and SQEP means that plugging gaps so clear strategic intent can be translated into execution within Industry was seen as a major challenge. Lack of clear process reference models means firstly; there is a level of vagueness in terms of how the overall process should be divided by MOD/Industry as part of a CLS with clear outputs across defined process boundaries and standard information exchange following accountabilities. This allows air gaps. Secondly, it means the integration points for overall processes and DLODs are not clear. As the MOD/Industry boundary shifts, defence companies are competing to extend their value chains to take on activities vacated by MOD. So, for example, who should provide the Design Authority role or additional DLODs (e.g. training)? This creates a level of conflict within Industry that could potentially create new barriers to information sharing and collaboration.

b. *A greater role in capability, fleet and obsolescence management*. Following the Haddon Cave Nimrod Review, interviewees felt there was a real drive by MOD to go back to the OEM and no longer have lots of different parties making changes to aircraft. This was a change in approach for technology insertions, modifications and upgrades. Interviewees thought MOD was changing its relationship with OEMs where it was clearly the design authority and so wanted it to be at the heart of decisions, drawing on its whole fleet experience and technical capabilities. This meant a closer relationship between maintenance, fleet and obsolescence management, which required being able to map out a much longer view of all upgrades and mods/insertions including sub-systems under separate contracts or GFX. Similarly the OEM could be involved at the Concept stage, say for new radios, to define the requirements for the platform in order that the end product is integrated seamlessly and gaining certification becomes an easier task.

c. *Integration of support and equipment processes and DLODs.* Significant value would come from integrating these so, for example, modifications were timed to coincide with the deep maintenance plan to reduce costs and make assets more available to the Commands. This is being facilitated by Defence Reform rationalising the old model with 3 MOD customers: Capability Branches in MOD Main Building; Commands; and DE&S with (in theory) the only direct relationship with Industry, is being simplified to just two customers (Command and DE&S). This gives more of an opportunity for Industry to contribute to capability management (particularly fleet and obsolescence management involving upgrades and mods/insertions) to create a more seamless approach. Allied to Industry's ability to cost model and advise on platform re-certification this is a beneficial step.

d. *Integration of additional DLOD*s into current services such as training. Clearly there are good examples of where this is happening already such as AirTanker and Military Flying Training System. In many respects, this was already happening naturally without defence reform, particularly in those Operating Centres where the trust and collaborative behaviours have already been created. The next evolution of IOS in rotary wing was Wildcat Integrated Support and Training (WIST). This included training in addition to integrated support.

e. *Extension of maintenance into theatre*. Industry interviewees highlighted the challenge that availability levels in theatre tend to decline each time new uniform crews are introduced because of their general skills and lack of familiarity with specific platforms. Industry taking on this role would be an opportunity to make further advances in availability and flying hours. There were models:

   i. Taking responsibility for maintenance at UK bases beyond deep check might be a first logical step.

   ii. Delineation of roles in theatre that Industry could carry out without Industry being put in harm's way.

   iii. More complex models under TSF and sponsored reserves or integrated maintenance teams

f. *Inconsistent profile of retained risks*. Each CLS has different MOD retained risks driven by individual Projects Teams. As MOD aggregates assets with different CLS/contracts to form an overall capability it ends up with retained risks it did not expect. The risk appetite of JFC/Commands and their acceptance of different types of risk is unclear. There is disparity on the information available to manage retained risks.

"MOD is changing its relationship with OEMs where it is clearly the design organisation. Post Haddon-Cave there is a real drive to go back to the OEM so there are no longer lots of different parties all making changes to the platform. A natural requirement is to have the OEM at the heart of the contract to allow data to flow and build a deep and trusted relationship."

– Senior industry interviewee

"As the role of industry grows, there is a flip-over point from an information perspective. Rules on the purple gate presume MOD will always hold the master data record. There is a point where this is no longer tenable. At some point, MOD will need to bite the bullet and say we want X organisation to hold the master data."

– Senior industry interviewee

"There are differences in our current portfolio of contracts that generates inconsistencies and in turn creates different IT/ data requirements based on output measures. MOD needs the same outputs to be created i.e. flying hours at a cost and this asks the question why the differences exist? MOD must have a vision to create a standard model."

– Senior industry interviewee

"Our recent restructuring forced us to focus on delivering a standard contract. In turn, this has raised a question within MOD whether it should do it in a common way and no longer support different and inconsistent models. It is more expensive, prevents benchmarking, aggregating data etc. There should be one way."

– Senior industry interviewee

There are implications for these potential developments:

a. *More complex commercial boundaries* for wider services, potentially with more suppliers or sub-tiers partners involved. Simplifying commercial boundaries would require greater standardisation and clear alignment of all elements.

b. *Whose information systems and processes* would be used if Industry plays a more frontline role? One Industry player noted: "The function of what will be performed is very clear but it is not at all clear whose systems would be used or whether MOD current systems are anywhere near fit-for-purpose from an Industry perspective". Changes in the boundary and the role played by Industry has key implications:

   i. As Industry holds an enlarging proportion of Team Defence data at what point does it become sensible for Industry to hold the master record and provide access to it back to MOD?

   ii. At what point does MOD need to specify common standards and formats that enable the re-integration and aggregation of data held by wider Team Defence (see Q 7) so it is usable within DE&S and Commands to inform decisions.

   iii. To what extent should Industry be allowed to define requirements for MOD systems? This is part of the current debate on MJDI and BWIMS.

   iv. How will MOD re-aggregate the information it needs, now held by Industry, to make decisions within the Command on Generate and Develop. Fragmentation of information held by Industry and non-standardisation of key service components and KPIs makes aggregation difficult as does the calculation of an overall cost and performance level. The role of information (financial, engineering, safety performance etc) in service aggregation is key.

   v. How will the information sharing and collaboration model change to include more management and strategic level processes. Interviewees thought these areas (such as demand forecasting) have been relatively weak within MOD and not supported by best practice or modern systems.

   vi. How will MOD address issues around inter-operability with Industry? There are key challenges such as the lack of Master Data Management (MDM)

c. *Information and collaboration* will be critical to deliver the cost/performance improvements needed, but also to find ways of increasing the transparency of information sourced from Industry e.g. MJDI is predicated on confidence in the supply chain. How does the front line logistician, who orders items with a priority code, get confidence they will be delivered to meet those timeframes or that items in the repair loop will arrive? Hitherto increasing visibility of the repair loop is under exploited. Security is a key layer within the model that needs to be considered, particularly if information on the 'mission' needs to be shared to optimise outcomes.

This will put pressure on the decision-making processes and information (knowledge) requirements to enable CLS to inform strategic operational option analysis within Commands and to track Operational Goals. This, in turn, requires a very close correlation between a properly specified CONEMP and CLS in terms of service definition.

3.3 Export

Growth of export markets is 'the' key driver for Industry. Overseas markets historically accounted for 35% of outputs for the UK defence industry. This is rising to 65% to compensate for declining demand in the UK. In this context, MOD is an important customer but one of a number of customers for a global UK defence industry. Industry needs to change its business model to globalise. This means much more standardised process, adoption of international standards and federated models. Maintaining unique requirements that are unique to each UK defence contracts drives cost and complexity back into Industry and this will be reflected in higher cost at a time MOD is looking to reduce spending. The model is no longer sustainable.

3.4 Addressing the skills issues

Interviews identified the problem that if Industry takes on a greater role driven by access to SQEP it will at the same time further erode SQEP for the remaining activities still needing to be carried out by military personnel e.g. forward deployment. The question then becomes how does the military build the necessary skills and experience it needs to perform its retained roles. It is a different mind-set and requires a different model to current ones. Future options suggested by Interviewees were:

a. Creation of a combined maintenance force with Industry taking responsibility for a competence and training regime so MOD builds the necessary SQEP for its retained roles. Thales highlighted that within their Sonar contract MOD staff are already coming to work with them so they can develop the necessary SQEP to maintain sonar equipment in theatre.

b. A mixture of sponsored reserves and full reserves sitting within Industry as part of the FF2020 and TSF concepts.

"To maintain design intent there needs to be a single master definition. Notionally it could be transferred from the party who carried out design, but it is very difficult to convey the 'understanding' of why the design was put together as it was, through just design information. The understanding is a key part of maintaining the design intent."

– Senior industry interviewee

"The reality is for it to be win/win most efficiencies come from a change in end customer behaviour and change in the modus operandi for the relationship. What has happened with the DE&S relationship is that they have abrogated the customer/supplier relationship in order to get the savings."

– Senior military interviewee

"My main point is there is a lack of coherence and strategic direction but it isn't just failed by information. I believe a major failing is the lack of any kind of corporate knowledge and learning."

– Senior MoD interviewee

"If no-one has a firm grasp of Design Intent then this creates major issues through-life. It is critical, therefore, to say who holds the overall Design Intent through-life for the product."

– Senior industry interviewee

"As an overlay on defining information requirements, it is critical to establish how knowledge will be created to maintain Design Intent across the 3 key stages, as: designed, maintained and operated cases."

– Senior industry interviewee

"Having established this there are then barriers. MOD can prevent access to key data. There are precedents of how Industry can serve to corrupt data on Design Intent in pursuit of commercial opportunities. The through life model needs to define roles so that there is clear accountability for maintaining Design Intent so the asset is safe, performant and useable."

– Senior industry interviewee

4. Do you think changes to the control structures within FLCs will require Industry to undertake a broader role: Design and Technical Authority role? What might the implication be for CLS and process ownership and control?

Key conclusions:

- Post Haddon Cave direction of travel is towards the regulatory models used in civil equivalents
- It is more than airworthiness. The regulatory environment is following in areas such as vehicle safety is introducing a new European regulatory regime. These now all require information to support new requirements
- SQEP issues mean MOD is relying increasingly on Industry to provide Design Authority and contribute to capability management (e.g. technology inserts)
- The model could change with Defence Reform when budgets sit with Commands and platform changes do not have to be made through DE&S with implications for maintaining master records and configuration management
- MOD is not always clear on how or who it wants to perform the Design Authority function and is leaving it to Industry to resolve. Fundamental choices are required
- It is unclear whether information management systems can convey design intent or whether knowledge of the design is critical as well

Summary of interviews

A central theme underpinning the Single System of Value is the need to generate and maintain information underpinning risk-based decision-making relating to on-going design (upgrades and mods/insertions), safety and through-life support. The question is how to generate and maintain information as a strategic asset through-life.

4.1 Changing regulatory environment

For the Air environment, delivering operational effect is a balance of cost, capability and safety. So much of the transformation in Air environment is a result of Haddon-Cave and the formation of the MAA. At its core is a more clearly defined management of safety and the resultant information needs for hazard, risk and safety analysis. Interviewees felt the Continuing Airworthiness Management Organisation (CAMO) model is likely to go forward and all parties would need to interface with this.

In the post Haddon Cave world, this dictates airworthiness protocols for military aircraft. This will give more power to the Command (i.e. Station Commanders as the Delivery Duty Holder (DDH) for the platforms operating out of their base). This is both more power than they had historically and they can exercise it more absolutely. Industry interviewees felt therefore the whole construct of military aviation was orientating itself towards the civil model and that close parallels were developing with the Design Approved Organisation Scheme (DAOS) and the European Air Safety Agency (EASA) Part 21 organisation as the Civil Equivalent. With the new Military Airworthiness Authorities (MAWA) there will be similar regulatory structures.

