

MODAF-M09-001

MINISTRY OF DEFENCE



MOD Architectural Framework Executive Summary

Version 1.0

31 August 2005

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partners

Approved by:- MODAF Project Review Board

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RECORD OF CHANGES

This page will be updated and re-issued with each amendment. It provides an authorisation for the amendment and a checklist to the current amendment number.

Issue No.	Date	Revision Details
Version 1.0	31 August	First MODAF Baseline release

Disclaimer

Following review it has been decided that, to better reflect its intended audience and to avoid confusion with the Acquisition Process, the Acquisition Community of Interest (COI) Deskbook is to be renamed the Integrated Project Team (IPT) COI Deskbook. This change is immediate; all references in the MODAF documentation to the Acquisition COI Deskbook should be interpreted as the Integrated Project Team COI Deskbook. This change will be reflected in the MODAF documentation at the next update.

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FOREWORD

1. An 'effects based approach' to military operations demands that we combine military capabilities in time and space, to an ever increasing tempo, in order to achieve the desired outcome. To achieve this, we must master the complex interaction of weapons, platforms, sensors and people, in order to maximise their combined strengths and to minimise any potential weaknesses. We seek to do this through our adoption of Network Enabled Capability, integrating existing capabilities into an increasingly coherent system of systems.
2. At the same time, perpetual pressure on Defence spending means that we must seek maximum return on our investments and drive inefficiency out of our operations.
3. Our greatest enemy in this regard is complexity and we must find effective ways to overcome it. One key to achieving the simplicity we seek is to focus on the decision-making process and the information flows that must support effective decision making and subsequent action.
4. The MOD Architectural Framework (MODAF) offers invaluable assistance in our struggle for simplicity, as it provides a common language and common formats for the capture and shared use of trusted data. It is therefore my intent that we adopt an architectural approach, grounded in MODAF, to our day-to-day business. This Deskbook explains how you can begin to use MODAF to articulate your business in a manner that will aid collective understanding, increase efficiency and enhance effectiveness; I commend it to you.

1. INTRODUCTION

5. This Executive Summary is intended to be the entry point into the MODAF suite of documents for all readers. It provides an overview of what MODAF is and why it should be implemented. For those readers who are going to go on to implement MODAF architectures it also includes an overview of the MODAF suite of documents and where to look next.

6. MOD's adoption of Network Enabled Capability (NEC)¹ as its means of integrating existing capabilities into a coherent system of systems is an ambitious exercise in managing both complexity and change throughout the enterprise. Modern warfare is fast changing and the systems that technology is now making available are in themselves faster, more complex and more adaptable than ever before. The combination and orchestration of these systems in concert with operational planning introduces a level of complexity never before experienced in the Ministry of Defence.

7. To assist decision-makers, MOD has decided to adopt the MOD Architecture Framework (MODAF) as a means of abstracting essential information from the underlying complexity and presenting it in a way that maintains coherence and consistency. One of the principle objectives is to present this information in a way that is understandable to the many stakeholder communities involved in developing, delivering and sustaining capability through life.

8. MODAF is an *Architectural Framework* which has been designed to meet the specific business and operational needs of the MOD. It defines a way of representing an *Enterprise Architecture* which enables stakeholders to focus in on specific areas of interests in the enterprise, whilst retaining sight of the "big picture". In essence it enables decision-makers to manage complexity by splitting the problem space into manageable pieces – defined in the framework as "Views". The views are categorised under *Viewpoints* by their perspective (e.g. operational, technical, etc.). Each View has a particular purpose, and usually presents:

- Broad summary information about the whole enterprise (e.g. high level operational concepts);
- Narrowly focussed information for a specialist purpose (e.g. system interface definitions);
- Or, information about how aspects of the enterprise are connected (e.g. how business processes or operational activities are supported by a system, or how programme management brings together the different aspects of network enabled capability).

9. The fundamental tenet of an *Enterprise Architecture* approach is that there is 'one source of truth'. This reflects the fact that while there can only be one enterprise, there can be many valid stakeholder views providing they are based on a common data set. The diagram in *Figure 1-1* attempts to illustrate this concept of a single enterprise that can be presented in different ways that has meaning for particular stakeholders or communities of interest.

¹ Network Enabled Capability JSP 777 Edition 1 dated April 2005.

