



Ministry
of Defence



Strategic Command



TEAM
DEFENCE
INFORMATION

MOD DMSO, DSEP, & Industry: M&S Workshop

Early Market Engagement Workshop
Shrivenham 23/01/2024



Foreword

This document summarises the comments, opinions, and ideas contributed by attendees during a modelling and synthetic environment workshop held at the Shrivenham Defence Academy on 23rd Jan 2024. The workshop was convened by Team Defence Information (TDI) and featured Subject Matter Experts (SMEs) including Strategic Development Partners, Service Partners, and Solution Partners.

This document does not attempt to set out a coherent vision on the form this new service should take or a larger Modelling & Simulation strategy, but simply to group the opinions of the workshop attendees into similar topics. It is to be viewed as a staging post from which the concepts voiced by the industry can be expanded on and incorporated into the proposed solution.

It intends to offer advice to DMSO as they consider an Industry-wide solution to develop MOD's exploitation of modelling and simulation (M&S) to improve operational performance and deliver greater value for money.

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Contents

Foreword	2
Executive Summary	4
Introduction	5
Defence Synthetic Environment Programme (DSEP)	5
Defence Modelling and Simulation Office (DMSO)	6
Industry Engagement	7
M&S within Defence	7
Current State	7
Key benefits	7
Challenges	8
Other Considerations	8
SWOT Analysis of DSEP	9
Learning Opportunities	9
Standards	9
Projects from alternative industries:	10
Examples within the wider Defence industry:	10
Examples of Digital Marketplaces:	11
Implementation	12
Case Study: DII (Defence Information Infrastructure)	12
Requests from Industry	13
Development Methodologies	13
Requirements:	15
Next steps	16
Conclusion	16
Annex	17
Abbreviations:	17
Definitions	17
About DMSO (Defence Modelling & Simulation Office):	17
Specific Nomenclature and Definitions	19
JSP 939 Rules (Coherence Principles)	21
Excerpt from a recent MoD press release	22

Executive Summary

This white paper is the culmination of a collaborative activity between Team Defence Information (TDI), the Defence Modelling and Simulation Office (DMSO) and the Defence Synthetic Environment Programme (DSEP). This workshop sought to obtain high-level industry insights on the concept of a pan-Defence Modelling and Simulation (M&S) ecosystem to support multi-domain operations (ensuring that every part of Defence can work seamlessly together, with other government departments and the UK's allies, to deliver a desired outcome) through common digital assets and services for standard and customised programmes across [Modelling & Simulation \(M&S\)](#), [Synthetic Environments \(SE\)](#) and [Digital Twins \(DT\)](#).

The value of M&S and the potential to further exploit its capabilities and benefits for the MOD was acknowledged by all participants. Industry was also clear that this is a big challenge with which to wrestle, but feedback from the collaboration workshops provided many threads which can be explored further and some topics for the DMSO and DSEP teams to remain watchful of:

- Aim for DMSO to be the first place that Defence M&S users would turn for M&S guidance
- Consider commercial challenges, for example:
 - Protection of intellectual property rights (IPR)
 - Supplier risk and liability
 - Potentially conflicting criteria for primes and small and medium enterprises
 - The need for agile procurement and compatible commercial models
- Marketplace concepts tend to be more successful when they have a focal point around which to cohere
- An ecosystem is likely to be more coherent, and better able to exploit existing skills and capabilities if built around established commercial (including academic) best-practice
- Iterative improvement of capability is a key benefit of a service-led approach
- Embracing spiral development and taking an agile approach is likely to deliver an optimised performance and maximised value from investment

This paper summarises the views of Industry M&S experts who participated in the workshop and is intended to inform the discovery phase of the DMSO/DSEP programme, support the operating centre and offer guidance on commercial approaches and technical options.

Introduction

At the request of DMSO, Team Defence sought a comprehensive view from Industry on how to promote and integrate the use of M&S to aid the MOD through enhanced capabilities, increased agility, and greater responsiveness.

Modelling & Simulation (M&S) has the capacity to deliver a range of enhancements to all areas of capability – supporting war fighters, trainers and equipment acquisition and support functions alike - by using advanced predictive capabilities and creating realistic, adaptive synthetic environments. These powerful tools will become increasingly critical as AI and other cyber technologies are developed by potential adversaries. This paper recognises the MOD intent to apply M&S capabilities across the full range of military functions from R&D, Force and Capability Development through to Training and Operations.

140 subject matter experts from across the Defence enterprise volunteered to assist with the workshop which informs this paper. The volunteers were briefed in person at MOD Shrivenham and divided into 3 groups, to focus feedback on their specific backgrounds and expertise:

- **Strategic Development Partners**
To design, build, integrate, and deliver the solutions & components for a cohesive pan-Defence M&S ecosystem
- **Service Partners**
Vendors who can provide M&S data, components, services, and applications to meet current and future needs once identified through the Defence Synthetic Environment Programme (DSEP)
- **Solution Partners**
Companies and end users who should benefit from DSEP to deliver more effective solutions into Defence, whether that's R&D, training, or operations

Defence Synthetic Environment Programme (DSEP)

Industry participants were provided with a short brief on the founding principles and proposed operating concept for the Defence Synthetic Environment Programme (DSEP).

DSEP aims to provide centralised delivery of services for Modelling & Simulation, Synthetic Environments and Digital Twins that projects and programmes can exploit across Defence.

DSEP aims to provide common data, services, and frameworks, generating value from reuse and increasing capabilities by linking previously siloed activities.