Below these regulatory changes is the changing relationship OEMs are having with MOD. This results from Haddon Cave (and a move to stop lots of different parties making changes to platforms), the continuing shift in the MOD/Industry boundary and MOD's need to address its SQEP issues. Interviewees felt that Industry was now often better placed to act as Design Authority for new platforms. As with any support process, this means creating a deeper and more trusting relationship, information sharing and being able to leverage the OEM's wider capability and experience, particularly drawing on whole fleet experience beyond the UK to inform decisions and lessons identified on other platforms.

Air has always had airworthiness to manage. Vehicle safety in Land is starting to come up in terms of importance with new European law with requirement that for legal reasons there needs to be an audit trail from defect report on a vehicle through to when the fix was resolved so the liability to fix is covered. The regulatory environment is therefore starting to be a much more significant factor across all 3 environments.

4.2 Impact on processes, roles and responsibilities

This puts the OEM at the heart of capability management, sharing information and working collaboratively within an integrated MOD/OEM team. For example, Chinook has an out of service date of 2040 requiring all parties to work together to assure the fleet of 38 Chinook endures to 2040 through proactive obsolescence management, upgrades and technology mods/insertions. Best practice ways of managing obsolescence require a long term contract so that the OEM can present the full range of improvements and the best way of managing change through to 2040. This offers a snapshot of how Industry is playing a much greater role in fleet management. It also highlights the benefits in terms of cost and availability of integrating all processes/DLODs and driving down from strategic and management to execution in allowing processes within Industry to realise value by being more proactive, integrated and planned. For example, the importance of looking at upcoming depth check cycles and integrating the planning of mods/inserts and upgrades, including for all sub-systems not within the TLCS contract.

This is a two-way street with Industry/OEMs having had a sea change from being purely design and manufacturing focused. The have had to embrace a new organisation model for through-life support and delivering services wherever the customer is located.

As the MOD/Industry boundary shifts, defence companies are competing to extend their value chains to take on a range of roles that used to be provided by MOD including Design Authority. In the Air environment, the preference seems to be with the OEM for Design Authority but this is not consistent between Environments and the preference is to let the market decide rather than mandate. This results in new potential barriers to information sharing and collaboration as Industry competes for these new roles. Some of the larger questions are also not clear in terms of the model MOD wants to operate:

a. How does MOD intend to fulfil its Engineering Authority role given SQEP issues?
b. Does it require Design Authority to be independent from in-service support?
c. How does it sustain through-life the knowledge and experience built up during the design and manufacture phases?

4.3 Engineering Authority

Related to this is the question of how it defines, generates and sustains the information needed to support the Design Authority and Engineering Authority roles so it has the evidence base it requires to inform key decisions. This has both an information requirements and an exchange perspective. What information does the Design Authority need to retain and where does the information come from (e.g. from In-service partners)? Who owns this information (MOD or Industry owned)? What format and to what standards should the information be maintained? Is there a need for a collaborative IT environment into which Industry partners input to manage Design Intent?

Defence Reform also opens up new questions for Industry. Successful CLS/IOS has Industry co-located with the PT. In the new model, decision-making and budgets now pass to Commands. In theory, Commands are free to bypass the PT and contract for tasks on platforms. Clearly, any upgrade or change in configuration to the MOD standard (current configuration and Service Bulletins) needs to be communicated to the CLS provider. This could be an issue for carrying out activities under the CLS and also updating information records that are used to preserve the Design Intent through-life. There may also be an issue if the timeliness or quality of information shared is impaired as it impacts decisions being made in real-time by Industry.

"The less the better at the strategic level, there are far too many metrics. The culture is not to let go and so require too much information from industry. Every KPI requires someone in DE&S to analyse the data and so it gathers cost but adds little by way of understanding the service that is being delivered."

– Senior MoD interviewee

"There are too many platform specific KPIs. So there are no consistent KPIs and benchmarking and comparison is impossible. It creates a much more complex picture for Commands to understand when they start to aggregate the picture but it carries a tremendous cost drag having to try and work it all out."

– Senior MoD interviewee

"KPIs drive behaviour to achieve contractual objectives but on a long-term contract the whole world has changed by the time you get there. It was right on the day it was written. The question is how loose MOD is willing to write its contracts to be able to flex."

– Senior MoD interviewee

"What tends to happen is that KPIs are very focused on a fixed environment. Reality is the environment is never fixed and with no encouragement of contractual KPIs by the right end-to-end behaviours, adaption of KPIs to different environments does not happen."

– Senior industry interviewee

Section B: KPIs and Business Processes

5. Do CLS metrics sufficiently incentivise Industry effectively to optimise e2e processes rather than Industry side only? Do they promote the right behaviours?

Key conclusions:

- There needs to be greater standardisation of KPIs and their definition so that information can be aggregated and benchmarked across platforms
- Standard contractual outcomes drive standardisation of information requirements and exchange definitions. Moving to standard commercial models (such as IOS) reduces complexity for both MOD and Industry, hence cost
- This simplification is key:
  - In order to advance up the acquisition staircase, bundle in more services and use more sophisticated metrics (e.g. cost per flying hour)
  - To understand levers and constraints right across the portfolio of CLS and in particular, for any one capability
  - To create enterprise information based on aggregation and consolidation at sub-system and platform level as well as from Industry
  - Increase 'value' by using enterprise information to drive fact-based decision-making on operational options and strategic choices
  - To provide Commands with information that enables dynamic modelling of the options to optimise force generation and reduce cost
  - To promote enterprise level learning and knowledge, which in turn would improve financial analysis, budgeting and control
- MOD understanding of cost consequences of the way assets are operated is often not good. In an environment where mission and operational effect are paramount, cost is often in third place
- This means addressing common definitions, formats and standards enabling information sourced from Industry to be aggregated and then consolidated at different levels with common meaning
- Part of this is finding common ways to consider the issues that impact metrics such as operational tempo, terrain or exceeding the operational envelope

Summary of interviews

In the Conclusions paper, we explained how information exploitation is the beneficial outcome of getting all elements of the Single System of Value correctly defined and set up. This includes alignment of Operational Goals, through-life capability management and CLS constructs, with decisions on how to structure Operational Levers, KPIs and incentive mechanisms. Industry define information requirements for each CLS and exchange definitions based on this. Historically, the lack of standardisation has driven each platform to require unique processes and information requirements.

We also highlighted the challenge in setting KPIs and Operational Levers as threats evolve and a platform's role changes and there is a need to avoid unused capacity. In defining metrics for an output-based specification, the question is how loosely MOD is willing to write its contracts to enable flex and how frequent it can reset, particularly volumes and if the cost construct it promotes within Industry allows for sufficient flexibility. It also questions whether a more dynamic type of CLS is required including looking at how costs are structured within the CLS (e.g. fixed to variable cost ratios) to increase flexibility.

5.1 KPIs and standardisation

Within the current organisation model, the approach to defining contractual KPIs is largely down to individual Project Teams. Key points raised by interviewees were:

a. *Limited standardisation of KPIs* (definition and business rules). There are examples, such as IOS, where contracts have built on earlier lessons identified. Even so contracts and KPIs are not standardised. The focus in IOS is now on whether a single standard model and contract can be adopted, albeit with differences required for different types of platforms (e.g. Apache used in theatre in an attack role vs. Sea King used in the UK for Search & Rescue). Non-standardisation means:

   i. Cost of supporting different models within Industry and MOD. Different KPIs and incentives mean different business processes and information requirements. Sustaining these different models carries a cost of complexity. Where this creates gaps, Industry has to look for 'proxy' information as they cannot source the exact information they need.

   ii. Information from MOD and Industry cannot be aggregated to form a consolidated view at platform; capability and force element level within MOD because it is defined inconsistently.

   iii. It is not possible to benchmark between suppliers or industry to promote best practice and cost reduction. KPIs are inconsistent. The ability to benchmark is a key recommendation with NAO Reports: "The Department should improve its guidance and consistently apply a common methodology for constructing internal value benchmarks against which to assess the value of proposed contracts. [22]"

   iv. It increases cost within Industry at a time they are looking to standardise their business models to address export markets

b. *Misalignment of KPIs and incentives across sub-systems on the same platform.* This typically happens where they do not fall under a single prime contract but rather are GFX or on a horizontal CLS (e.g. radios, sonar, radar). This means:

   i. MOD may be paying for availability in one area but be constrained from operating the platform on another. Paying for high levels of availability% but not meeting Operational Goals.

   ii. Increasing spares. This requires an understanding of the reliability of each of the sub-systems to calculate the spares required to maintain a serviceable and operational fleet that deliver Operational Goals. This responsibility generally sits with the Project Team and not with Industry

c. *Too many KPIs*. Project Teams collect too much information rather than focus on outcomes for contracted services and the smallest set consistent with achieving Operational Goals and incentivising performance and behaviours. This drives cost both into Industry. KPIs are distinct from Service Level Agreements (e.g. fix-time). In the rotary IOS there has been a reduction in KPIs from 12 for the original SKIOS down to 5 for IMOS. Rolls-Royce cite their civil contracts, which mostly run with only one KPI (usually level of asset availability) and a supporting structure of PIs. The KPI is the main measure of success, but PIs may also have 'exceedence' terms (eg 3 consecutive failed deliveries equals performance failure).

d. *Blurring accountabilities with too much information.* If AFEDs[23] and RFEDs are to be delivered at 90% availability for Maritime platforms then it should be up to Industry to work out how to deliver this most efficiently. The clearer the roles and responsibilities, the simpler it becomes to enforce accountabilities by managing outcomes as the 'intelligent customer'. It was felt that there was too much managing processes and inputs, particularly in the first 2-3 years of a new contract when trust and collaborative behaviours were still developing, which obscures risk transfer. Collecting and analysing a large number of KPIs also carries its own cost drag.

e. Much of the focus on KPIs within MOD is on the supply chain for moving materiel out to theatre. Industry will always be focused on its contractual obligations. There is not enough focus on those metrics that Industry are interested in, namely, the reverse support chain for key assets.

22 National Audit Report: Transforming Logistics Support for Fast Jets. 16 July 2007
23 Available Force Element Day (AFED) and Ready Force Element Days (RFED)

"There are far too many metrics. The culture is not to let go and so require too much information from industry. If you look at Rolls-Royce then they have only 1 KPI in their 'power-by-the-hour' contract – in defence it's many more."

– Senior MoD interviewee

"Industry says they should be allowed to take more risk and this means going above the maximum 10% profit margin. The balance is not right. The risks industry takes are those with sufficient guarantee of a beneficial outcome because the risk/reward ratio is not right to do more."

– Senior industry interviewee

"Cost modelling is an absolute problem. In James and equivalents in Air they measure usage and breakages plus supply chain but it never comes together as a total cost of ownership. The information exists in separate areas. In Industry it is brought together but MOD does not."

– Senior industry interviewee

"The cost model does not work. In a global support model you need to sign up to the cost of war. The assumption is deploying assets cost no more, but this is never true. MOD needs to understand the cost consequences to input to a strategic model at capability level. It requires a much improved understanding of cost, different data and metrics."

– Senior MoD interviewee

5.2 KPIs in terms of securing outcomes

Many of the KPIs are driven by a fixed or static view of the outcomes that the contract needs to achieve. With the Capability Package and use of Contingency Capability Requirements and Standards model (CCRS) to support it, MOD/Industry need to also consider the big picture implications and be prepared to flex target outcomes. JFC is more concerned with the big picture, rather than minutiae such as fatigue or parts failure rates, so it is information that identifies the risk or impact to securing outcomes. This is important as it implies sharing more information with Industry so it understands the big picture against which it needs to report risks or issues. What JFC wants to avoid are locking into contractual arrangements where MOD outsource for affordability or financial risk transfer, but then Industry make ill-informed (due to lack of operational information) decisions. These might impact availability and surge capability and put at risk the ability to secure mission outcomes. This requires collaborating with Industry in new ways.