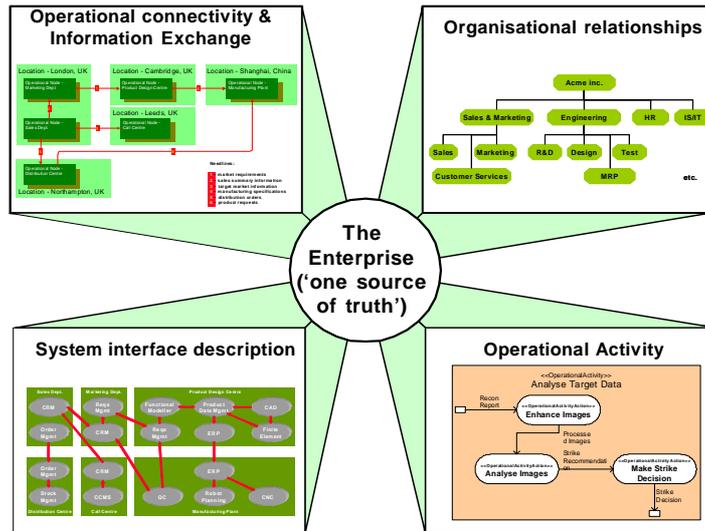


Figure 1-1: Enterprise Architecture View

10. MODAF has been developed to provide an Enterprise Architecture approach in support of a wide number of communities across MOD and assist them in conducting their day-to-day business. Although focussed largely at operational processes and acquisition of capability to support these, MODAF is equally applicable to business space, all other aspects of the MOD enterprise and other organisations that interface with it, such as coalition partners and its supply chain.

11. MODAF is being adopted within the MOD in order realise a more coherent and integrated approach to the acquisition, management and operation of military capability. The nature of MODAF benefits will include:

- a. Structured analysis and articulation of business issues
- b. Enhanced requirements specifications
- c. Improved efficiency, effectiveness and standardisation of MOD-wide processes and ways of working
- d. Improved validation and assurance of solutions
- e. More coherent portfolio of military capability and more integrated systems
- f. Avoidance of unnecessary costs in the overall investment programme

2. MODAF FRAMEWORK

12. The MOD Architectural Framework (MODAF) is a framework for developing architectures that provide a means to model, understand, analyse and specify Capabilities, Systems, Systems of Systems (SoS) and Business Processes. MODAF may be applied across a wide variety of MOD processes including: capability management, acquisition, operational analysis, planning and through-life management.

13. MODAF has been developed from the US Department of Defense Architectural Framework (DoDAF)². MODAF keeps compatibility with the core DoDAF viewpoints in order to facilitate exchange of architectural information with the US, for example in conducting international interoperability analyses. However, MODAF has supplemented DODAF with two new viewpoints that better support MOD processes and lifecycles. Therefore, MODAF consists of six viewpoints as shown in *Figure 2-1* - these cover all of the main perspectives and dimension that are required in order to conduct the core MOD processes around acquisition, sustainment and operations.