DSEP has been developing a cloud-based M&S ecosystem, using open architectures, and modular services to deliver the common assets and services required for pan-Defence activities, enabling projects and programmes to customise their solutions to ensure their specific objectives are met.

By delivering centralised data and services, DSEP will create a MOD-coordinated, common M&S baseline available to an array of use cases which benefit from simulation-based predictive capabilities including:

- R&D
- T&E
- Force and Capability Development
- Training
- Operations

DSEP aims to deliver across 3 fundamental programmes and user needs:

- Accelerate - The deployment of new programmes
- Enhance - The capabilities of new and existing programmes
- Better exploit - The value generated from current programmes

DSEP will work in sync with Front Line Commands (FLCs) and Industry programmes and applications, servicing the pan-Defence need via two-way interactions, providing data and services ('push') as well as obtaining data and insights relevant for downstream use ('pull') plus streamlining interactions between disparate solutions.

Defence Modelling and Simulation Office (DMSO)

The Defence Modelling & Simulation Office (DMSO) is a specialist, centralised Ministry of Defence (MOD) team within Joint Warfare (JW), Strategic Command. This is a recently formed team (April 2022) with approval to grow to a staff of 15.

Working for Strategic Command as an overarching capability, the vision is:

“Enabling Defence to operate, integrate, innovate, develop and adapt through the exploitation of Modelling and Simulation by promoting coherence, reuse of resources and interoperability across Defence and with Allies and partners.”

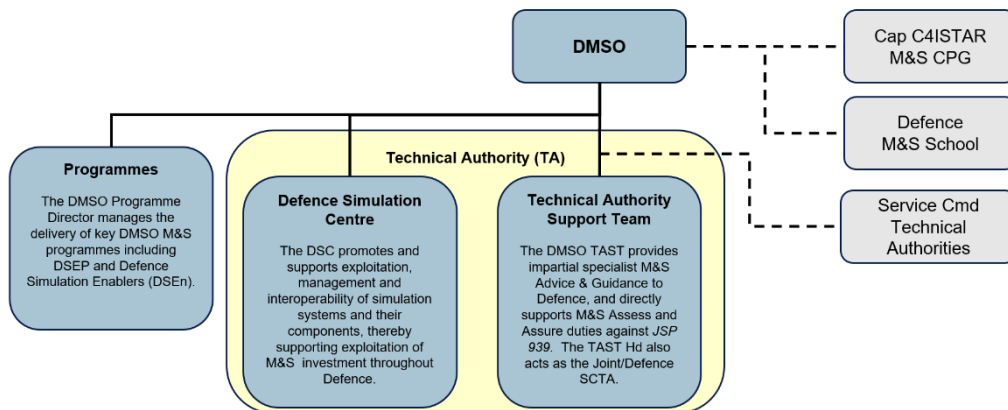


Figure 1: Defence Modelling and Simulation Office (DMSO) structure.

Its customers – anyone with an M&S query/enquiry/issue, including MOD, OGDs, Allies, Academia, and Industry.

DMSO will work toward collating Defence M&S assets and resources, processing those available for reuse into a separate interactive catalogue.

DMSO will help MOD users select capabilities and support them in their implementation by offering advice on product/service orientation, stakeholder facilitation and corresponding skills and competencies.

The key MOD policy and industry standard in use is [JSP939](#), which is intended to provide direction and guidance for the acquisition, development and usage of modelling and simulation across UK defence. However, it is envisaged that further standardisation for data structure would be required for any new, shared ecosystem, especially if modular components are produced by different teams and organisations.

Industry Engagement

Working with Team Defence, DMSO and DSEP teams selected five steps to help understand the pan-Defence M&S ecosystem from an industry perspective:

1. Internal customer investigation with MOD *Complete*
2. Review and summarise *Complete*
3. Wider Industry consultation over MOD findings *Next Steps*
4. Review and summarise *To be done*
5. Request For Information (RFI) This white paper forms step 2 and will be provided to Industry for consultation in step 3

M&S within Defence

Current State

M&S currently plays a critical role across the entire defence landscape at almost every phase of the lifecycle, however, DMSO intends to add value to M&S activities within Defence. This is a remit to optimise interoperability between M&S functions and user communities and to exploit existing capabilities with a broader user set. Additionally, advances in data analytics, artificial intelligence (AI) and autonomous systems require synthetic data, virtualised testing, training, and evaluation capabilities. due to the complimentary benefits and dependencies that these central pillars of advanced digital capabilities each have.

Within the design function, digital modelling is common in more recent projects; however, this is often siloed with much legacy information existing only in printed documents, spreadsheets, or email chains. While simulation tools are commonly used, it is often only applied to individual components or systems, with little thought given to wider integration. Consequently, this data is not readily available to the potential full user community. Furthermore, there is only limited feedback from real-life data once the capability is in operation which reduces the potential value of the model and limits Learning-from-experience (LfE) opportunities. This leads to unnecessary duplication as many assets are modelled repeatedly and with only a fraction of the potential capability available to users.

The benefits of M&S, SEs, and DTs have been well documented and were universally endorsed by the participants.