5.3 Aggregating metrics

One of the issues with Project Teams being free to define their own KPIs (number, definitions and business rules) is that it makes it more difficult for MOD to:

a. Aggregate information from platforms and sub-systems to a consolidated view at capability level. Using non-standard metrics makes it difficult to present an integrated view and abstract performance and costs at different levels of aggregation (Capability and Enterprise). It is then difficult to analyse capability options –the most cost effective way of "getting the job done" when cost and performance are not calculated in a comparable way.

b. Understand what is required. MOD's thinking about enterprise information aggregated from Industry and MOD is relatively under developed. There is a reluctance to trust information sourced from Industry or to work collaboratively to get this information properly defined and in a useable state. For example, information on aircraft serviceability and repair coming back to Air Command from Industry was considered unreliable and so was set aside with Air Command preferring its own estimates. Industry information builds on information provided by MOD and so an iterative improvement process is required e.g. accuracy of dates for aircraft entry into maintenance to improve accuracy of exit dates.

5.4 Risk/Reward

Getting the right KPIs and incentives aligned with Operational Goals was seen to be paramount. Whilst MOD defines the framework, it is Industry that is incentivised to identify new opportunities for improving performance and efficiency. This includes investment in specific tools and capabilities. To build trust that incentives work for mutual benefit, a transparent gain-share model was seen by all parties as being key. Incentivisation on both sides – so for example, asset availability with gain-shares on cost and budget – is vital, as the more complex the improvement is to unlock, the more important collaborative working is to eventual success. The key is that incentives need to be aligned to securing outcomes and this includes those set by JFC for the capability.

As well as defining the framework, incentives are also highly dependent on the contract type and length. The higher up the acquisition staircase the more likely it will be successful. The longer the contract length the more Industry is willing to invest in longer term improvement activities, particularly those such as HUMS, where the payback is not as immediate or direct. Incentives are also about Industry's willingness to take on more risk and use its skills, knowledge and experience as well as information, to make better risk-based decisions. Even with longer term contracts, the view from Industry is that measures such as capping the maximum profit at 10% are counter-productive. Industry is not incentivised to take risks unless there is sufficient opportunity for a profitable outcome. The risk/reward ratio does not incentivise Industry sufficiently to take on the larger risks. So, for example, on contracts with high levels of existing inventory there is no incentive to reduce inventory if the risk of having to buy additional inventory entirely sits with Industry.

5.5 Operational tempo

One of the key issues with the contractual effectiveness of KPIs is how surge/ operational tempo and operating in different environments are addressed within the commercial construct. Some CLS have the ability to adjust KPIs in theatre to reflect operational surge (e.g. higher levels of availability% or resetting the number of flying hours as in the case of Chinook TLCS). Operating outside the envelope set for the platform however, has implications for the longevity of the asset as well as degradation of performance and safety and increased cost of support.

On HIOS for the Hercules C-130 platform, the view was that with operational surge the contract metrics tended to disappear into the background and what was more important was the quarterly survey of HIOS partners covering 13 measures of perception. This was used to examine whether it was felt all parties were working well together to meet Operational Goals as opposed to having to call on hard-wired contractual KPIs.

Different environments, operational surge and operating outside the 'flying envelope' are all relatively normal scenarios that have to be built into a logistic support system. What is often not predictable is the commercial impact if a platform is operated 'in the yellow' for six months. Interviewees thought that enterprise information and enterprise learning, in particular, was under developed. It was only when a platform was in theatre did the parties 'cross this bridge'. Of all the areas, cost modelling was potentially the weakest. If an engine loses 5% of its power then it is not necessarily an issue for operations in theatre but rather it will increase costs in the next overhaul. Information and visibility are key – transparency and trust. In general, interviewees did not see why these factors could not been modelled upfront as part of the commercial contract.

One of the issues identified was that within the current organisational model, finance tends to be a corporate service rather than tightly integrated into operational decision-making. For example, creating a real understanding of the cost of operating in different environments should inform the overall cost of operations and capability management decisions. Civil airlines are very aware of the cost of operating different routes and what hot/dusty or cold/wet do to the cost of operating an aircraft including fuel burn. Having this at an enterprise level means improved budgeting based on current operations.

5.6 Data quality and latency

A final issue raised was the impact of poor quality of data and issues affecting its latency. Information value declines if not of the right quality and latency, resulting in more spares to cover risk.

6. Would a CLS model where MOD owns Strategic level processes but Industry owns e2e Management and Execution level processes improve optimisation of support processes?

Key conclusions:

- Limited development of through-life support requirements as part of capability management means supportability engineering, processes and information and exchange requirements are immature at the point of contracting CLS. This stores up problems for information sharing and collaboration post award
- Lack of standard commercial mechanisms means each contract requires different non-standard processes, KPIs and information. This work against the notion of enterprise information, enterprise learning and enterprise level processes (operating above a platform or capability level)
- The move in Industry is towards much greater standardisation to reduce complexity and address export markets MOD specific customisation of process and information will be reflected back in higher costs
- Complete non-standardisation is not sustainable as it limits:
  - Enterprise information (no standard KPIs or definitions) and learning (benchmarking/comparison)

"We are very much aware of the gaps in strategic and management level processes within MOD that we should address and which would unlock significant performance and cost benefits. It should be with industry to do the execution activities but with MOD to do more strategic activities and a more shared role around management processes."

– Senior MoD interviewee

"A key issue is there is no consistency between PTs – overlapping and gaps in processes vary by PT. There is no reason why there cannot be far more consistency in defining an overall approach and creating greater commonality. This is definitely the quick win. If you supply a large number of ships then commonality would create significant efficiency gains."

– Senior industry interviewee

"There is an issue with demand planning in terms of visibility and foreseeability. Whilst a level of activity can be planned it can be hard to predict peaks in the operational tempo. The model must be agile as MOD doesn't know what it will be invited by the Minister to do next. Undoubtedly more can be done to improve the flow of information at a strategic level."

– Senior military interviewee

  - Ability to interface aggregated (MOD and Industry) information with Commands
  - Elevating to enterprise level processes running across capability areas and dynamically modelling operational options and strategic choices
  - Ability to make model top-down driven e.g. rather than plan support requirements at platform level look strategically at Combat Air and take an integrated view across Tornado, Typhoon and F-35
  - Ability to evolve with changes in Operational Goals and Command Management Plans
- Significant gaps exist in strategic and management processes and best practice tools, resulting in gaps in high value information that enable optimisation of processes and inform strategic decisions
- Integration across fleet, obsolescence, asset and supply chain processes and DLODs also insufficiently mature
- Standard process reference models with pre-configured KPIs, information and exchange requirements, but allowing tailoring may be part of the solution
- Re-writing of JSP886 to allow a less linear an more agile approach is another
- Building on LCIA, process reference models draw on standard models such as SCOR integrated with OAGIS and PLCS for data standard to provide a solution

Summary of interviews

6.1 Overall process model

In terms of process, interviews covered a broad scope as reflected in Figure 4 below.

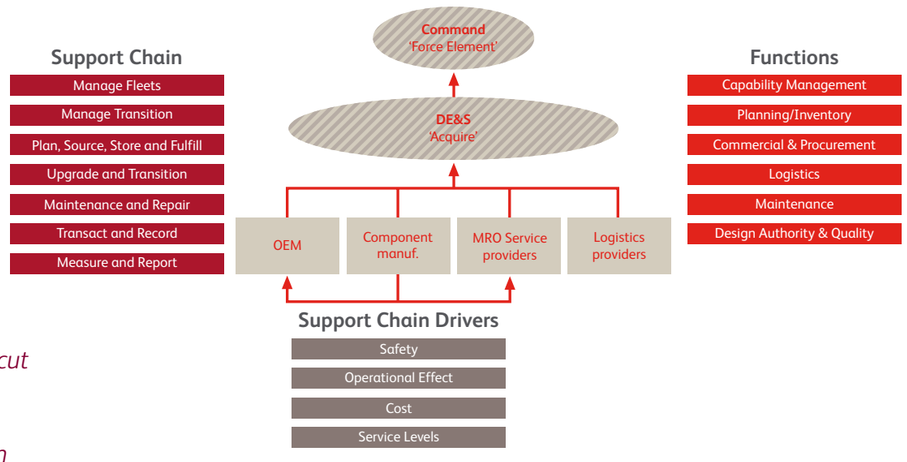


FIGURE 4: OVERVIEW OF PROCESS SCOPE FOR SUPPORT PROCESSES

"JSP886 needs to be cut back to its essentials and be made more useable so that it can easily be followed. The Defence Support Network is a good example of this. Instead of the classic linear model that dictates every step from 1st line to 4th line a new model is needed."

– Senior military interviewee

Definition of the model for support processes, roles/responsibilities and information relies heavily on detailed development of CONEMP and CONUSE (summarised in the URD) for through-life support as part of Concept and Assessment Phases of CADMID. Feedback is that this often does not go into sufficient detail to properly develop the support process model, information and exchange requirements at the point of CLS signature. Lack of understanding of cost drivers and modelling to support capability trade in/out stores issues for In-service with long-term implications. Often problems in information sharing stem from this genesis moment and are difficult to resolve in the first 2-3 years of a CLS before sufficient trust between MOD/Industry teams has been allowed to develop.

Industry interviewees also highlighted the lack of consistency in approach between Project Teams. Individual sub-systems that do not fall under a single prime contract may adopt different strategies (e.g. different points on the acquisition staircase and different KPIs), with one Project Team driving in a particular direction at odds with another. This adds to the complexity of integrating across the 8 DLODs and achieving inter-operability and coherence at a capability level. Even where there are mature commercial models looking to achieve broadly similar Operational Goals - – such as IOS – there are still a large number of commercial variants. This manifest itself in different:

- business processes unique to each contract
- non-standard KPIs and definitions that cannot be compared or benchmarked across platforms or consolidated as enterprise information
- information and exchange requirements unique to each contract
- levers, metrics and incentives so non-alignment of platforms and subsystems
- non-comparable information so loss of enterprise learning & knowledge in MOD
- additional costs in Industry to customise and adapt internal systems to meet requirements unique to each contract. This is not sustainable and runs counter to Industry's aim to standardise to address export markets

6.3 JSP886 (defence logistics support chain manual)

As part of Defence Reform, responsibility for JSP886 transferred on 1 April 2013 to ACDS Log Ops. All interviewees were aware of the central role of JSP886 in through-life support. As a guide it was seen as too detailed (3,000 pages) and inevitably, because of this and SQEP issues, the level of adherence was thought to be low (and the impact of this on operational effect was unknown). The sense within Industry was that JSP886 was very much an MOD guide for how they chose to do business and did not hugely impact Industry who had their own processes and tools.

As with CADMID, the current JSP886 process model was thought to be too linear and rigid, for example, dictating each step from 1st to 4th line support. The intention within ACDS Log Ops is to restructure it to simplify and focus on essentials, making it a lot less linear. This might mirror the Defence Support Model: linking up in theatre to MJDI and James to enable sharing of information to identify serviceable parts. Rather than operating a purely linear JSP886 model so every part needs to be sent back for to the UK. JSP886 needs to be shorter and reflect a more agile approach.

"We instantly relate to the model [figure 5] and it is the key to CLS. An overlay is who does each role with the maturity of the CLS and platform model moving how boxes are shaded. A mature contractual relationship pushes the MOD/Industry boundary right out."

– Senior industry interviewee

"The hope is the strategic processes will improve as the PT's role contracts and allows them to focus on them."