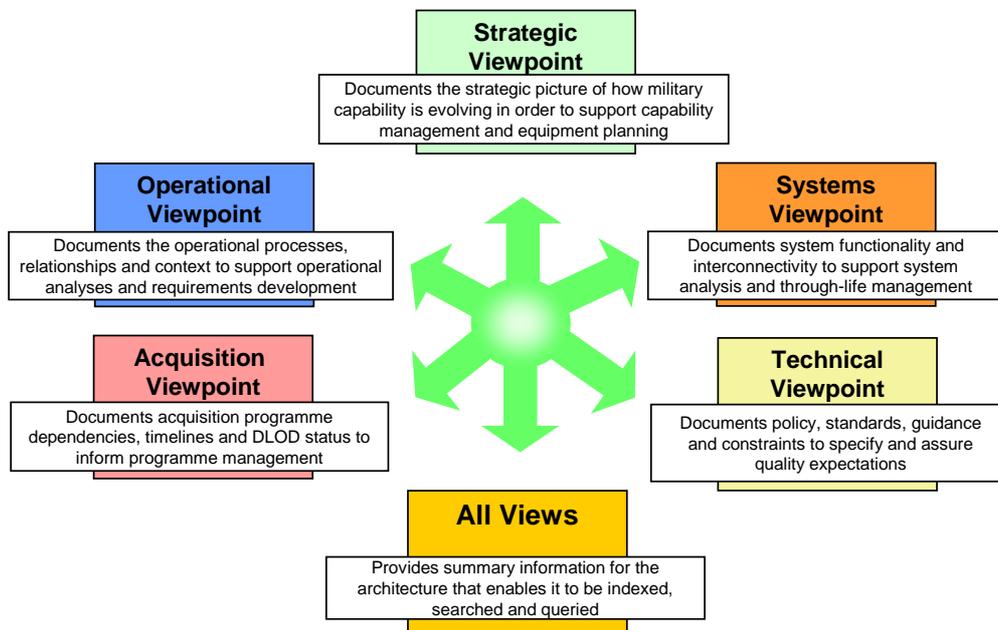


Figure 2-1: MODAF Viewpoints

14. The new elements of MODAF that are not included in DoDAF are the Strategic and Acquisition Viewpoints. These have been added to MODAF in order to better contribute to MOD processes and lifecycles, specifically the analysis of the strategic issues and dependencies across the entire portfolio of military capabilities.

15. The six MODAF viewpoints are not separate models of different things but are a means of viewing the same problem from different architectural perspectives - for instance, that of the operational user, the policy setter, or the system architect. This is illustrated in *Figure 2-2* below³. The architectural model is contained within the cube and the different faces of the cube provide different perspectives represented by the MODAF viewpoints – in this case operational, system and technical.

² DOD Architectural Framework, version 1.0, February 2004

³ Adapted from an architectural modelling approach developed in DCBM(A) – now known as CSD Apps, SOinC(A)

Furthermore, there are a number of separate openings on each face of the cube that represent the number of different views available within each MODAF viewpoint.

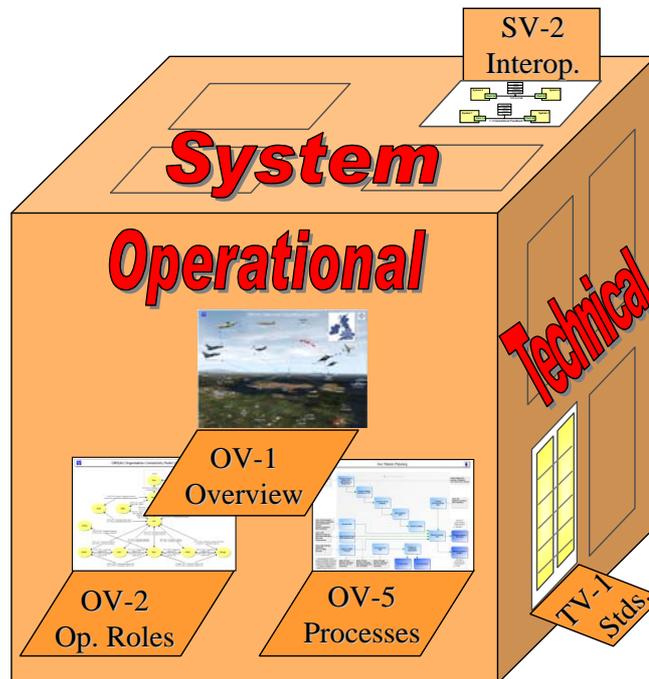


Figure 2-2: Relationship between MODAF Views

16. In support of the MODAF framework a number of MODAF Enablers are also required that ensure consistency and interoperability between MODAF-based architectures. These MODAF Enablers are:

- a. **MODAF Meta-Model (M3)** defines the objects that can be utilised in each MODAF View and the structure of architectural data exchange files. All MODAF-compliant tools will have to be able to read and write files that conform to the M3
- b. **Enterprise Reference Model (ERM)** is a conceptual model describing the types of information that can be represented in a MODAF architecture. The ERM is specified by the MODAF stakeholders, and the M3 is derived from it
- c. **MOD Architectural Repository (MODAR)** is a system for integrating architectures from different sources. It provides long-term storage and query capabilities
- d. **MODAF Taxonomy** is a hierarchical structure of standard terms that is used as the common dictionary for MODAF architectures.

17. The utilisation of these MODAF enablers along with the MODAF framework will enable consistency and re-use of architectural models. A number of architectural tools are being developed that will comply with these MODAF standards. In the meantime, interim guidance has been issued on the availability of MODAF convergent tools⁴.

⁴ Interim NEC, CBM and BMS MODAF Modelling Policy, DEC (CCII) File ses 046-05, 1/3/05.