Key benefits

- Once created, building blocks may be used for other applications in training, mission rehearsal and conversion of operational requirements spanning the full lifecycle
- Once established, M&S solutions could dramatically reduce testing time and financial burden of projects
- Provide faster design iterations for existing solutions

- Enable the progression of more innovative solutions with reduced development overhead
- Support for DTs federated by using a common environment.
- Evidential support to all responding to pressures of continual improvement (i.e. doing things better, faster, and all whilst delivering increased value for money)
- Allow for the integration of emerging digital technology, such as AI
- Suitable for use with modern data analytics approaches

Challenges

- Security challenges from external threats, plus robust classification, and declassification procedures
- Need to ensure Validation & Verification (V&V) of components and solutions before they may be applied
- Determine trust metrics and liability for suppliers when products fail or otherwise lead to unexpected outcomes
- Integration risk: with a potentially, large number of different assets from partners and/or allies, interoperability requirements should be considered as early as achievable in the lifecycle
- Agreement on standards for a given range of capability should developed collaboratively by an appropriately broad range of stakeholders

Other Considerations

- Whilst a unified architecture with full interoperability remains an aspiration, the ability to pass or link relevant data from and between assets would suffice for current maturity levels
- High-volume, low-value assets should be separated from more sensitive materials in a catalogue format
- Acceptable open data formats should be identified to prevent reliance on proprietary formats, facilitating sharing and accessibility
- As with all complex projects, solutions should be considered as iterative as requirements change and understanding of underlying problems evolve (qv spiral development)
- The threshold for access should be as low as is necessary to meet the needs of the user (qv user-centric design)
- Identify responsibilities for M&S roles with clear guidance for those charged with updating and managing data
- Incomplete or partial capabilities may be developed further by being paired with collaborating partners under DSEP guidance
- A communications plan to spread awareness of DSEP to ensure it is fully exploited and return on investment maximised
- Access via the digital backbone enabled to provide opportunities for continuous development by [Defence Digital Foundry](#) and Industry partners
- Consider accessibility via a DSEP cloud solution to enable cost-effective down/upload of software in a secure environment for testing and application. This would permit different instances of the same programme to be used, maximising licencing value and hardware utilisation
- Take a coherent architectural approach to requirement-setting and agree an ontology for data sharing and interoperability to provide wherever achievable common M&S solutions for a wide range of capability from, for example, high-level OA to engineering or acquisition models

- Security considerations, both physical and digital, should be considered early in the lifecycle and tested alongside other assurance criteria during validation of methods and outcomes
- Risk appetite should be clearly understood by all relevant stakeholders; also, the degree to which trust between customer(s), primes, system integrators and component suppliers can be established is likely to affect the overall effectiveness of M&S applied to Defence
- Success metrics to be agreed by user community; consider: quality of decisions, speed-of-delivery for outcomes, level of visibility/accessibility or cost savings
- M&S data and the models should be kept separate so that flexibility is maximised, and complexity remains manageable

SWOT Analysis of DSEP

“A SWOT analysis is designed to facilitate a realistic, fact-based, data-driven look at the strengths and weaknesses of an organization, initiative, or within its industry.”

Below is a SWOT analysis, intended to summarise the predicted advantages and opportunities of the new solution as proposed, as well as the most likely weaknesses and threats it will face.

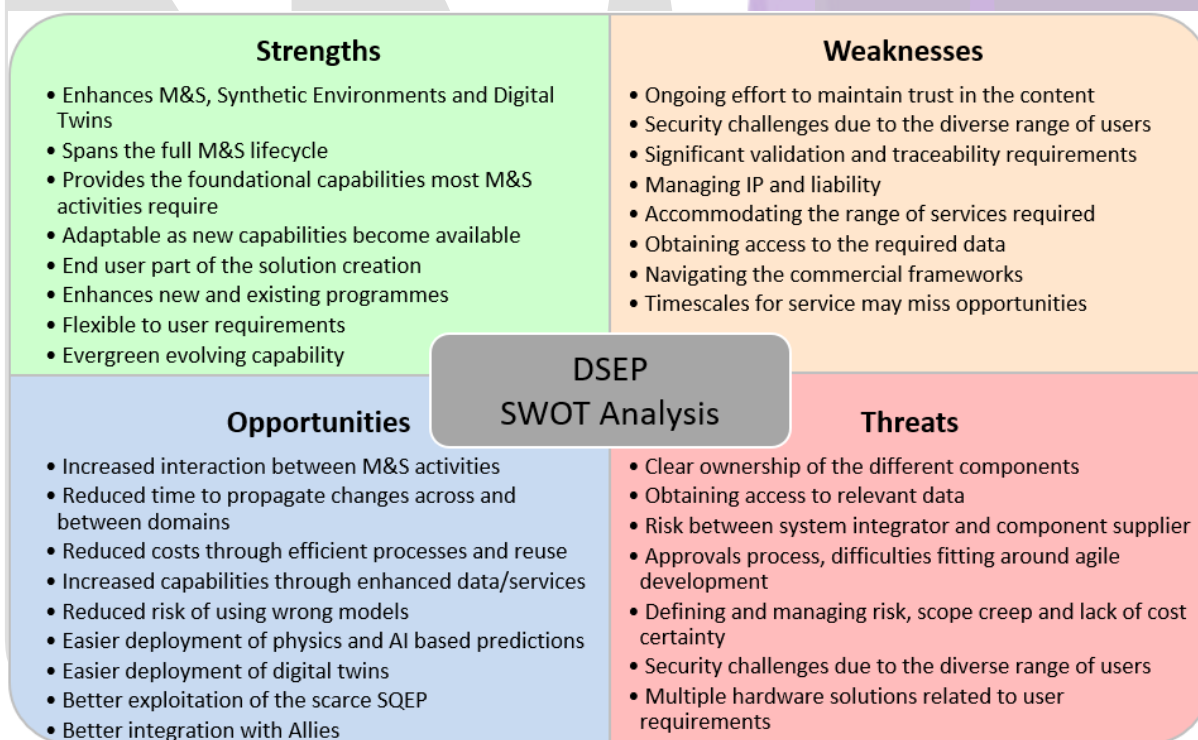


Figure 2: DSEP SWOT Analysis (Strengths, Weaknesses, Opportunities & Threats).