– Senior industry interviewee

Process Reference Model

Industry felt that if there was a move towards more standardised commercial models, it would be beneficial to underpin this with standard process reference models, as illustrated in Figure 5 below.

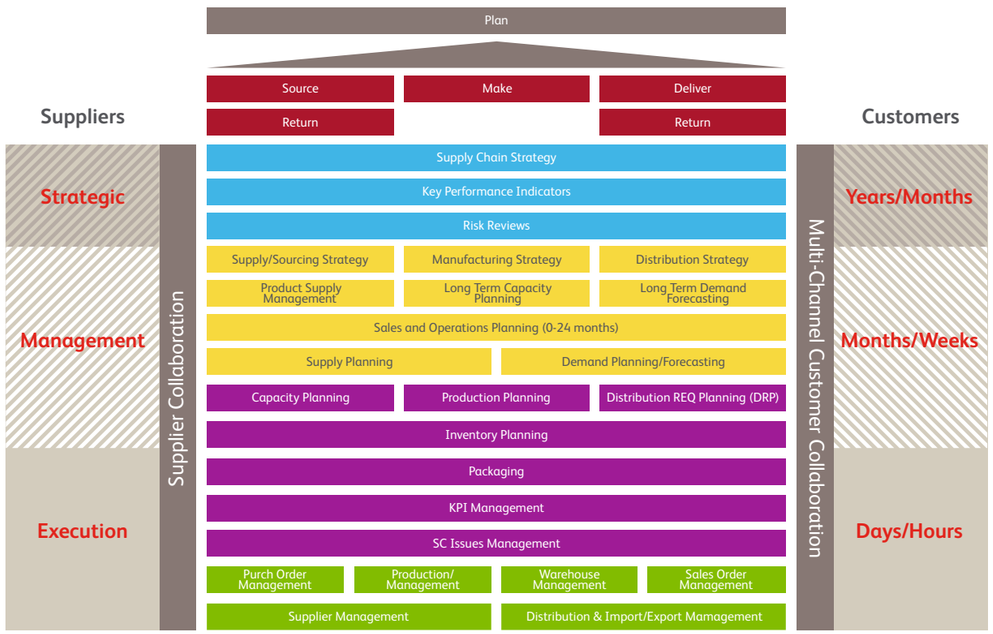


FIGURE 5: STANDARD PROCESS MODEL

Industry will always use their significant investment in-house processes and systems to operate CLS. Interviewees were welcoming of a more standard process reference models if it allowed CLS to be configured that delivered through-life cost savings and better operational effect whilst not constraining innovation or incentives. Key advantages of starting with a standard process reference model are:

- Clear understanding of end-to-end value chain including integration of all support processes (see Figure 5) and across the 8 DLODs (including inter-operability). The reference model would provide a baseline Industry felt this integration was difficult to achieve and there needed to be very specific tools for securing it.
- Ability to orchestrate CLS negotiation around transfer of standard end-to-end processes with clear process outputs/interfaces, metrics, data requirements, KPIs, information requirements and exchange definitions. Allows information governance to be agreed prior to CLS signature
- Building on LCIA as well as industry standard models such as SCOR[24], to define processes, data requirements and metrics at each process stage. Bringing in OAGIS and PLCS for data standards provides a complete model that can define standard information and exchange requirements. It might need tailoring based on Operational Goals and support requirements within the URD.
- It builds on the concepts of enterprise information and enterprise learning in terms of standard definitions that would achieve comparability and benchmarking across platforms. These means KPIs can be aggregated and form a common language when looking at alignment of systems and sub-systems.
- It reduces typical duplication of effort that comes from lack of clarity on roles and responsibilities, particularly in the first 2-3 years of a contract, which dilutes risk transfer and accountability.
- It provides a link between information of the right latency and quality with achieving overall Operational Goals (performance and cost), KPIs and encouraging the right behaviours.

"Somewhere the model needs to switch to coming top-down. What are the options to achieve outcomes? It means looking at the cost. Information is not there to enable this kind of decision-making. The phrase 'intelligent decision-making' is fact-based."

– Senior industry interviewee

24 The Supply Chain Operations Reference (SCOR®) model is the product of Supply Chain Council (SCC)

Whilst acknowledging the benefit of this approach, the experience of IOS has been that it is hard to completely define all information requirements upfront. There needs to be enough to get the model set up but also the flexibility to expand over time. This was also the experience of the Sonar CLS where existing equipment was transferred into a 10 year CLS and so it never went through a CADMID cycle with formal definitions of information requirements, rather they were allowed to evolve. Using standard process reference models therefore should be seen as priming the contract with the initial set of information requirements, which will then need to be built on.

6.2 Strategic and Management Processes

A standard process reference model, such as in Figure 5, highlights there are 3 levels: strategic, management and execution layers. It maps outputs from processes at each level into the level below including metrics and information outputs. Interviewees felt that the historic focus within DE&S and for information exchange was on the execution level and consequently, there were significant gaps within the strategic and management level processes. There was also limited focus on driving innovation and best practice into these processes. Interviews felt that strategic and management level processes have the highest value information because of their role in optimisation and linking delivery to Operational Goals and risk mitigation.

Industry's experience was that an 'air gap' existed within DE&S information systems e.g. inventory optimisation. In transferring processes under IOS/CLS, Industry had to fill this air gap with additional systems capability. Industry was unclear how these processes are supported with DE&S or by organisations such as REME. There is significant focus currently within LogNEC on addressing information issues within the transaction layer (e.g. MJDI, James and BWIMS), which is a key source of historic usage patterns and trend information for the strategic and management layers. In some cases, new tools were on the LogNEC strategic roadmap, such as demand planning. There were also key enablers on the roadmap, such as Master Data Management, which would be critical to reducing cost and inventories as well as working with Industry.

Some industry interviewees felt that a direct focus on fixing the gaps in the strategic/ planning processes represented the single greatest quick win. The opportunity here was also to work with the inventory reduction team as this was only one of the consequences in terms of the evident gaps there were in these strategic and management level processes.

MOD interviewees' perspective was that at a Command level, there was clarity on strategic intent. The defence planning assumptions were clear in terms of which platforms - flying hours required per year - were being using for how long and where. The issue was how well this information was cascaded down through strategic and management level processes and organisational structures to arrive at optimised decisions at the execution level. The gaps, posting policy and SQEP issues were part of the challenge. With these gaps it was difficult to translate high level decisions within the Command through the levels and structures in the model to optimise orders for spare parts or maintenance activities.

Many thought that a logical split for CLS was to transfer to Industry both management and execution level processes. This would leave MOD to concentrate on two aspects. Firstly, the strategic level as it related to a specific capability. Secondly, on enterprise level processes that drove optimisation across capabilities and at the Command level.

The logic for also transferring management processes to Industry was that they had access to best practice processes, modern tools, knowledge and experience. Integrating of management and execution levels was thought to require comparable skills (whereas strategic is different) and technologies/system integration. Where Industry was the OEM they have much greater reach back to the experience and knowledge gained from supporting a much larger fleet (e.g. Chinook) than the UK. It was also felt that posting policy and significant SQEP issues had impaired MOD's

"As we take on more of execution and management it is hoped MOD raise its game on strategic level processes such as 3, 5 and 10 year plans for the platform. MOD has job titles for this activity but their focus is more on execution so they are not doing the substance of each role well."

– Senior industry interviewee

"MOD knows where they will use assets and utilisation rates. These are in the defence planning assumptions. One hypothesis should be that key information is available but not reflected down through process layers from strategic to management and execution so does not always find its way to industry."

– Senior military interviewee

"Creating the joint integrated process through-life model means understanding connectivity of all support processes and how each DLOD needs to be integrated. This goes back to understanding the value stream and DLOD co-ordination. This is difficult to achieve and there are very specific techniques for securing this complex integration."

– Senior industry interviewee

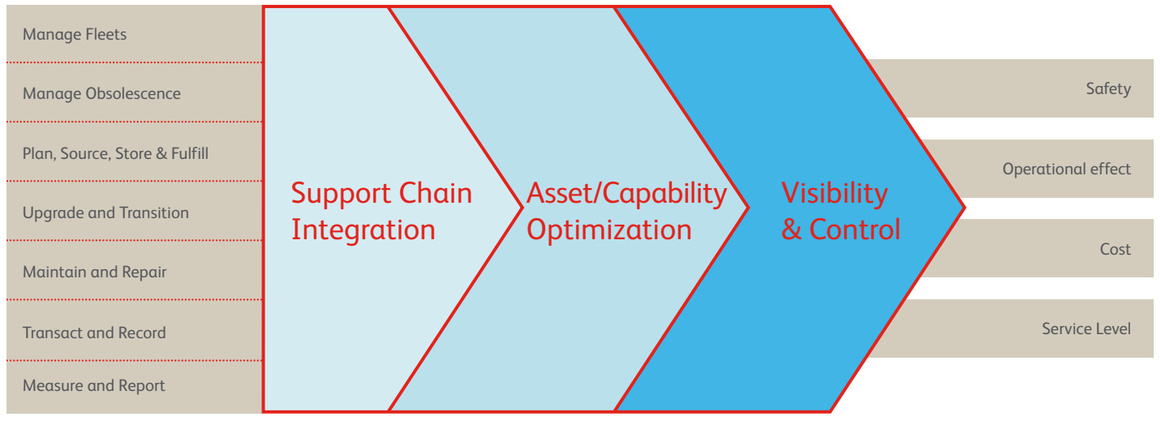
ability within the management level to translate strategic intent into execution in Industry. Many in Industry felt that this was a 'quick win' to increase value. Clearly, the model would still need to be enabled by integrated and collaborative MOD/Industry teams and military personnel would be required to own frontline execution level processes. The division is therefore of primary accountability. There was also an expectation that enabling MOD to concentrate more on the Strategic layer would create:

- Greater focus on strategic/planning processes which have traditionally been weak and where there are potential gaps e.g. developing 3, 5 and 10 year plans and a technology roadmap with emerging requirements and buy-in from stakeholders.
- Elevate processes from platform into the enterprise process layer so that a more strategic approach was taken. For example, rather than the current bottom up approach to defining platform specific in-service support requirements take a top-down integrated view. Rather than a Project Team defining support, have a single strategic view for support model for example across the rotary wing.

As well as processes, interviewees thought it was important that any change should be linked to a move towards more fact or data driven decision-making, particularly within MOD. Improved decision-making is a key facet of the model, which requires both the right information to be available to make risk-based decisions, considering all the key trade-offs (programme, engineering, cost and risk). The history of poor logistics systems, limited financial information and data quality issues meant that, particularly within MOD interviewees, there was not a culture of fact or data driven decision-making. Resolving data quality required a culture change but a key part of it was instilling a culture of fact or data driven-decision-making.

6.3 Process integration

Understanding the overall value chain means understanding the intersect of fleet, capability/obsolescence, asset and supply chain planning at the strategic, management and execution levels. This is summed up in Figure 5. Overlaid on this is integration of the 8 DLODs that enable inter-operability and coherence.