3. THE MODAF DOCUMENTATION SUITE

18. This MODAF Executive Summary forms part of the overall suite of MODAF 1.0 baseline documentation as shown in *Figure 3-1*.

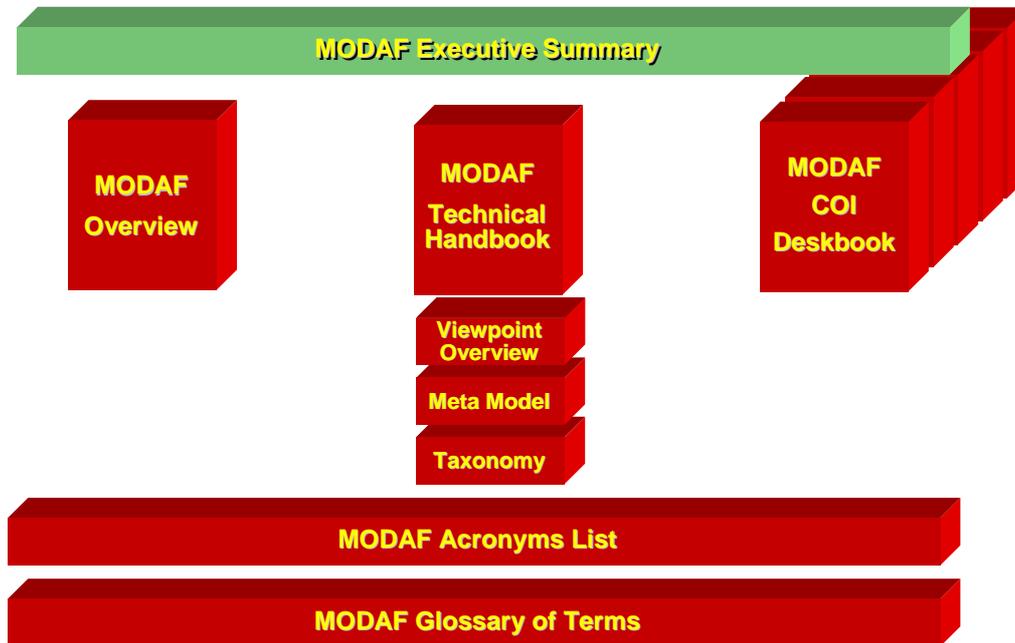


Figure 3-1: MODAF 1.0 Baseline Products

19. The main elements of the MODAF baseline are:

- a. **Executive Summary** – provides a brief summary of the entire MODAF baseline
- b. **MODAF Overview** – describes what MODAF is, why it should be used and details the process for developing architectures
- c. **MODAF Technical Handbook** – provides details of the construction of MODAF Views and their relationship to the MODAF Meta Model (M³). This is supported by:
 - i. **Viewpoint Overview** – a short summary of each view intended for quick reference by MOD users
 - ii. **MODAF Meta Model (M3)** – used to define the architectural objects that are permitted in MODAF views and their relationships with each other. The M3 is derived from a conceptual model of the elements within the MOD architecture - the Enterprise Reference Model (ERM)
 - iii. **Taxonomy** – provides the approved names and definitions for architectural objects to be used within the MOD's architectures
- d. **MODAF Deskbooks** – describe how users within particular communities in the MOD are expected to utilise MODAF architectures to support their processes
- e. **MODAF Acronym List and Glossary of Terms** – these documents define the commonly used terminology in the MODAF Document Suite.

20. For the purpose of describing the relationship of MODAF to MOD's processes, five Communities of Interest (COI) have been considered as shown in *Figure 3-2* below. Whilst these do not describe the whole of the MOD's processes as described

in the Business Management System (BMS), they do cover the core processes around acquisition and military operations.

21. It should be noted that the COI names referred to in *Figure 3-2* are merely convenient labels to apply to communities / groups that are engaged in similar activities. For instance, the scope of the Acquisition COI aligns broadly with that of the DPA IPTs (ie largely equipment focussed from Concept stage through to delivery into service). Obviously this scope is somewhat more limited than the full Smart Acquisition definition of Acquisition – which encompasses all DLODs and the entire lifecycle. However, collectively the MODAF COIs do encompass all of the DLODs and cover the entire MOD acquisition lifecycle.