Learning Opportunities

Standards

The key MOD policy in use is [JSP939](#), which includes a set of [coherence standards](#) and provides direction and guidance for the acquisition, development, and usage of M&S across UK Defence. However, further standardisation for data structure would be required for any new, shared ecosystem, especially if modular components are produced by different teams and organisations leveraging different tools. For the future, policy staff would be encouraged to consider how flexibility (and cost-effectiveness) may be enhanced by re-use of existing (compatible) systems, thereby reducing file conversion time, training, and licencing overheads.

Projects from alternative industries:

The following list whilst not exhaustive was drawn from the experiences of individual businesses supporting the workshop. This list, or one like it, could be developed further as a valuable follow-on activity for the team:

- [Ordnance Survey](#)- Creation of the OS National Geographic Database (NGD) which contains over half a billion geographical features and is kept up to date with 20,000 daily changes. With the ability to create customised data selections, customers will be able to more easily pick and choose data as and when they need it from a simplified data structure, with the potential to speed up processes from a week to a matter of minutes and hours. This is only operated within one organisation with many legacy assets.
- [Health service](#) was viewed as having similar challenges to Defence (e.g. [Serenity Integrated Monitoring in A&E](#), [NHS Data Partnerships](#)). The NHS intent is not for everything to be interoperable; however, they are open to fast and agile acquisition which has produced faster solutions whilst reducing costs. This will connect many different organisations.
- [Formula 1](#)- The development of cars in 6 days between races limits real-world testing. So, they rely heavily on digital twins to rapidly train drivers, develop cars and set up cars for a specific race. These synthetic environments can allow drivers to test cars on specific tracks in predicted precipitation, heat, and humidity.
- [Sony and Honda](#) – SHM (Sony Honda Mobility) Sony have teamed up with Polyphony Digital (Creators of the Gran Turismo video game) to combine simulation data, experience, intuitive operating systems, and more to future vehicles such as the Afeela. SHM intends to fuse the virtual and the real in development.

Examples within the wider Defence industry:

- [USA Department of Defence](#) - Trusted Capital Digital Marketplace (TCDM). The program establishes trusted sources of funding for small and medium-sized providers of innovative defence-critical capabilities, offering long-term strategic benefits and combatting predatory investment practices. The modular open architectures employed by DoD were viewed favourably by the workshop attendees but with caveats: similarities and differences need to be understood before determining a direct read across; also, how well has the DoD approach delivered against their original intent? DoD acquired an architecture and made it available for reuse - is this working as envisaged by industry and DoD?
- [NATO M&S Centre of Excellence](#) – The NATO M&S COE is located near the southern outskirts of Rome and acts as a catalyst for transformation through the involvement of NATO, governments, academia, industry, operational and training entities, by improving the networking of NATO and nationally owned M&S systems, the cooperation between Nations and organisations through the sharing of M&S information and developments and serving as an international source of expertise for transformation in the related domain.
- [Niteworks Modular Architectures](#) - support capability drawing together a broad spectrum of knowledge and expertise from industry, the MOD and academia in a collaborative environment to analyse and address security and defence issues. The Niteworks 3 contract ceased following the original contract timetable on 31 March 2018.
- [CRENIC](#)- Project CRENIC is a £400 million programme intended to deliver next-generation FP ECM protection in the land and littoral domains for the British Army, and ground elements of the Royal Navy and Royal Air Force. It is specifically designed to protect personnel from the threat posed by explosive ordnance initiated using the electromagnetic environment as a

command mechanism. It is a good example of a Common services approach that could be emulated. CRENIC approach to engaging with industry is also recognised as a good practice.

Examples of Digital Marketplaces:

Providing a comprehensive cost framework for a 'store' would enable opportunities to manage both specific App costs and the resources required by the overall delivery service. Defence would also be able to invest separately should they wish to develop a specific element of capability. 'Catalogue' type marketplaces are successful because they have a focal point around which to cohere and share knowledge. For example:

- [Unity Store](#) - For example, Unity Asset Store allows game developers to buy and sell a wide variety of assets available, covering everything from textures, models and animations to whole project examples, tutorials and Extension Assets. Games engines are good examples of ecosystems, but the workshop counselled that using the games industry as an analogy may be unhelpful as risks, adaptation difficulties and scales of investment are very different.
- [GitHub](#) - is a developer platform that allows developers to create, store, manage and share their code. It uses Git software, providing the distributed version control of Git plus access control, bug tracking, software feature requests, task management, continuous integration, and wikis for every project. is viewed as a good example of a technical vendor service; however, comprehensive market scanning to identify best in class might be a challenge for the exacting requirements of Defence users.
- [Argos Catalogue](#) - shows it has a good place a search for requirements via a clear marketplace mechanism – one place, with precise information, is a trusted source and guide to what is available.