- Reduced overall inventory investment
- Lower indirect and direct material purchasing costs
- Improve fleet reliability information and part availability
- Improve Master Data Management to rationalise inventories
- Improve recovery on surplus
- Increase access to information, parts and suppliers
- Reduce pricing for technical and indirect spend

- Improve accuracy of forecasts, scheduling and deployment
- Improve visibility of long-term technology roadmap e.g. 3, 5 and 10 year
- Reduce overall inventory investment while maintaining service levels
- Improve fleet reliablity/part availability
- Reduce part and overhaul expense
- Streamline vendor/supplier base
- Integrate planning of technology transition with maintenance

- Improve inventory tracking and visibility
- Improve demand planning & responsiveness
- Improve repair loop visibility
- Streamline operational processes
- Reduce supply chain planning cycle times
- Increase supply chain partnering and collaboration
- Stronger supply chain relationships
- Increase asset utilization
- Improve integration of technology insertion & scheduled maintenance
- Engance process controls
- Integrate financial and operational information

FIGURE 6: PROCESS INTEGRATION WITH KEY CHALLENGES SURFACED

Industry thought this was a complex area. One industry observer commented: *"Processes like fleet and obsolescence management could be considerably better if done as partnership with Industry. A more rigorous approach would mean joining up all the dots and it could be improved by being very much more proactive and integrated into planning processes and leveraging the tremendous reach knowledge the OEMs have"*. Often the desire to be able to hold industry at a distance to enable individual work packages or upgrades to be tendered meant that Industry was not fully to support MOD as they were able to.

6.5 A changing boundary

Interviewees thought it was important to standardise the model, drive it more top down through better strategic/management level processes and deliver improvements now as the future was likely to become more complex. They also felt there was a natural migration path, for example with IOS, where each successive contract builds on the trust and experience gained within the Helicopter OC. There is a desire to advance up the acquisition staircase and extend the transfer of Management and Execution processes for Defence Logistics but also to other DLODs such as training as with WIST.

From a supportability perspective, the CLS model is mature and Industry is used to working in the availability space. Behaviour at Prime level is critical to getting this model to work and enabling information to flow down the tiers so all suppliers can ensure their products and services are fit for purpose and serving operational and strategic goals.

6.6 Innovation

Interviewees noted that staff at operational bases that know the platforms and can think strategically about the platform are often not empowered to make decisions. Conversely, the role of a Project Team can be more commercially focused. For example, Rolls-Royce has a Service Delivery Centre at RAF Marham where joint teams work together to improve availability and save money. Personnel at RAF Marham do not feel empowered to take strategic decisions on the platform and the escalation route for a decision can be unclear. Similarly, many ideas come from Green-Box but it is very difficult to drive change back into the Project Teams as the structure does not exist to drive change.

6.7 Future Change

Defence reform, TSF, FF2020, SQEP issues and defence cuts create an opportunity to fundamentally challenge the way business processes operate. Increasingly, there is a need to take a capability rather than platform specific view. There is also an opportunity to integrate key strategic processes within the model at a higher level, driving from the Operational Goals set by the Commands.

So, for example, rather than consider the asset and supportability strategy at a platform or sub-system level. This means being able to execute a top down strategic plan (reflecting Operational Goals and needs of Commands) for how each will be supported. Today's model takes a bottom up platform or sub-system specific view with support for each contract negotiated differently by each Project Team. There may be an opportunity with power moving to Commands to coalesce a single more strategically top-down driven approach. As noted in Q8 this requires the ability to dynamically model and compare different options in order to trade-off between contracts and capability to optimise outcomes.

"We help MOD cost model through Concept using sophisticated cost modelling, trade in/out and choices that save money. On technologically complex platforms MOD can never have this capability as it requires understanding key interactions and cost implications i.e. engines, frame, comms, nav and flight systems."

– Senior industry interviewee

"Processes like fleet and obsolescence management could be considerably better if done in partnership with us. A more rigorous approach would mean joining up all the dots and it could be improved by being very much more proactive and integrated into planning processes."

– Senior industry interviewee

"There was confusion on roles and responsibilities with MOD believing they were still responsible for delivering outcomes. This created conflict. There were barriers which meant MOD were unwilling to share information. Over-time based on how we used the data shared MOD became confident Industry would use it to improve the cost and performance."

– Senior industry interviewee

7. Do you believe there is effective ownership and control of e2e processes within CLS? How should roles and responsibilities be divided between MOD and Industry? The RACI model below provides a view on this. Do you agree with the distribution?

Key conclusions:

- The common view was that nothing as formal as a RACI matrix is currently standard practice. The current allocation was seen to be fairly hit and miss
- This was partly as it takes a number of years for trust to mature during which time there is duplication of roles and more than one source of information
- An agreed RACI would bring clarity and prompts debate about who is best placed to perform the role
- It can be used to prompt discussion about risks transferred and the information exchange from Industry needed for MOD to manage the risks it retains
- There is an enterprise level view of roles and responsibilities if the aim is to elevate the Single System of Value to enterprise level and use information to inform strategic options and choices that followed this new model

Summary of interviews

Interviewees reviewed an example RACI (responsible, accountable, consulted and informed) model with an illustrative division of accountabilities for a CLS - Figure 7.

As an overlay on this RACI, it is possible to be clear not only on accountabilities but, in a defence context where it is likely only financial risk is transferred for a time bounded period, it can help bring clarity on the other forms of risk MOD cannot transfer e.g. Duty Holder Function. Whilst information needs to transfer with the role, if only financial risks transfer, then MOD needs to be clear on the information it requires back from Industry to manage its retained risk including those after the end of the current contract e.g. obsolescence.

Often MOD lacks the SQEP or resourcing to exercise effective control and so a RACI matrix was thought to be good at prompting clear decisions on who is best placed to assume and manage risk. As a result, if greater end-to-end ownership and control was implemented over processes then greater transfer to Industry is possible.

	MoD Centre	PTs	FLCs	Platform Design Partner	CLS partner	Material supplier	2nd Tier supplier
Strategic							
Agree MoD strategic activities and requirements	A	C	C	I	I		
Set asset capability requirements	A	C	C	C	C		
Agree CLS targets	C	A	C	C	R	I	I
Management							
Set planning parameters throughout value chain		A	C	C	R	I	I
Manage assets	C/I	R	R	C/I	A/R	R	R
Supply Chain Planning 3mth to 24 mths		C/I	C/I	C/I	A/R	C/I	
Manage suppliers	C/I	A	R		R		
Execution							
Maintain assets	C/I	R	R	C/I	A/R	R	R
Requisition material		A/R	R		R	R	R
Deliver material		C/I	C/I		A	R	R
Maintain Inventory		R/C/I	R/C/I		A	R	R

FIGURE 7. ROLES AND RESPONSIBILITIES RELATING TO PROCESS

7.1 MOD retained accountabilities

- MOD needs to access the information it needs to manage and mitigate non-financial risks that do not transfer; make fully costed through-life decisions (beyond the current contract duration when financial risk transfers back to MOD) and operate strategic and management level processes it retains. This is important when one considers:
  a. The challenge in aggregating information held by Industry to inform risk management.
  b. The importance of information sharing and collaborative team working. From an MOD perspective it needs both the information but also to own decisions where it bears the ultimate risk and to have a deeper understanding to contextualise risk relating to the platform.
  c. Its role as 'integrator' at capability level where multiple CLS and GFX equipment make up the overall capability but also within the Command as the ultimate service integrator of force elements. MOD may have passed financial accountability to Industry for availability but it needs to set the spares strategy to ensure Operational Goals are met in terms of serviceable assets available to the Commands. It also needs to consolidate commonly defined information from different CLS and internal MOD sources (e.g. commodities) to understand the picture at platform and capability level.

7.2 Allocation between MOD and Industry

Interviewees thought that where process control sits on CLS was more by chance and coincidence than through consistent application of a RACI applied against a standard process reference model. There was a lack of clarity. This also reflected the grey area, especially on new contracts, where control has formally been ceded to Industry but there continues to be a lot of duplication of roles within DE&S. Developing the trust in Industry's ability to execute was at least a 2-3 year journey. In some Environments, there were also significant cultural barriers to working in genuine partnership with Industry as there was genuine mistrust of their motives leading to duplication and shadowing of roles and decision-making.

For contracts of 3-5 years in duration Industry would be far more protective of information as it represented knowledge and insight that enabled them to successfully win any re-complete. There is a question then on these shorter contracts whether the required level of trust can ever develop to fully allow removal of duplication and create an integrated team.

Interviewees felt there needed to be much greater formalisation of roles and responsibilities, information exchanges and information sharing (particularly of Industry information) within their current CLS arrangements. There also needed to be a drive toward a single source of information rather than each side maintaining their own set.

Information needs to follow this roles and responsibilities matrix. A more standardised process model with commercial Operational Levers, KPIs and incentives aligned with a more standardised roles and responsibilities matrix (and risk allocation) would mean that information requirements and information exchange definition could also be more standardised. This would be both from an industry perspective and also in terms of access, aggregation and consolidation of information held by multiple Industry partners (where there is no single prime) in order to inform risk management, strategic processes and decision-making within the Commands.

7.3 Defence Reform

Interviews also highlighted that there was an enterprise level roles and responsibilities matrix. If the aim was to elevate the Single System of Value to enterprise level then accountabilities needed to be carved up to reflect the new Defence Operating Model. Enterprise information (standard and aggregate-able with common definition and meaning) needed to follow accountabilities within this new model.

"The through life model needs to define roles so that there is clear accountability for maintaining Design Intent so the asset continues to be safe, performant and useable."

– Senior industry interviewee

"Until we can address the roles and responsibilities construct from the outset and who is putting their corporate reputation at risk then we will not get to the heart of the issue. There will be no forward momentum on information exploitation unless we plot a path through it which also requires addressing both cultural and organisational processes."

– Senior industry interviewee

"Industry is incentivised to demand information to improve performance and cost. We have had issues with gaps in MOD systems – usually the only option is to find a workaround. There are areas where information is less good. Defining all information sources upfront would not have made things better. The gaps would still have been gaps."

– Senior industry interviewee

"[Our first CLS] transferred accountability and responsibility but the information requirements need to develop over time. It is hard to completely define upfront but you have to have enough to start and then Industry generates a pull over-time to move from 70%-80% up to 100%."

– Senior industry interviewee

Section C: Information

8. What was your view on the information model used by Successor starting with CONOPS and the hierarchy of through-life decisions? Do you recognise barriers to long-term partnering and a need for culture change to get effective information sharing across MOD/Industry and partners boundaries?

Key conclusions:

- The information model from Successor offers a good starting point but needs to be adapted for the unique characteristics of each Environments
- The model must be centred on the relative 'value' of information in terms of securing Operational Goals, KPIs and gainshare incentives. It also includes the ability to effectively manage risk, safety and design
- Ownership and right of use over data often unclear. Who owns James or MJDI data?
- Current focus is on transfer of transactional data from MOD to Industry for execution level processes from systems such as MJDI and James
- The importance of information still fails to be properly understood. Some companies receive ±20% of all the information they need when they need it
- Industry to MOD channel is under exploitation. There is distrust of information sourced from Industry (rather than a desire to work collaboratively to resolve issues, which are likely to be joint as it builds on MOD sourced data).
- Defence Reform will require the ability to dynamically model of operational options, strategic choices and drives optimisation. This is the most valuable information. It is where the gaps are today form both an enterprise process and information perspective
- Enterprise information required the ability to aggregate information from Industry and consolidate it with MOD financial and operational information. There is no means for doing this today in terms of common definitions, standards and formats
- This reflects the bottom-up and non-standard nature of contracts and process models, rather than being driven top-down by the needs of Commands.
- There are still barriers to information sharing and collaborative working between MOD/Industry but also across Industry: legal, commercial, cultural, intellectual property, ITAR, security and technical
- Information on its own is not sufficient; it requires collaborative working to extract the full value. It takes time to build trust and a willingness to share information: shorter term contracts are not conducive to this
- The LCIA team within DE&S has been stood down so Project Teams no longer get support in creating their Log Info Plans as reflected in Def Stan 00-600. This does not negate the need for a comprehensive plan. LCIA is a modelling toolset or framework that can be used to create it. It is not the Log Info plan itself. The risk is that without "help" Project Teams may not see fit to create an information plan.