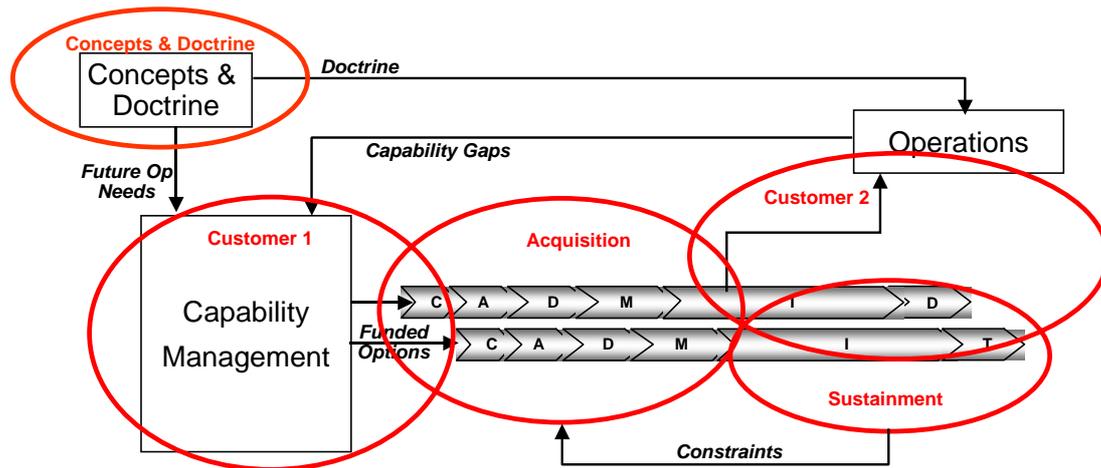


Figure 3-2: MODAF Deskbook Communities of Interest

22. The high level scope of these COIs is:

- a. **Concepts and Doctrine** – the development of analytical concepts (e.g. Joint High Level Operational Concept), applied concepts (e.g. Joint Fires) and in-service doctrine (e.g. Standard Operating Procedures (SOPs) and Tactics, Techniques and Procedures (TTPs))
- b. **Customer 1** – the monitoring of capability gaps against future needs, building the Equipment Programme (EP) and ownership of User Requirements Documents (URDs) for new capabilities
- c. **Acquisition** – the development and fielding of new military capabilities, the primary focus is up to the acceptance into service of a fully operational capability
- d. **Sustainment** – the processes to maintain military capability in line with the relevant Through Life Management Plan while recognising the in-theatre sustainment roles of the relevant Second Customer's Pivotal Managers
- e. **Customer 2** – the Core Leadership and Pivotal Management roles as defined in Smart Acquisition⁵ and described further in the Joint and Single Service 2nd Customer Handbooks⁶.

⁵ For further detail, see Smart Acquisition Handbook, available at <http://www.ams.mod.uk>.

⁶ Customer 2 (Core Leadership) is undertaken by single-Service Chiefs to provide overall strategic management of individual Services and their professional direction. Core Leadership provides advice to Customer 1 on the full range of factors contributing to military capability across the DLODs. Customer 2 (Pivotal Management) is undertaken by those who use the equipment in-service (primarily the front line and training commands) in order to provide the user perspective and manage allocated resources to achieve the required output.

23. Having read this MODAF Executive Summary most readers will probably then want to digest the MODAF Overview (MODAF-M09-002, Version 1.0) that contains significantly more detail on each of the topics in this document and introduces the recommended approach to developing MODAF Architectures. Following this, those who are going to use MODAF architectures are then likely to refer to the MODAF implementation details appropriate to their processes within the relevant MODAF COI Deskbook(s). Architecture developers and those developing MODAF tools are likely to consult the MODAF Technical Handbook (MODAF-M07-022, Version 1.0).

4. QUANTIFYING THE BENEFITS OF MODAF ARCHITECTURES

24. One of the key benefits of implementing MODAF is that it provides good visibility of strategic portfolio management and programme integration issues – between multiple projects and across the Defence Lines of Development (DLODs). In this sense MODAF is an enabler of a more coherent enterprise architecture that is capable of better aligning all activities and capabilities across the MOD.