Security is a specific concern for MOD and protective markings, classifications and cyber security measures will need to be afforded appropriate priority. That said, careful risk management may enable opportunities for non-standard suppliers to support Defence outcomes where a sufficiently compelling advantage has been identified. Similarly, export controls (e.g. ITAR) need to be given careful thought.

Case Study: DII (Defence Information Infrastructure) Background

In 2005, the Ministry of Defence offered a contract to a consortium of suppliers called Atlas to replace a large number of different computer systems being used by the military with a single system that would be used by all MoD users: 300,000 accounts across 2,000 sites.

Outcome

This should all have been available in June 2006, but less than half of the requirement had been delivered two years later in June 2008. *“ATLAS underestimated the complexity of the software it had agreed to create and could not muster the resources to run multiple streams of software design work concurrently. When ATLAS did present designs, they were often not in a fit state to be signed off, forcing the Department to decide whether to wait for new designs and delay the Programme or to proceed at risk. During the first two years of the Programme, the number of defects found in ATLAS’ designs was unacceptably high.”*

Lessons

“When the DII Programme attempted to begin implementation in 2005, it quickly began to unearth problems, such as asbestos, at many sites. These issues took much longer to resolve than the 38-week timetable could tolerate, but the lack of active project management—supposedly one of the advantages of the Fixed Rollout Methodology— meant that a flexible response was impossible. Sometimes, a single manager would be responsible for the implementation of DII terminals at up to 30 different sites. In many places, this resulted in sub-contractors attempting to do work at sites in line with a timetable that was no longer realisable. It was only at the beginning of 2007, almost two years after the start of the Programme, that a more sensible rollout methodology was adopted.”

“The Department did not conduct a pilot before commencing full implementation, even though the DII Programme was complex and the timetable ambitious. Even if the rollout methodology does not change substantially in future, the Department should set aside time to run a pilot before commencing work on each remaining increment of the DII Programme. This will allow it to recognise and reduce risks not previously encountered.”

Figure 3: Excerpt from a recent MoD press release.

Source can be seen:

<https://www.gov.uk/government/news/widespread-reforms-to-transform-delivery-of-kit-to-uks-armed-forces>

Implementation

If M&S is to become an everyday part of MOD activities, confidence in both outcome reliability and the M&S ecosystem needs to be established and DMSO acknowledged as the principal M&S authority for defence users. Furthermore, accessibility for users should be enhanced with barriers-to-entry minimised to simplify curation and delivery of M&S capability. Commercial and other risk criteria may need to be considered by the authority. The workshop recommended:

- Don't try and build it all at once, iterate by scaling up from an established minimum viable product
- Think innovatively about approaches to managing IP
- Create modular components that FLCs use to build a capability
- Maximise the re-use of legacy digital assets
- Collate a use-case library and encourage additions from users
- Use of spiral development principle to deliver capability efficiently (and consider appropriate commercial approaches for each solution/requirement)

Requests from Industry

The workshop participants listed the following requests of the authority:

- to provide a list of potential use cases to improve understanding of what market expectations might be
- consider the evolution of the model through the entire lifecycle and notify future interoperability requirements as early as possible
- create a dependency map that summarises current usage and existing best practices; this would improve engagement with stakeholders
- Improving awareness. No matter how well designed and implemented the systems are, they will not get used unless the defence community know they exist, understands their usefulness, and can learn how to use them quickly
- consider flexibility; analyse existing utilisation of M&S to ensure that, where achievable, users able to apply tools with which they are familiar, have licences for and that follow current file formats

Development Methodologies

The workshop recommended that DMSO (and DSEP) should adopt a phased approach. This would require lower initial levels of funding and create capability organically with spiral development leveraging lessons learned. This be considered as part of a de-risking strategy that would support M&S roll-out at a granular level. As M&S have many applications within Defence some industry use cases are listed in the ['Learning from Industry'](#) section.

There were several valid delivery approach considerations proposed during the workshop sessions. Essentially, these contained elements of both Agile and Spiral models. Agile where flexibility and adaptability are required to accommodate evolving requirements and Spiral breaks the programme into phases to manage risks through incremental development.

By understanding the nuances between the Agile and Spiral models, project teams can make informed decisions about which methodology best aligns with their project goals, constraints, and organisational culture. Whether prioritising adaptability and customer collaboration with Agile or focusing on risk management and iterative refinement with the Spiral model, choosing the right approach would improve project success rates and overall stakeholder satisfaction.