Summary of interviews

Interviewees noted that the approach to information management was really down to each contract and each Project Team albeit in the context of existing standards and examples of best practice.

As outlined in Q1, interviewees highlighted that the Successor Case Study needed to be seen in light of operating in the Maritime environment. Any information model needs to be able to cater for unique differences between environment, equipment types, numbers and scale/value of a programme. It should also be borne in mind that Successor is the Assessment phase of CADMID and so the information model is still under development.

In general, interviewees thought that information was not given the same weighting in terms of importance as the other DLODs. Without this it was difficult to drive changes in behaviour. They felt that information needed to be more centre stage in terms of importance. It needs to be considered at every level – strategic, operational and tactical. As the Successor Case Study surmised, waiting until the contracting phase of CADMID is too late. It needs to sit within capability development as a key activity. Even on existing contracts the importance of information fails to be properly understood with some companies in Industry flagging that they only currently receive about 20% of all the information they need when they need it.

8.1 Information and governance model

Interviewees thought the Successor Case Study outlined a logical and architecturally-driven approach, building on strong foundations:

a. A clear set of Operational Goals with Successor and the 'effect' it is looking to achieve through-life in terms of CDAS. This emphasizes the critical need to pinpoint the 'value' of information (a key theme for a number of interviewees).

b. Early involvement of the through-life support partner from the outset as an integral part of the design team to contribute to development of the concepts covering through-life support, supportability engineering and its enabling information lifecycle system (ILS). The in-service partner brings all the lessons identified on earlier platforms allowing problems to be resolved at root cause both within design but also within information and ILS.

c. Architectural approach to defining information requirements, including the 5 layer model for defining information requirements. This underlined the approach being driven by LogNEC. The 5 layer model started with concepts of operations and (as complete as possible) a hierarchy of decisions, taking into account the broader (fleet, programme and mission) requirements as well as the need for contextual information to support fully costed risk-based through-life decisions. Interviewees did question whether outside Successor there would need to be an additional layer within the model in terms of support needed from Industry in helping to translate high level concepts into what happens at a platform level. This exercise in de-composing concepts requires significant platform specific knowledge and experience.

d. Clear roles and responsibilities for the Industry partners supported by information sharing, negotiating and agreeing information exchange between the parties and issues with conflict between existing MOD standards and the need for a standard through-life data architecture.

8.2 Information value

MOD and Industry measure value in different ways. For MOD, the upfront acquisition is about balancing affordability against value for money (with affordability generally winning). Any assessment of 'value' In-service is framed by mission and Operational Goals. The latter needs to be at a capability (what it takes to do the job) level – rather than the more parochial platform or sub-system level.

An important point to bear in mind in MOD is that financial value may accrue to a different budget-holder than the one making a decision. Spares are purchased by DE&S but charged at the point of consumption. There is no incentive for a Command to make a trade-off on capability if it results in lower spares. Similarly, the Command does not pay for infrastructure. If you move to a CLS with all infrastructure and spares then it will hit the Command's budget. CLS require an enterprise view to be taken of value for money.

Information exploitation carries a cost (collecting, disseminating, storing and analysing) to deliver outcomes. It is important therefore to pinpoint what information is most valuable in *"driving the dial"* to improve outcomes. Interviewees felt there was a real lack of a framework to do this. This partly goes back to the lack of cause/effect or cost modelling within capability management. It is more trial and error. Whilst there is a significant flow of information that is successfully passed between MOD and Industry, there is limited focus on value and what is truly important. Frameworks such as LCIA are useful to structure and define categories but they don't differentiate its value.

"There is a lot of talk about collaboration but in effect most of it is exchange of 'industrial transactional' data to populate systems and models operated by industry rather than genuine collaboration. We need to adopt the principles of information as a strategic asset."

– Senior MoD interviewee

"The real challenge is understanding the information needed to be able to make better and more informed decisions and therefore to be able to distinguish what information is important and where the value lies."

– Senior industry interviewee

"One of the issues faced by MOD is expressing a compelling case for investment in information in terms of value. It is very hard to explain the return on investment in terms of better decisions."

– Senior MoD interviewee

"Information is a necessary evil of decision-making. If you are looking at any of the requirements for support then you need to look at the Operational Goals and the levers that effect output i.e. what will deliver the biggest change in those Operational Goals and the information needed to exploit it"

– Senior industry interviewee

"MOD usually has the information but when assets are deployed overseas or in theatre the information is less easy to obtain or it may be delayed such that its value to being able to make timely decisions is impaired by the delay."

– Senior industry interviewee

"The critical starting point is to understand the beneficial business opportunity and drive down. What is the benefit of the endeavour you are embarking on and the cyber security requirements should definitely form part of the CONOPS."

– Senior military interviewee

So, for example, there is little direction on aligning 'design for sustainability/ maintainability with operational outcomes although, it can be argued that by extending LITS and JAMES to the level of operational units, it has moved in this direction (and in some cases provides a timely view of platform availability and through the Enterprise Data Warehouse, historic trends). The question is whether HUMS and other information sources, such as Vehicle Telematics, be correlated with mission profiles (within Opsec and other constraints) making clear to Industry that the resulting information, suitably securitised/sanitised, is required to support tactical planning as well as longer term capability development as well as design of new platform and systems.

In the case of the Successor Case Study, it is comparatively easy to pinpoint the 'value' of information (a key theme for Industry interviewees) in terms of its cause/ effect on realising Operational Goals. Value engineering measures it is as the ratio of function (what something "does") to cost – cost per flying hour, ship or boat day. Risk is also another important constituent of value e.g. risk of non-availability. Within the Commands, this ratio of enterprise cost (including the entire hidden infrastructure and other cost) per flying hour or ship day was seen to be a constructive metric. With simple changes to behaviours user generated costs may be reduced delivering savings to Industry, returned in the form of gainshare (see cause/effect modelling).

Conversely, Industry has a different Goal that drives the definition of the value of information as reflected in contractual KPIs and gain-share incentives (driving profit). Value can be a symbiotic relationship with Industry leveraging its capabilities, investment and knowledge to identify new sources of value on a platform that will impact the function/cost ratio. The incentive to collaborate realises value for MOD through lower cost and improved performance ('effect') and gain-share for Industry. This is the dynamic created in examples of successful information sharing, exploitation and collaboration such as ATTAC for Tornado, TLCS for Chinook and IOS in the Air environment.

A senior MOD interviewee commented: *"Improving the game on collaboration will only come from articulating the outcomes Team Defence is setting out to achieve and properly expressing them. There needs to be greater visibility of the problem as information sharing must be value driven".*

Looking at the process hierarchy (strategic, management and execution), clearly the value of information reflects this hierarchy. At a strategic level it reflects the complex integration of different processes, constraints, risk assessment and policy as well as historic information combined with the latest planning assumptions. The management layer enables it to be translated into execution.

The suspicion is that information is heavily weighted towards execution processes and transactional data. This means there are significant gaps in the more valuable categories of information from a Command; Operator; and Industry perspective as a result of:

- Gaps in strategic and management level processes
- Lack of integration of the overall process model at capability level: obsolescence, fleet, technology insertion, asset management (spares, repairs and maintenance) and supportability management
- Lack of understanding of constraints and being able to dynamically model them
- Lack of information to inform risk analysis
- Issues with the different systems/sub-systems making up a capability,
- Lack of cost modelling underpinned by an understanding of cost drivers

Another key facet of value for Industry is the immediacy of fulfilling the information requirement. Within the Maritime Environment, particularly sub-surface, Industry is used to less frequent information. In contrast in Air with its deployable base and line maintenance on platforms, changes can be made in baseline configuration and information on condition, usage or spares be delayed and so its value in terms of being able to prevent degradation in Operational Goal diminished. Poor latency of data means having to carry more spares.

8.3 Information channels

Interviewees felt that the main channel for information sharing today was out of MOD and into Industry to support the different contracting models. It is very transactional by nature, covering areas such as: demand, usage, spares and condition. It drives execution level processes (e.g. maintenance scheduling, ordering etc) and enables Industry to make informed decisions. Where Industry provides a service as Design Authority, it includes information to update baseline configuration records to be updated.

Looking forward, however, with growth of CLS a growing proportion of information and data required by MOD and the Commands will reside out in Industry. MOD does not yet have a definition of the analytical questions it will need to answer. Nor does it have a strategy for how it will aggregate this information across multiple Industry partners and provide it to a wide range of different MOD decision-makers, including the Commands to improve situation awareness and facilitate force generation.

MOD and Industry need to work together collaboratively to really understand the decisions (force generation, operational, capability development, safety and risk) needing to be answered. There are multiple ways of deploying a capability but no dynamic model to help examine the different options open to the Command to achieve Operational Goals reflecting choke points and repair times as well as options on support, spares provisioning and locations. This might require more joined up thinking in terms of looking across different platforms at capability and providing the right level of visibility of the Industry supply chain and the operational levers and commercial incentives to achieve target outcomes.

It means capturing the parameters and providing the Commands with aggregated and consolidated information needed to make empowered decisions, including trade-offs between contracts on how best to achieve the required 'effect' in the most efficient way. Using information empowers the Operational Analysis teams rather than have decisions made policy, Project Teams or Commercial contracts. It creates competition at a platform level and the Command (as the ultimate system integrator) is in a position to address the issue of paying for availability it never uses because CLS are not connected or aligned and so sub-optimised at a capability level.

This would require closer integration of strategic business processes within the Acquirer function. Asset and supportability strategies are typically looked at bottom-up today from a platform or sub-system level. With more dynamic modelling and improved information there is the opportunity to consider the whole strategy top-down.

Although a single information environment is a part of Lord Levene's Defence Reform recommendations, this applies to MOD and not to Industry. There are no common standards, definitions or formats to enable the aggregation and consolidation of information held by multiple Industry partners together with information held within different local Project Team solutions and LogNEC systems. Each company within Industry has its own in-house systems and tools and as noted below, different positions on their willingness to share information for competitive or intellectual property reasons.

This means that movements up the acquisition staircase to include more services, growth in CLS and in the use of horizontal CLS (as opposed to prime contractor relationships) means fragmentation of data across multiple Industry partners and collaborative work environments. With a large and growing proportion of data now held by Industry it raises key questions:

- Where does the master record sit? This is particularly important for maintaining a single definition of the design and base configuration record.
- What if Industry is providing line maintenance services in theatre? Whose systems should be used if Industry has superior processes and knowledge that resides within them?

"How good is MOD at accessing the information it needs such as for Force Generation? In Air Command it was not that the information was not available from Industry it was the level of trust as it was viewed to be false and there was no collaborative model to get to the cause of inaccuracies. Air Command did not have contextual information to understand the variability."

– Senior military interviewee

"MOD has good visibility of information available. Do they ask for the information without revealing the decision they are looking to inform or do they explain the question? The latter is far better so both parties can work collaboratively on finding the right information."

– Senior industry interviewee

"Industry already has a huge role in the information systems we use. Indeed many of the information exchange issues we have are that we use Industry IS to support our platforms because it is cheaper and carries less risk. This is possibly the key difference between engineering, safety and supply chain systems."

– Senior MoD interviewee

"If you have better information sharing on the platform than on the weapons systems then they are out of kilter anyway – one will be available and one will not so you are paying for one and the other is then a limiting factor meaning it is a wasted cost."