25. It has been estimated within the AfNEC programme that the total risk and rework associated with integration across the Equipment Programme (EP) could be between £2.3 B and £3.4 B if no mitigating actions are taken⁷. The degree to which this risk can be addressed depends strongly upon the maturity of the system(s) being considered. There is far more leverage to be obtained by addressing integration issues at the early stages of the lifecycle than by addressing the same issues when the system has already been developed or is in-service. Therefore, the adoption of a rigorous architectural approach in the early stages of the system lifecycle when there is still an opportunity to correct issues regarding system context, scope, interfaces, etc is likely to have a high impact on this EP risk and should realise good savings.

26. Although it is not feasible to unpack the individual contribution of MODAF towards these overall savings, the impact that the collective approach of MODAF, AfNEC, IX and other IA services would make across the acquisition portfolio is shown schematically in *Figure 4-1*. In complex enterprises with large capital-intensive infrastructures similar to the MOD it is not uncommon for there to be 30 to 40% of the total portfolio value in risk and rework across the acquisition portfolio associated with integration and interoperability issues. Not all of this risk and rework will have been budgeted for within contingencies (i.e. within the EP) – therefore, if this risk does mature it will adversely affect the affordability of downstream projects ie delaying the availability of future military capability. However, if the enterprise was to adopt a more coherent approach to managing across the entire portfolio and using good practice systems engineering / architectural approaches this risk and rework element could be significantly reduced⁸ – with less downstream affordability impact on the rest of the future portfolio.

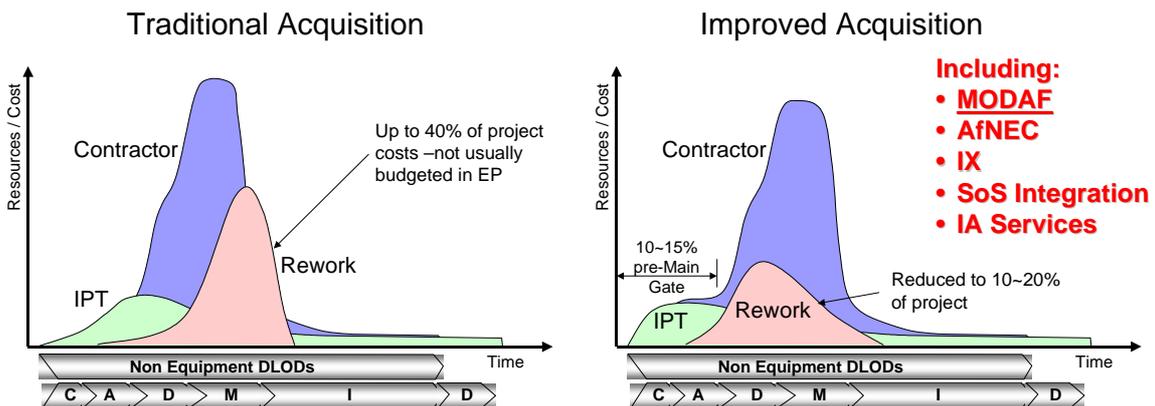


Figure 4-1: Potential Benefits in Acquisition Risk / Rework

27. When considered from an overall perspective such as this there is not any burden associated with conducting MODAF architectures. Quite the contrary, there is a large reduction in overall cost / resources, although with a small shift in the

⁷ AfNEC Business Case, Spetember 2004 and Integration Cost Report, D/PFG26/11/3

⁸ See Figure 6 in NASA SP6105, June 1995 and Systems Engineering Centre of Excellence report 01-03, 2003 (on www.incose.org)

resource profile early in the lifecycle toward early investment in de-risking the remainder of the lifecycle.

28. More specifically, the nature of benefits that can be obtained from the adoption of an Enterprise Architectural approach such as MODAF will include⁹:

- a. Structured analysis and articulation of business issues
- b. Enhanced requirements specifications
 - i. New projects scoped more accurately meaning fewer adverse 'surprises' and cost increases during implementation
 - ii. Reduced development risks / costs for projects and faster introduction, so that business benefits can be realised earlier
- c. Improved efficiency, effectiveness and standardisation of MOD-wide processes and ways of working
 - i. Cost reduction through the introduction of standards and improved management of Whole Life Costs
- d. Improved validation and assurance of solutions
- e. More coherent portfolio of military capability and more integrated systems
 - i. Improved portfolio and programme management
 - ii. Scarce resources are now focused on investments that are best aligned with the enterprise needs and strategy – not those with the loudest or most powerful sponsors
 - iii. Enhanced systems interoperability
- f. Avoidance of unnecessary costs in the overall investment programme
 - i. There is less need for expensive 'temporary' workarounds caused by incomplete project implementations

29. The means by which the benefits of an architectural approach are likely to be realised by MODAF COI are listed in Appendix A.