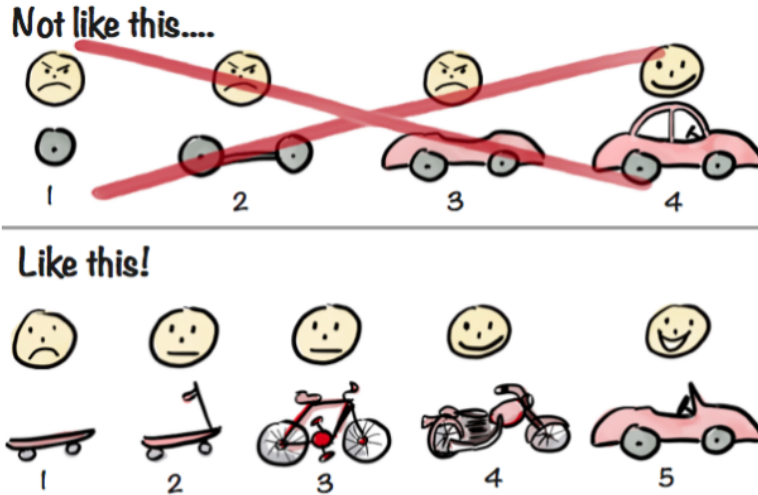
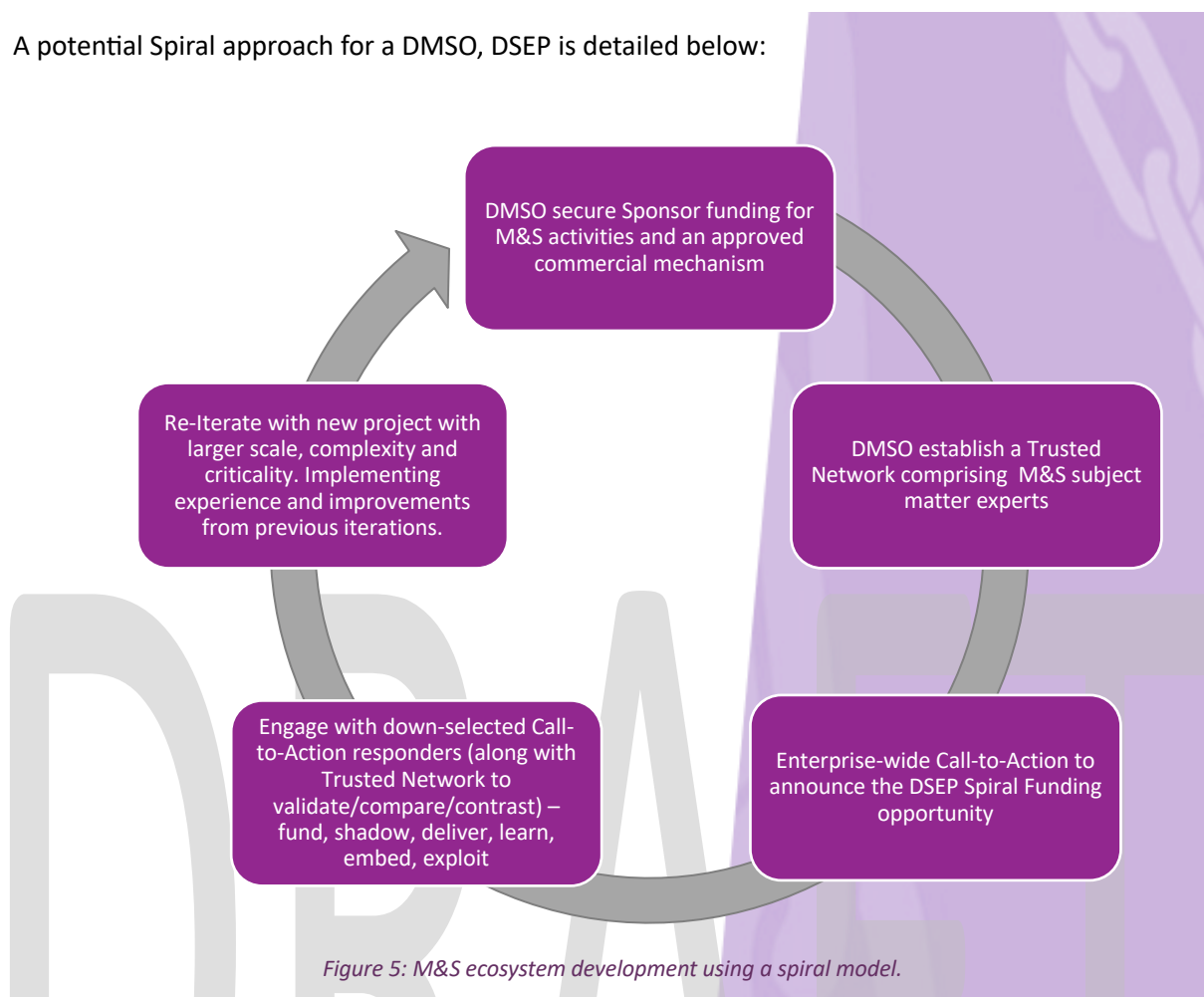


Figure 4: A metaphor for agile development, it's not about the delivery of half a car, but focussing on the underlying customer need, in this example it's to get from A to B faster and deliver that in an agile manner.
 Crisp (2016) Making sense of MVP (Minimum Viable Product). Available at:
<https://blog.crisp.se/2016/01/25/henrikkniberg/making-sense-of-mvp> (Accessed: 20 March 2024)

Industry supports the DMSO intent to adopt a spiral development approach, The automotive industry uses spiral development widely for complex tasks as well as for managing risk. The spiral model is used by software engineers and is implemented in large, expensive, or complicated projects. It generates a minimal viable product and refines the product through each phase of the spiral as well as testing prototypes at each phase. The most important feature of the model is its ability to manage unknown risks after the project has commenced; creating a prototype makes this feasible. Any early failures would be self-contained, small in scale, and act as LFE for the next iteration of the spiral, rather than committing all resources to an approach from the outset with little flexibility if requirements develop.

A potential Spiral approach for a DMSO, DSEP is detailed below:



The key benefits are to **deliver enhanced M&S capability** and **deliver existing capability faster**. Coincidentally, a recent MOD press release supporting these aims may be found [here](#).