– Senior industry interviewee

- At what point does the master record reside with Industry? When accountability is with Industry and it holds 80% of data is it tenable for MOD to still hold the master record? One view was that Industry already has a huge role in provision of information systems for Team Defence, which is a source of many of the current information exchange issues. The experience was OEM IS was often cheaper and carried less risk but resulted in the diversification from a standard IS suite. Willingness to use OEM IS was possibly the key difference between engineering/ safety and more mainstream supply chain systems.
- How would post purple gate visibility be provided within MOD systems? To a large extent this challenge already exists in terms of visibility of the repair loop not managed on MOD systems.

8.4 Barriers to information sharing and collaborative working.

Information sharing and collaborative working is seen to be the cornerstone of delivering greater value from being able to fully exploit information. AgustaWestland noted that the 600 MOD staff sharing their site and working collaboratively are pivotal to success. Similar comments were made by BAE SYSTEMS, Thales and Rolls-Royce.

This is because debate does not just come from a process model, rather it is the dialogue that surrounds the information that is shared – what does MOD really want to achieve and in which order? BAE SYSTEMS gave the example that it could be asked to *"put this box on the aircraft"* but what was more valuable was a dialogue which was *"we would like to introduce this new capability"* and then for there to be an interactive process for defining the best way of achieving the outcome. This means sharing long term strategic information and the role the Joint User plays in it. This is most often the gap in the strategic thinking (the strategic process level described in Q6).

The barriers in collaboration between industrial companies were summarised in the Successor Case Study: legal, commercial, cultural, intellectual property, ITAR, security and technical. It also highlighted the importance of the right programme and governance structures in resolving these barriers. Some issues like ITAR needed to be worked on at an inter-governmental level.

Interviewees thought that within the Maritime environment industrial companies had relatively clear long-term roles, distinct capabilities and infrastructural assets. This meant there was a tendency towards greater collaboration between companies. Areas of conflict with Industry were more likely to be on the margins where traditional MOD/ Industry boundaries were shifting and companies were looking to extend their value chain into areas once occupied by MOD. This is exacerbated where MOD was not clearly defining how it wanted key roles to be fulfilled e.g. Design Authority. The level of security attached to certain Maritime assets meant that it was difficult to persuade all parties to adopt secure electronic information sharing, which was seen as vital for the introduction of best practices such as concurrent engineering.

Outside of Maritime it was felt there was more overt market competition although OEMs noted that in the post Haddon Cave era there was a real drive to go back to the OEMs so there were no longer lots of different parties making changes to aircraft.

In terms of barriers between MOD and Industry, there were viewed to be a number of factors including culture and use of shorter term, 3-5 year contracts. Both acted as barriers to information flow and collaborative working but also resulted in a more contractually driven relationship between MOD and Industry:

a. *Protection of information, knowledge and intellectual property.* This is seen as a key source of competitive advantage for re-compete. An understanding of the asset in the first 5 years of a contract is also paramount to estimating potential for savings in support costs in the next 5 years. These savings do not accrue evenly and it takes time to achieve any reduction, which drives Industry behaviours as an initially loss making contract needs to be moved into profit to recoup those costs. Industry is less willing to share information in these circumstances. The view was that 3-5 year contracts provide DE&S with confidence they are securing Value for Money, but are a barrier to unlocking improvements in performance and cost that come from a more collaborative model. Finally, export markets are now of prime importance and companies are reluctant to share where prime and sub-contractor roles might switch and shared information would set benchmark precedents to be used against them by a prime on a different contract.

b. *Short term payback investments.* Short term contracts need a direct and immediate payment. This means, for example, investing in more spares to meet availability% targets rather than Health Usage Monitoring Systems (HUMS) to improve design with a more long term and indirect payment, or optimise the order in which maintenance is carried out on the fleet. Typhoon was provided as an example of where the short term contract duration has influenced the scale of investment that it is economic to make, based on payment within the contractual time horizon.

c. *Lack of trust.* Trust between a Project Team and Industry on a new programme takes a number of years to develop. In the initial period there tends to be limited collaboration and information sharing. The point is reached where trust across the MOD/Industry boundary is sufficient for it to work and the contract reaches its end. A senior MOD interviewee commented: *"You only have to look at the 10 year history of Op Herrick and the way information flows have evolved between coalition partners as trust has been built between them".*

d. *Cost focus.* Interviewees thought that 3-5 year contracts meant Project Teams' horizon was purely focused on short-term cost savings (4 year Comprehensive Spending Review) and being able to deliver demonstrable savings. An MOD interviewee comments *"all commercial models are so fixated by cost whereas they need to take a broader definition of value and included areas such as removing risks".* All other metrics, such as improving reliability or reducing risk, as well as the longer term more strategic goals (e.g. fleet and obsolescence management) were not on the radar. Longer term contracts placed a completely different emphasis and a balance between cost and the more strategic objectives.

e. *Not valuing partnerships.* Again a senior MOD interviewee noted: *"we do not value partnerships within the MOD model. The reality is that MOD has to have a contract but if that is everything you have then the battle is effectively lost".* Another commented: *"DE&S have abrogated the customer/ supplier relationship to the cost savings"* it is the key metric staff are evaluated on. Looking at GoCo, it was thought it could go one of two ways. It could create a far more dynamic interface to MOD/Industry relationships and one that is far more culturally attuned and understanding of the importance of them. Conversely it could be hardnosed and brutal, destroying collaborative partnership in the pursuit of enforcing contracts and short term cost savings.

f. *Mutual understanding of the issues.* Again this takes time to develop. With the IMOS contract this effectively moved the DE&S/Industry boundary for the first-time. It was only by moving the boundary did Industry really start to understand the risks MOD faced and were they able to design processes and systems to address them. This learning curve takes time.

g. *Buy-in to non-proprietary standards.* The single information environment within defence is looking to replace existing information models with a single, non-proprietary approach to achieve coherence and interconnectivity. This means being able to integrate simulators such as Combined Arms Tactical Trainer (CATT) with those from other environments beyond Land. MOD does not feel that all of Industry has bought into working to a common standard and removal of proprietary standards.

There was a view that commercial practice within MOD was driving many of these barriers because of the need to re-compete. The UK support contract for Typhoon was contrasted with the much longer contracts given by other European nations to their build partners for support. Interviewees also highlighted that some of the older platforms, where there was only one company (usually the OEM) willing and /or able to provide support, had delivered some of the best improvements in terms of CLS: BAE SYSTEMS'S 10 year ATTAC contract had halved the cost per flying hour for Tornado. Since 2006, IMOS (Merlin) had reduced costs by 33% and in Maritime, the Sonar CLS had delivered an auditable baseline saving of 20% and improved reliability on assets up to 30 years old. These improvements were particularly striking as platforms such as Tornado had come into service in 1979.

"Information sharing is often viewed to be a threat. Every time the support chain involves multiple organisations there is a strain around who owns the data. This is less of an issue with MOD. It is more of an issue between different Industry organisations. Each party will want to own something that secures its grip on the future."

– Senior industry interviewee

"There is cultural change around information sharing as there are limits to the extent 'crown jewel' knowledge is shared. Organisations defend their core capabilities. To realise the benefits that come from sharing it has to preserve the value of that information to the company i.e. very long term contract."

– Senior industry interviewee

"A shared data environment would have definitely have helped avoid this and as a result of this accident people are more circumspect about data, checking and clarity on roles and responsibilities."

– Senior industry interviewee

"MOD needs to update its thinking as there is tremendous additional value that could come from investment in Product Lifecycle Management to get downstream processes involved earlier in the design whilst safeguarding overall design requirements. If this was a commercial business much more dynamic engagement of the supply chain would be allowed to happen."

– Senior industry interviewee

9. Is a single collaborative information environment realistic or should the focus within Industry be on bi-lateral agreements and sharing solely based on need?

Key conclusions:

- Successor provides a good Case Study of how more dynamic access to information and collaboration through a single IT PLM environment drives new forms of business model. It offers significant advantages from a design and build (concurrent engineering with the supply chain) perspective
- It also enables development of an early view of the maintenance schedule and fuller development of concepts for through-life support in the Concept and Assessment phase of CADMID in conjunction with the support partner
- The 'information era' requires MOD to embrace new ways of working and to resolve concerns over secure information sharing
- An open question is whether for collaborative programmes the prime contractor or MOD should own the environment given the life of the underlying assets. It does address data fragmentation
- For programmes that are OEM led, this is more likely to be a service provided by the OEM
- Aggregation of information across platform and sub-systems still requires common definitions, formats and standards. Master Data Management is a key element of this
- MOD needs policy for exploiting information FOR GAIN not just FoI and Public Record. This needs to cover ownership (across CADMID cycle), access and potentially one or more neutral service providers serving all of defence

Summary of interviews

The Successor Case Study provides a good example of how a single collaborative information environment with more dynamic access to information can be used to drive a new 'information age' business model that enables design (facilitating concurrent engineering) and parallel working down the supply chain and In-service partners on concepts for through-life support. Successor will be first submarine programme handed over with an MBOM[25] reflected in a fully populated single collaborative ILS[26] in TeamCenter[27]. For this the Concept and Assessment phases of CADMID will need to include definition of information requirements/exchange definitions that will drive the population of TeamCenter and an information governance model. Critical to this, is a well-developed understanding of In-service processes as well as what is needed to manage/mitigate risk and design intent through-life including upgrade and mods/inserts.

It represents a new way of working and requires proper resolution of any security concerns. It is possible to partition what information each of the build partners has access to. It enables innovation in the way the emerging product model can be shared with suppliers and In-service partners. This allows downstream processes to be involved earlier in the design process whilst safeguarding overall design requirements. Design is an iterative activity as you move forward from functional design enabling the spatial design to mature faster. There is a huge amount of design to get to right down to a parts illustrated list that can be developed concurrently and populated in Teamcenter. It can be used to develop an early view of the maintenance schedule and more fully develop through-life support concepts of operations although in the context of Successor there are security and ITAR constraints.

More broadly, interviewees felt there was no business case for sharing all information but that at an aggregated level it may make sense if there was demonstrable value in doing so. Clearly, consortium driven programmes are different from OEM or single prime contractor models. Information falls broadly into:

25 Manufacture Build of Materials (MBOM), which is distinct from the designed (engineering bill of materials), as it is what is needed for through-life support, ordering spares etc.
26 Information Lifecycle Support (ILS)
27 Siemens Teamcenter is an integrated suite of Product Lifecycle Management applications

1. **Asset Management**. This is the information needing to be generated and maintained through-life on tracking the baseline configuration of the asset through design, manufacture and maintenance covering technology insertion, modification and upgrade. Teamcenter is the tool to be used on Successor for this. This is needed to provide the evidence base and support risk-based decisions reviewed and approved by the Engineering Authority.
2. **Process**. Currently, much of this information is very transaction and is sourced from MOD systems on demand, usage, inventories and condition that are used by Industry to make cost and risk-based decisions as part of management and execution layer business processes. The gaps is there needs to be more higher value information from strategic and management processes that enable the proper integration of fleet, obsolescence, asset and supply chain processes as well as making planning more proactive and long-term planned.
3. **Health Usage Monitoring Systems (HUMS)**. Access to HUMS data for fault analysis and monitoring asset condition and usage.

On 1, even more important than the debate on collaborative environments was clarity about which party was the Design Authority and so had the mandate to maintain the master configuration record that underpinned design intent through-life. There were two issues. Interviewees thought it difficult to convey the 'understanding' purely from design information. The understanding is a key part of being able to maintain design intent. Secondly, if there were multiple design definitions then it all fell apart.