⁹ Based upon commercial case studies and research (eg Gartner) – for more detail refer to MODAF PID, Version 0.10, October 2004

5. DOCUMENT MAINTENANCE

30. It is intended that the MODAF product suite will evolve through time in order to reflect learning from experience, changes to the MOD's processes and the evolution of architectural best practice. A change control process will be established for all MODAF products and suggestions upon the refinement / improvement of this and related products are welcome. The formal MODAF change control process shall be published in due course (see www.modaf.com). In the interim, suggestions should be forwarded to the MODAF team – through <http://defenceintranet.diiweb.r.mil.uk/DefenceIntranet/Teams/BrowseTeamCategories/ProgrammesProjectsAndWorkingGroups/MinistryOfDefenceArchitectureFrameworkmodaf.htm>.

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DCSA	D Def Acq	NITEworks
DG Info (incl. CBM J6)	DGMO	

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The role of Industry is also acknowledged in providing support to the MODAF development and in reviewing the MODAF products prior to its release.

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The MODAF 1.0 Baseline has been developed for the MOD by MODAF partners. The MODAF partners team leaders for this work have been:

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6. BIBLIOGRAPHY

The following were used to provide background context for the development of the MODAF Baseline products:

Architectural Frameworks:

IEEE Std 1471-2000, Architectural Descriptions of Software Intensive Systems, September 2000

DOD Architectural Framework, Version 1.0, February 2004

Federal Enterprise Architecture Framework, Version 1.1, September 1999

TOGAF 8, The Open Group Architectural Framework, December 2002

Zachman Framework for Enterprise Architecture, see www.zifa.com

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Acquisition Management System, www.ams.mod.uk

ECC Handbook, Issue 3, December 2003

Joint Second Customer Handbook, Draft Edition 1, July 2005

The Concept Handbook, AD Draft July 2005

APPENDIX A: COI SPECIFIC MODAF BENEFITS

31. The nature of the potential benefits from implementing MODAF within each of the COI is detailed below.

a. Benefits to Concepts and Doctrine COI

- i. Improved articulation of the process from concepts development to identified defence capabilities
- ii. Improved identification and management of cross-capability dependencies
- iii. Better support for concept generation and capability development and assessment
- iv. Ensure better capability selection, endorsement and integration across all DLODs.

b. Benefits to Customer 1 COI

- i. Improved definition of both capability and user requirements; by providing a integrated set of Views to support requirements development
- ii. More effective cross-DEC working; by bringing commonality to the articulation of data across options, plans and analyses
- iii. Reduced risk to the Equipment Programme through improved delivery assurance; by providing traceability of requirements into the activities of Acquisition, Sustainment and Customer 2.

c. Benefits to Acquisition COI

- i. Improved clarity of the context within which a new capability will operate
- ii. Clearer and more comprehensive requirements documents
- iii. Improved ability to resolve interoperability issues between systems
- iv. Better understanding of the mapping of system functions to operational needs and hence the ability to conduct improved trade-offs.

d. Benefits to Sustainment COI

- i. Improved military, logistics and acquisition decision-making, primarily through better traceability between the business processes and the solutions which support those processes
- ii. Improved clarity of the CONOPS, CONEMP and CONUSE of an existing, improved and new capability, including how support will operate
- iii. Improved efficiency through easier identification of opportunities for rationalisation of activities, roles and equipment, and faster, more effective feedback
- iv. Improved interoperability between systems
- v. Enable the integration across the DLODs
- vi. Reduction in risk for introduction of equipment and their support
- vii. Improved value-for-money and an enabler towards faster delivery.

e. Benefits to Customer 2 COI

- i. Improved military decision-making through a better, joined-up, coherent and holistic understanding of relationships between all the elements of the military landscape (eg capabilities, activities, systems and roles). This will result in improved military effect and reduced risk
- ii. Improved clarity of the context within which a new capability will operate
- iii. Improved efficiency through easier identification of opportunities for rationalisation of activities, roles and equipment, and faster, more effective feedback.
- iv. Improved interoperability between systems
- v. Reduction in risk for introduction of equipment.