Requirements:

The workshop took the view that:

- MOD should own the operating environment and standards
- the ability to reliably pass assets between systems was the appropriate, current, interoperability target; however, the solution must facilitate the sharing of all relevant data
- high-volume, low-value assets should be separated from more sensitive materials in a catalogue format
- open data formats are employed to prevent reliance on proprietary standards
- where appropriate, Digital Twins should be federated using a common operating environment
- iterate test models and then promote to production if success criteria are satisfied. (This will drive competition but need to cohere around a delivery model - promoting the idea of a 'platform')
- The threshold to access is to be as low as reasonably possible: user-centric design is considered essential

Next steps

- Draft Document to be shared with Industry
- Comments and feedback are reviewed and feedback into a document
- A completed document is to be presented to DMSO for their review and consideration
- Work out a resolution to financial, IP, implementation, and security concerns before commencement
- Communicate agreed acquisition strategy (e.g.):
 - Incremental
 - Progressive benefits
 - Maximise re-use.
 - Service- vs equipment-orientation
- Consider supplier management processes that enhance operational advantage, leveraged via high-value, agile, small, and micro-businesses
- Commercial good practice to include seamless and transparent on/off boarding and matching incentives to long-term benefits and associated risks
- Initial use cases to be identified, ideally small, high-value applications leading to larger projects once proven

Conclusion

The workshop audience was unanimously supportive of MOD's ambitious M&S plans. The group recognised the risk of proceeding too quickly to a mature end state and recommended a measured, controlled maturing of capability governed by affordable realisation of benefits that matched operational priorities and availability of SQEP. An iterative, spiral development, methodology was considered to be a good approach and likeliest to deliver value for money whilst satisfying user needs and formal scrutiny. The potential to further exploit its capabilities and benefits for the MOD, Industry, Academia, and Allies was evident.

Modelling and simulation span many elements of the Defence enterprise and are often an element within a broader user need rather than an exclusive M&S requirement in its own right. The challenge of integrating diverse capability elements for a broad, demanding, user community should not be underestimated. Similarly, integration at the data level where organisations apply different file formats, methodologies, security, and operational requirements will take detailed guidelines and disciplined leadership to accomplish.

The collaboration workshops and feedback provided many threads which may be explored further should DMSO and DSEP teams wish.

Annex

Abbreviations:

Name	Description
AI	Artificial Intelligence
DMSO	Defence Modelling and Simulation Office (<i>See Below</i>)
DSEI	Defence and Security Equipment International
DSEn	Defence Simulation Enablers
DSEP	Defence Synthetic Environment Programme (<i>See Below</i>)
DT	Digital Twin (<i>See Below</i>)
DVS2	Defence Virtual Simulation
FLC	Front Line Command
FP ECM	Force Protection Electronic Countermeasures
IP	Intellectual Property
ITAR	International Traffic in Arms Regulations
LFE	Learning from Experience
M&S	Modelling & Simulation (<i>See Below</i>)
MOD	Ministry of Defence
MVP	Minimum Viable Product
NGD	National Geographic Database
NHS	National Health Service
OGD	Other Government Departments
R&D	Research and Development
RFI	Request For Information
SCTA	Safety Critical Task Analysis
SE	Synthetic Environment (<i>See Below</i>)
SHM	Sony Honda Mobility
SMA	Subject Matter Expert
T&E	Test & Evaluation
TCDM	Trusted Capital Digital Marketplace (USA DoD)
TDI	Team Defence Information
V&V	Validation & Verification

Definitions

About DMSO (Defence Modelling & Simulation Office):

- DMSO is a specialist, centralised MOD team within Joint Warfare (JW), StratCom
- a newly formed team (Apr '22) with approval to grow to 15 people. Working for Strategic Command as an overarching capability, DMSO is keen to raise awareness of its new role and resources
- DMSO customer set comprises any MOD user with an M&S query, enquiry, or issue. DMSO stakeholders including MOD, OGDs, Allies, Academia, and Industry
- The intended role for DMSO is to track Defence M&S assets and resources, separating those available for reuse into a separate interactive catalogue
- DMSO will help MOD users select the most appropriate M&S tools, offer advice, manage stakeholders, and gauge levels of skill and competency required
- Central coordination role – to analyse MOD user needs and determine appropriate solutions to optimise effect, budgets, value-for-money or, if no appropriate solution is available, source



other options (e.g. central procurement of additional licences or seek funding for a new capability)

- as a facilitator, rather than a deliverer, of M&S services DMSO will also have a role in promoting best practices in validation, traceability, and verification

Specific Nomenclature and Definitions

Term	Definition
DMSO	The Defence Modelling and Simulation Office (DMSO) sits within UK StratCom Joint Warfare with pan-Defence responsibilities. DMSO provides improved coordination and coherence of MOD M&S activity to promote both VfM and improved M&S capability across the Defence Enterprise. It ' <u>champions</u> ' the role of Modelling & Simulation (M&S), informs and advocates policy, and exploits opportunities for greater cost-effectiveness and consistency through the sharing of M&S knowledge and resources. DMSO will promote and create partnerships with Industry, Academia, OGDs and International Partners to secure these aims.
DSEP	It is envisaged that Defence Synthetic Environment Programme (DSEP, previously defined as the platform) can provide a coordinating and enhancement role via an M&S ecosystem to the benefit of multi-domain integration and seamless interaction with AI and Analytics through common assets and services for standard and customised programmes across Modelling and Simulation (M&S), advanced SEs and Digital Twins.
DSCC	The Defence Simulation Centre Catalogue will be an enterprise data catalogue designed for pan-Defence Synthetic Environment information. It will contain a central Metadata Repository that provides information about the digital assets (data, information, models, terrains etc) which are stored in the Data Repository. It will enable users to discover and access suitable and available resources and reference material. The Catalogue must be able to connect and interact with similar systems as developed by OGDs and Allies to enable wider sharing of resources.
SES	The Synthetic Environment Services manages, maintains, and provides geospatial data, environmental data and 3D models optimised for M&S usage enabling sharing and reuse, with an ability for the service to evolve to cover other types of data specifically for M&S. The system must be able to export data in a number of formats as listed in Def-Stan 03-50.
Model	A physical, mathematical, or otherwise logical representation of a system, entity, phenomenon, or process. [NATO]
Simulation	The imitation of the operation of a real-world system or process over time. The use of a data processing system to represent selected behavioural characteristics of a physical or abstract system. [NATO]
Synthetic Environment	A Synthetic Environment (SE) is a representation of the real world, within which any combination of players may interact. [NATO] The integrated set of data elements that define the environment within which a given simulation application operates. The data elements include information about the initial and subsequent states of the terrain including cultural features, and atmospheric and oceanographic environments throughout an exercise. The data elements include databases of externally observable information about instantiable entities and are