Another key question was who should own the collaborative environment and whether it should be MOD owned so that it is not owned by any one commercial interest. With products, such as Teamcenter used for Successor, there is the capability to segment data to give MOD the information it needs as 'requirements authority' whilst segmenting other information. It also avoids Drivers towards duplicating IT environments. It could also be at capability or Operating Centre level (i.e. submarine, combat air or helicopter fleet). The advantage of a pan enterprise capability is that it can also be used for nascent programmes so capabilities need to be enduring.

Looking at future needs and the potential to avoid data fragmentation to enable aggregated and consolidated information to be provided to MOD at capability level, there were a number of considerations:

- Contractual timescales. Industry thought there was no point in investing in a single information environment for a 3-5 year contract as there was no payback.
- Clarity on what was required. MOD thought that whilst there was a lot of discussion about secure information sharing there was often a lot less clarity on the nature of information exchange (exchanging emails or detailed design documentation) and the benefits case for investing in collaborative technologies.
- Information is held in a way that it can be extracted into common definitions, formats and standards so that if the need arises it can be quickly moved where analysis can be carried out. This fits in well with the cross-government CTO agenda which is looking to achieve greater commonality and commoditisation of technology choices.
- An enterprise level approach to master data management, reflecting MOD's desire to rationalise inventories and consolidate on more standard components, particularly where it had extensive existing inventories.
- Information must be held at a realistic level of aggregation. For example, it may be necessary for Industry to provide aggregated information to MOD to support its decision-making. For this information need not be held at a part or item level, but aggregated to enable an interaction with DE&S and Commands to support decision making or dynamic. How information is fed into a single environment then needs to be negotiated within the programme.
- Where data is being exchanged there needs to be greater focus on information assurance and cyber security safeguards over MOD data needs to be in place. This is particularly the case for sensitive programmes such as Successor.
- Level of information sharing between prime and sub-contractor. This would need to vary depending on circumstance.

"A single collaborative environment is too expensive and probably not necessary. It should not be a just in case as there is a high on-going cost. It comes back to the point on what is the nature of the boundary exchange – what is being exchanged and in what way?"

– Senior military interviewee

"A single environment avoids the current model which keeps on duplicating different environments. This could be a single collaborative at platform level. Maritime is considering a pan enterprise capability as there are nascent projects so capabilities needs to be enduring."

– Senior industry interviewee

"The requirements definition piece is the key. Need to find a better way of specifying requirements in general but especially for information. Requirements must relate and tie back to the overall beneficial outcome (CONOPS)."

– Senior military interviewee

"This comes back to the value chain analysis. Need to sort out the process model to enable the joint process. If you cannot get the overall business model defined then the rest is superfluous. Understand the single system of value. Streamline and remove duplicate roles and information. The long term contract is key to this."

– Senior industry interviewee

MOD needs a policy for exploiting information FOR GAIN not just Freedom of Information and Public Record. This needs to cover ownership (across the CADMID cycle), access and potentially one or more neutral service providers (potentially from the J2 and CCIRM [28]) to collect, collate, process & disseminate on behalf of all of defence, although the product life cycle and changes on anticipated mean that:

- There is a need for very long duration storage and clear Governance as well as Ownership across the lifespan of the underlying data
- Assured access and continued ability to extract and transform throughout lifespan
- A data catalogue to allow potential users to understand what is there and the context in which it was gathered

Section D: Implementation

10. Which areas of the IVCA model do you see as having the greatest immediate value for MOD? Which areas should be prioritised in terms of incremental implementation?

Key conclusions:

This suggests the implementation approach is three fold:

- *Single System of Value* - address issues and opportunities identified based on detailed understanding of the end-to-end value chain, roles and responsibilities. Create more standardised components and reference models for process with standard information and exchange requirements
- *Strategic and management processes* – this was identified as a quick win and a way to unlock significant additional value over the current focus on more transactional data. It includes the recommendation to transfer more of the management processes to industry and for DE&S to focus on both the strategic layer but also operating enterprise level processes across capabilities areas
- *Raise the model up to an enterprise model* – within a defence reform model; articulate the overall end-to-end value chain and separating out what is with JFC and individual service Commands who aggregate force elements, DE&S as Acquirer and Industry. Create a strategic level dashboard that brings together the threads of information that enables strategic choices. Elevate to enterprise level the key process sitting across capability areas that enable implementation

10.1 MOD perspective

Interviewees thought it very timely to address IVCA in parallel with the issues with CLS (including MOD audit reports) its growth accelerates and complexity increases. In this regard, Successor provides a good end-to-end picture of a way forward. The following priorities were identified by MOD interviewees:

1. *Understand where MOD needs to target.* An exercise, probably by value (rotary wing and high value platforms are a priority) with a deep dive on a sample to really understand the issues and opportunities. This research will provide the evidence-base MOD to mandate a change in approach. MOD definitely realises there is significant value that can come out of IVCA but it is only at the start of the journey in raising its prominence in terms of changing culture and addressing known issues such as data quality. Much of the current model is about exchange of very transactional data whereas it needs to be more strategic and about long-term partnering and genuine collaboration.

   Research needs to start with the definition of Operational Goals and development of requirements for through-life support, including cost modelling and decision-making processes. MOD needs to find a better way of specifying requirements in general but especially for information.

   Requirements must relate and tie back to the overall beneficial outcome: "If you go back and pick up any URD and try to ascertain the beneficial outcomes it is seeking to achieve it is incredibly difficult to extract the big idea – maybe Successor is the exception given CASD". It needs to consider the overall SOSA approach to defining requirements and ensure it is driving the right kind of integrated behaviour across a capability. The URD needs to have many more standardised components, otherwise "we will continually face the current issue that 10 years on from contract signing the world has changed and we are stuck with a legacy contract and unable to respond in an agile way". Articulating what we are trying to achieve is key. This applies to "all of the DLOD otherwise we will have another Apache scenario where we have aircraft but no trained pilots".

   The key driver for change is financial (in-service support costs) and finding efficiency savings whilst improving across the Commands' 4 key metric domains: development, capital, through-life and activity levels.

2. *Focus on running pilots.* Identified changes need to be rolled out to a few more platforms to really understand the implications. The tenets of IVCA could also be applied, to building business cases, accelerating scrutiny and assuring early benefits realisation. The key success factor for the adoption of IVCA will be the development of criteria to screen programmes for one or more intervention opportunities as Beacon Projects (in OGC speak) that would prove the concept, provide lessons and inform broader recommendations such as rewrite of JSP886.

3. *Extend the footprint.* This includes extending to lower value platforms. It needs to be broad in coverage so it tackles issues such as professionalisation of the field-force including the retained asset management function (where design, engineering and supply chain are brought together).

4. *Implement the control systems.* Within defence reform, the accountabilities are now carved up and information has to be aligned with these new accountabilities. This means articulating an overall end-to-end value chain and separating out what is with JFC and individual service Commands who aggregate force elements. Too much of the information focus today is about the "engineering moment". What is needed is to present comparable performance/cost information for each capability with a greater focus on meeting the needs of the Command as the customer of the process. They are the real service integrators in the new model, which means GoCo/DE&S have to meet sophisticated information requirements to inform their option analysis and decision-making across a new commercial boundary. This has to be fact-based not rely on supposition and estimates. This suggests some form of strategic dashboard that links the end-to-end value chain with information requirements at enterprise level to empower the Defence Reform model and enable options and decisions to be evaluated at an enterprise level.

   A key part of this is likely to be standardisation of key components of service and information. Simplifying and enabling complex interactions to be understood at an enterprise level based on common definitions. A standard reference model would be good in understanding integration and reflecting roles and responsibilities within the model. It is different from the support option matrix as this is more about an acquisition staircase where you are allocating individual responsibilities along process lines. A more standardised process model would enable standard interfaces and standard information exchange definitions.

5. *Enabling more radical change* – the question with the Successor Case Study is whether it allows DE&S to become more outcome focused. The SDSR in 2015 and the 2013 Treasury Spending Review will require further bold moves that transfer more responsibilities to Industry to save costs and raise performance. There is a current exercise with the Defence Suppliers Forum looking to identify more innovative and radical models.

"If we had to choose between a more information centric model and a direct focus on fixing gaps in the strategic/planning processes then, it is the strategic thinking piece which has a quicker win."

– Senior industry interviewee

"I am a strong supporter of tackling the issues with CLS. It is timely as CLS will grow and the issues in the audit reports need to be addressed. Successor provides a good end-to-end picture of a way forward. Looking at priorities, understand where MOD needs to target and how to move forward."

– Senior military interviewee

28 J2 - Operational Intelligence. CCIRM - Collection Coordination and Intelligence Requirements Management

"When you buy a drill at B&Q you are buying holes not a drill and so MOD is buying the threat of holes in somebody or something rather than a range of sub-systems and platforms. It is the complete asset that is key to get holes in a target – the complete capability."

– Senior industry interviewee

"The whole model must inform through-life costs. The job was done in Afghanistan but the struggle is accounting for the cost. Need to Proof of Good Order if making an operational decision based on information. What is the impact to strategy? What is the impact on operational effectiveness?"

– Senior industry interviewee

10.2 Industry Perspective

In contrast, interviewees came about the issues from a very different perspective:

1. *Analyse out the value chain.* The fundamental issue is sorting out the process model and fixing the issues at strategic and management level so that it results in more predictable and demand responsive execution by an integrated MOD/Industry team. It needs to be driven through a proper architectural approach starting with the strategic level business drivers. It should be a lot more standardised with clear process reference models to draw on. If you cannot get this overall operating model properly defined with clear roles and responsibilities and corresponding information requirements then the rest is superfluous. It needs a focus to continuously work on streamlining processes; make activities more long-term planned and remove waste and duplication of roles and information sources. A long term contract is key to being able to do this. It also needs good planning tools to taking out costs and optimise decisions from at a strategic and an enterprise level.
2. *Resolve strategic and management processes.* The biggest challenge is getting the strategic/policy direction. Often there is clarity at a senior level within the military but it is the management layers where posting policy and SQEP means that it is not being translated into actionable plans for execution by Industry. One industry interviewee summed it up as: "If we had to choose between a more information approach and a direct focus on fixing gaps in the strategic/planning processes then, it is the strategic thinking piece which has a quicker win. It is difficult to understand why MOD has been so unable to plug the obvious gaps in its processes".
3. *Understanding where to draw the boundary.* It is likely that more of the management level processes should be moved into Industry as they have the process focus, SQEP and access to capabilities, knowledge and experience to undertake these tasks.
4. *Tackle behaviour and culture* – information needs to have the same level of importance as other DLODs and not be marginalised to C4ISR (battle winning IT). It will not be possible to change behaviours unless information moves centre stage "XV230 Nimrod caused the top of the shop to realise the importance of changing attitudes to safety and they quickly embraced change. It now needs real examples of what is hurting MOD as a result of the lack of information and how it can be improved". Industry cannot continue to live day-to-day with poor information flow and data quality issues. Part of this is MOD posting policy as it requires consistency to tackle the issues and more than 18 months for trust and collaborative behaviours to develop on any programme.
5. *Rationalise commercial models* – each Industry partner has a current portfolio of contracts that generates inconsistencies because each contract is unique. In turn, this creates different IT/data requirements based on output measures. In theory MOD needs the same outputs to be created i.e. flying hours at a cost. This asks the question why the differences exist as it also creates enormous complexities within MOD's own business and a loss of enterprise level learning through not being able to benchmark or aggregate any information. MOD must have a vision of creating a standard model. There will always be slight difference given the nature of platforms. The HELS Operating Centre is well down the line compared to others.

We should like to thank those who made themselves available to be interviewed or for review and their valuable contributions to this study:

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