	adequately correlated for the type of exercise to be performed. Also known as a virtual world. [IEEE]
Digital Twin	Digital Twin - Overarching definitions in this setting (can be an asset, product, service, or enterprise) in most circumstances a mix or amalgamation of all these. [Team Defence] <ul style="list-style-type: none">• Digital Twin – Connected both ways from ‘real’ to Digital.• Digital Model – Not connected to ‘real.’• Digital Shadow – Connected one way from ‘real’ to Digital To summarise, a Digital Twin is best described as a visualisation and scenario builder to assist with decision-making

Note: Workshop facilitation and report creation were carried out by Team Defence Information (TD-Info) <https://www.teamdefence.info/>, a not-for-profit specialist Defence Trade body which has wide and varied experience in this sector. It has offered to assist DMSO as an intermediary in their quest. While it cannot take ‘ownership’ of the problem, it can support the evidence gathering to help inform the DMSO Management Team.

JSP 939 Rules (Coherence Principles)

Rule 1. Reuse Existing.

Any available existing systems, components, services, data, and licences that meets the M&S requirement must be used as the default or 'Do Minimum' option.

Rule 2. Procuring for Reuse.

Any new/modified/enhanced M&S components, services and data acquired by a project shall be made available for reuse via the DMSO M&S Catalogue in formats specified in Def Stan 03-50 where applicable and practicable.

Rule 3. M&S Standards.

Any M&S standards selected for use by the capability or technical solution change must be compliant with Def Stan 03-50.

Rule 4. Enumerations.

All new and revised distributed simulation enumerations must comply with the DMSO Enumerations Policy and be registered with the Defence Simulation Centre (DSC).

Rule 5. M&S Enterprise Architecture.

All M&S based capability must be developed in accordance with the DMSO Enterprise Architecture approach (both in terms of engineering approach to implementing the architecture and the agreed physical architecture itself) as advised and approved by the relevant SCTA.

Rule 6. Technical Documentation.

In order to support interoperability and reuse, suitable documentation must be made available for all M&S based Capabilities, this to include Interface Control Documents (ICDs), 3D model metadata, etc.

Rule 7. Synthetic Environment (SE) Data.

All M&S-based capability needs for SE Content Data, are to be sourced via the DSC, including terrain data and 3D models, hydrographic data, etc.

Rule 8. Research and Reports Exploitation.

All M&S-related research and decision support activity, including any outputs, is to be registered with the DSC.

Widespread reforms to transform delivery of kit to UK's armed forces.

Key principles.

To avoid previous challenges where programmes have been over-complex, over-budget, and over time, a new Integrated Procurement Model will be brought in from April, which will see:

- The Integration Design Authority (IDA) introducing new checks and balances to avoid some of the challenges faced in previous procurements.*
- Greater empowerment of subject matter experts across the defence enterprise including defence scientists, government export leads, finance experts and industry partners to challenge and shape proposals before they receive the go-ahead.*
- Increased focus on exportability of a capability at the start of a procurement, to prioritise developing kit that can be sold to and used by other nations.*
- Earlier engagement with the UK defence industry to ensure quicker delivery of kit into the hands of the armed forces.*

The new model will expose and resolve potential issues in any major programme at the start of the process, aiming to avoid unexpected complications that could cause in-service delays or additional costs.

Minister for Defence Procurement, James Cartlidge said:

“There is no question that we are living in an increasingly dangerous world, and so our approach to major military procurement programmes cannot go on as it has before.

Pace, challenge, and integration are vital to setting ourselves up for success and replacing the siloed nature of major programmes that hamper timely delivery and squander global export opportunities.

All parts of UK defence must embrace these reforms as a positive shift in our approach that will deliver a military fit for the future.

Delivering new equipment and technology more quickly is key to the overall reforms, and the concept of ‘spiral’ development will be at the forefront as new programmes are initiated. This will avoid capabilities that are not adaptable to the changing environment or are overly complex and too bespoke to export.

Rather than striving for perfection before delivering to the frontline, capabilities at 60-80% of their full potential will be provided to the user, allowing early application, and subsequent improvements to reach their full potential”.

Excerpt from a recent MoD press release.

Source can be seen:

<https://www.gov.uk/government/news/widespread-reforms-to-transform-delivery-of-kit-to-uks-armed-forces>

Visit TD-Info to keep up to date on developments at:

<https://www.teamdefence.info/>

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